

Intra-Industry Foreign Direct Investment

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Appendix A: Data and Sources for Regression Analysis

Firm-Level Data: We use data from WorldBase, a database of more than 43 million plant-level observations in more than 205 countries and territories compiled by Dun & Bradstreet (D&B) from the 2004/2005 file. WorldBase is the core database from which D&B populates its commercial data products including Who Owns Whom™, Risk Management Solutions™, Sales & Marketing Solutions™, and Supply Management Solutions™.¹ These products provide information about the “activities, decision makers, finances, operations and markets” of potential customers, competitors, and suppliers of D&B clients. Whereas other databases draw primarily from national firm registries, D&B compiles its data from a wide range of sources with a view to providing its clients with contact details and basic operating information about potential customers, competitors, and suppliers. Sources include partner firms in dozens of countries, telephone directory records, websites, and self-registering firms. All information is verified centrally via a variety of manual and automated checks. Information from local insolvency authorities and merger and acquisition records are used to track changes in ownership and operations.

The unit of observation in WorldBase is the establishment rather than the firm. Establishments, which we also refer to as plants, like firms have their own addresses, business names, and managers, but might be partly or wholly owned by other firms. We are therefore able to observe new enterprises spawned from existing firms, or, by aggregating to the firm level, examine only independent new firms. We use four categories of data that WorldBase records for each establishment.

- i. Detailed industry information including the four-digit SIC code of the primary industry in which each establishment operates and, for most countries, the SIC codes of up to five secondary industries, listed in descending order of importance. D&B uses the United States Government Department of Commerce, Office of Management and Budget, Standard Industrial Classification Manual 1987 edition to classify business establishments. In 1963, the firm introduced the Data Universal Numbering System—The

¹ D&B has been the leading U.S. source of commercial credit and marketing information since approximately 1845. Presently, it operates in 205 countries and territories, directly or through affiliates, agents, and associated business partners. For more information about the quality control process see: http://www.dnb.com/us/about/db_database/dnbinfquality.html.

D&B D-U-N-S® Number—used to identify businesses numerically for data-processing purposes. The system supports the linking of plants and firms across countries.

- ii. Detailed ownership information including information about firms’ family members (number of family members, domestic parent, and global parent), status (joint venture, corporation, partnership), and position in the hierarchy (branch, division, headquarters).
- iii. Detailed location information including the country, state, city, and street address of each family member.
- iv. Basic operational information including sales, employment, year of establishment, and an indicator of import and export activity for each establishment (less coverage).

U.S. Trade Data: From Foreign Trade Division, U.S. Census Bureau, for 2005.

U.S. Related-Party Trade: Data includes import transactions between parties with various types of relationships including “any person directly or indirectly, owning, controlling or holding power to vote, 6 percent of the outstanding voting stock or shares of any organization,” from Foreign Trade Division, U.S. Census Bureau, for 2005.

Market Size: GDP, from World Development Indicators.

Human Capital: High school enrollment years of schooling per worker, from World Bank.

Trade and Investment Costs: Bilateral distance.

Skill Intensity: Non-production workers (e.g., managers and engineers) as a proportion of total employment. The higher the proportion, the higher the skill level presumed to be embodied in the production processes and product offerings.

Proximity: For each pair of codes, we identify two different input-output coefficients: the *Direct Requirements Coefficient* (i.e., the amount of the output of industry i used directly as an input to industry j) and the *Total Requirements Coefficient* (i.e., the total amount of output of industry i used either directly or indirectly in the production of industry j). Our measure of proximity is the ratio of direct/total requirements coefficients.

Closeness: Absolute difference between the four-digit SIC codes of two products.

Appendix B: Sensitivity of Results to the I-O Analysis

How sensitive are these results to the I-O analysis? We initially use a coefficient cutoff of 0.05 and vary this to test the robustness of our results to different coefficients. If we raise the cutoff coefficient to 0.075, we lose only one of the top 10 vertical pairs in Appendix Table 1. All of the others have coefficients greater than 0.075. The pair we lose is Orthopedic, Prosthetic, and Surgical Appliances and Supplies (SIC 3842) (parent firms) and

Surgical and Medical Instruments and Apparatus (SIC 3841) (subsidiaries). The I-O coefficient is 0.063 and there are 201 such pairs. We are reluctant to cut this pair because it appears to be a bone-fide vertical relationship.

Altering the cutoff coefficient in this way, we lose only three pairs in the top 50 most frequent parent-subsidiary industry combinations, and each of those industry pairs seems to make sense as a vertical relationship: Railroad Equipment (parent), Switchgear and Switchboard Apparatus (subsidiary); Telephone and Telegraph Apparatus (parent), Radio and Television Broadcasting and Communications Equipment (subsidiary); Chocolate and Cocoa Products (parent), Candy and Other Confectionery Products (subsidiary).

Appendix Table 1: Most Frequent Parent-Subsid Horizontal Industry Combinations in DNB Data

Parent industry	No. of Subsidiarys	SIC
Motor Vehicle Parts and Accessories	1080	3714
Pharmaceutical Preparations	1042	2834
Industrial Gases	1018	2813
Plastics Products, NEC	576	3089
Motor Vehicles and Passenger Car Bodies	541	3711
Computer Peripheral Equipment, NEC	394	3577
Perfumes, Cosmetics, and Other Toilet Preparations	386	2844
Periodicals: Publishing, or Publishing and Printing	349	2721
Paints, Varnishes, Lacquers, Enamels, and Allied Products	325	2851
Newspapers: Publishing, or Publishing and Printing	319	2711
Books: Publishing, or Publishing and Printing	279	2731
Printing Ink	278	2893
Plastics Material and Synthetic Resins, and Nonvulcanizable	260	2821
Surgical and Medical Instruments and Apparatus	245	3841
Elevators and Moving Stairways	237	3534
Flat Glass	220	3211
Petroleum Refining	220	2911
Pumps and Pumping Equipment	219	3561
Telephone and Telegraph Apparatus	213	3661
Air-Conditioning and Warm Air Heating Equipment and Commerci	209	3585
Semiconductors and Related Devices	209	3674
Electronic Components, NEC	204	3679
Tires and Inner Tubes	200	3011
Steel Works, Blast Furnaces (Including Coke Ovens), and Roll	198	3312
Plastics Products, NEC	195	3089
Industrial Inorganic Chemicals, NEC	190	2819
Electronic Computers	190	3571
Ophthalmic Goods	185	3851
Bottled and Canned Soft Drinks and Carbonated Waters	182	2086
Paper Mills	182	2621
General Industrial Machinery and Equipment, NEC	175	3569
Industrial Gases	168	2813
Chemicals and Chemical Preparations, NEC	165	2899
Radio and Television Broadcasting and Communications Equipme	160	3663
Motor Vehicles and Passenger Car Bodies	142	3711
Power, Distribution, and Specialty Transformers	142	3612

Notes: Author's construction with D&B Data.

Appendix Table 2: Most Frequent Parent-Subsid Upstream Vertical Industry Combinations in DNB Data

Parent industry	Subsidiary industry	parent sic	subsid sic	No. of firms
Medicinal Chemicals and Botanical Products	Pharmaceutical Preparations	2833	2834	475
Speciality Cleaning, Polishing, and Sanitary Prep.	Soaps and Other Detergents, Except Speciality Cleaners	2842	2841	228
Orthopedic, Prosthetic, and Surgical App. and Supplies	Surgical and Medical Instruments and Apparatus	3842	3841	201
Biological Products, Except Diagnostic Substances	Pharmaceutical Preparations	2836	2834	201
Computer Storage Devices	Computer Peripheral Equipment, NEC	3572	3577	167
Computer Peripheral Equipment, NEC	Electronic Computers	3577	3571	165
Computer Terminals	Computer Peripheral Equipment, NEC	3575	3577	154
Pressed and Blown Glass and Glassware, NEC	Flat Glass	3229	3211	146
In Vitro and In Vivo Diagnostic Substances	Pharmaceutical Preparations	2835	2834	143
Motor Vehicles and Passenger Car Bodies	Motor Vehicle Parts and Accessories	3711	3714	134
Periodicals: Publishing, or Publishing and Printing	Books: Publishing, or Publishing and Printing	2721	2731	128
Industrial Instruments for Meas., Display, and Control	Measuring and Controlling Devices, NEC	3823	3829	128
Railroad Equipment	Switchgear and Switchboard Apparatus	3743	3613	122
Periodicals: Publishing, or Publishing and Printing	Books: Publishing, or Publishing and Printing	2721	2731	118
Paper Mills	Paperboard Mills	2621	2631	109
Commercial Printing, Lithographic	Commercial Printing, NEC	2752	2759	107
Industrial Organic Chemicals, NEC	Industrial Gases	2869	2813	103
Unsupported Plastics Film and Sheet	Plastics Products, NEC	3081	3089	102
Electronic Components, NEC	Electronic Connectors	3679	3678	101
Radio and Television Broadcasting and Com. Equip.	Communications Equipment, NEC	3663	3669	94
Printed Circuit Boards	Electronic Components, NEC	3672	3679	88
Paints, Varnishes, Lacquers, Enamels, and Allied Products	Plastics Material and Synthetic Resins, and Nonvulcaniza	2851	2821	87
Telephone and Telegraph Apparatus	Radio and Television Broadcasting and Com. Equip.	3661	3663	86
Plastics Foam Products	Plastics Products, NEC	3086	3089	84
Plastics Products, NEC	Plastics Material and Synthetic Resins, and Nonvulcaniza	3089	2821	78
Concrete Products, Except Block and Brick	Cement, Hydraulic	3272	3241	74
Flat Glass	Glass Products, Made of Purchased Glass	3211	3231	69
Meat Packing Plants	Sausages and Other Prepared Meats	2011	2013	68
Surgical and Medical Instruments and Apparatus	Orthopedic, Prosthetic, and Surgical App. and Supplies	3841	3842	66
Cyclic Organic Crudes and Int. and Organic Dyes	Industrial Inorganic Chemicals, NEC	2865	2819	65
Plastics Material and Synthetic Resins, and Nonvulcanizab	Industrial Inorganic Chemicals, NEC	2821	2819	65
Surface Active Agents, Finishing Agents, Sulfonated Oils	Industrial Organic Chemicals, NEC	2843	2869	64
Truck and Bus Bodies	Motor Vehicles and Passenger Car Bodies	3713	3711	61
Poultry Slaughtering and Processing	Prepared Feed and Feed Ingredients for Animals and Fow	2015	2048	58
Industrial Valves	Valves and Pipe Fittings, NEC	3491	3494	57
Radio and Television Broadcasting and Com. Equip.	Electronic Components, NEC	3663	3679	57
Aircraft	Aircraft Parts and Auxiliary Equipment, NEC	3721	3728	56

Notes: Author's construction with D&B Data.