

Data Appendix
for
The Economic Significance of National Border Effects¹

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¹Board of Governors of the Federal Reserve System. The views expressed in this paper are those of the author, and not necessarily those of the Board of Governors of the Federal Reserve System or the Federal Reserve System. I wish to thank James Harrigan, John Helliwell, James Rauch, and Phil Swagel for provision of data.

1 Countries and Industries in Data Set

Countries Section II, Subsections A and B; Section III, Subsections B and C: Australia, Canada, Denmark, France, Germany, Japan, United Kingdom, United States.

Section III, Subsection A: Australia, Canada, France, Germany, Italy, Japan, the Netherlands, Spain, United Kingdom.

Industries Section II, Subsections A and B; Section III, Subsections B and C: Non-manufactured products; Food, Beverages, and Tobacco; Textiles, Apparel, and Leather; Wood Products and Furniture; Paper Products and Printing; Chemicals and Drugs; Petroleum Refineries and Products; Rubber and Plastic Products; Non-metallic Mineral Products; Basic Metal Industries; Fabricated Metal Products, Machinery, and Equipment; Other Manufacturing; These categories are based on the ISIC sectoral division in *The OECD input-output database* (1995).

Section III, Subsection A: Chemicals and Allied Products; Electric and Electronic Equipment; Non-electric Machinery; Food and Kindred Products; Primary and Fabricated Metals; Transportation Equipment; and Other Manufacturing; These are the categories provided in the BEA publicly-available data.

2 Trade and Production Data

Section II, Subsections A and B; Section III, Subsections B and C Data on industry-level OECD bilateral trade flows are taken from Feenstra, Lipsey, and Bowen (1997), with the original source as the Statistics Canada World Trade Database. The data are provided on an SITC basis; they were concorded to ISIC based on Maskus (1991). Feenstra et al. also provide the trade data according to the WBEA classification. These data were also concorded to an ISIC basis in order to confirm the original SITC-ISIC concordance. Results did not change substantially.

Domestic trade for manufactured goods is production (gross output) within each industry less exports from that industry, with both production and export data taken from the *The OECD STAN database* (Various Years) and converted to U.S. dollars using the annual exchange rate in the *Database*. Non-manufacturing domestic trade is total gross goods production less manufacturing production less non-manufacturing exports. The gross goods production data were either provided by John Helliwell through private correspondence, with the original source cited as *U.N. national accounts statistics* (Various years), or taken from *The OECD input-output database* (1995) or *The OECD STAN database* (Various Years). Non-manufacturing exports are calculated as total exports less manufacturing exports.

Production data are from *The OECD STAN database* (Various Years). The production data were converted to U.S. dollars using the annual exchange rate in the *Database*.

Section III, Subsection A Data on exports from the U.S. to the countries in the sample are taken from Feenstra (1997), with the original sources as U.S. Bureau of the Census (1978-1988 and 1989-1994). They were converted from the SITC classification to the BEA classification using the concordance in Feenstra, Lipsey, and Bowen (1997). Production (gross output) data within industries for the U.S. are from *The OECD STAN database* (Various Years).

Domestic trade for manufactured goods is production (gross output) within each industry less exports from that industry. Domestic production, employment, and total export data are from *The OECD STAN database* (Various Years). The production data were converted to U.S. dollars using the annual exchange rate in the *Database*.

Data on the activities of foreign affiliates of U.S. multinationals are from the U.S. Bureau of Economic Analysis (1985-1994), as provided in Feenstra (1997). Total sales and local sales by foreign affiliates are used as, respectively, production and consumption. Thus, the left-hand-side variable is *local sales* of foreign affiliates, while the right-hand-side production indicator is *total sales* by the foreign affiliates. These quantities correspond to domestic sales and total production in the case of domestic firms.

3 GDP, Population, Distance Variables

The distance data were provided by John Helliwell. $DIST_{cc'}$ is the distance from exporter k to importer j . It is generally measured from capital to capital and calculated using Great Circle Distances from Latitude and Longitude given in *Direct line distances*, by Fitzpatrick and Modlin (1986a, 1986b).

Own distances are calculated as $\frac{1}{4}$ of the distance to its nearest trading partner. For islands or countries with no trading partner in the sample group own distance was calculated as $\frac{1}{2}$ of the minor radius of the country. These internal distances are consistent with the formulation used by Wei (1996).

For Section II, Subsections A and B; Section III, Subsections B and C, GDP and population data are taken from Heston et al. (1995). For Section III, Subsection A, GDP data are taken from the *OECD national accounts statistics* (Various Years); population data are from Heston et al. (1995) and the *U.N. demographic yearbook* (Various Years).

4 Product Differentiation Variables

Advertising to sales ratio is from the COMPUSTAT database, as is the R&D to sales ratio. The original characterization of goods was provided by James Rauch and is further described in Rauch (1999). The method of aggregation is described in the text. Intra-industry trade as a proportion of total trade was calculated according to the Grubel-Lloyd index, as interpreted in Hummels and Levinsohn (1993).

5 Calculation of Elasticities from Rauch Index

The Rauch index values for the industries vary between 0.03 and 1.00. I set the two endpoints of the elasticity range (2 to 5) to the minimum and maximum Rauch index values, and used linear interpolation to assign elasticities to the intervening industries, based on their Rauch index values.

6 Alternative Trading Partner Indices

Alternative trading partner indices are calculated as $A_c = \sum_{c'} \frac{GDP_{c'}}{DIST_{cc'}}$, where the summation over c' is over country c 's trading partners c' within the sample. Population is used instead of GDP for some of the analyses.

7 Instruments

Endowment data used as instruments in Section II, Subsections A and B; Section III, Subsections B and C were provided by James Harrigan, with the original source as Heston et al. (1995) (workers, capital stock) and World Bank *World development indicators* (agricultural land). Instruments for Section III, Subsection A are from OECD (1998) (labor force), World Bank *World development indicators* (agricultural land), and Heston et al. (1995) (capital stock). For the capital stock data, the last two years were extrapolated from a 1985 to 1992 series.

8 Policy Variables

Trade policy data are taken from Lee and Swagel (1997). The original source was the UNCTAD (1991). The Lee and Swagel data were aggregated using total imports by each of the recipient countries. For domestic trade, a 0 tariff is assumed.

9 Transactions Costs Variables

The variables used as indicators of transactions costs are the following (with sources noted for each):

Group Membership: average number of religious or church organizations; education, arts, music, or cultural activities; or youth work organizations per respondent. Knack and Keefer (1997), World Values Study Group (1981-1984/1990-1993).

Rail Density: number of kilometers of railroads per thousand population. Central Intelligence Agency (1990).

Highway Density: number of kilometers of highways per thousand population. Central Intelligence Agency (1990).

Social Capital Index: calculated from measures of voter participation, newspaper circulation, confidence in the administration of justice, society's respect for individual security, government focus on income redistribution versus investment and growth, and equality of opportunity. World Economic Forum (1990).

Trust: percentage of respondents to the survey stating that most people can be trusted. Knack and Keefer (1997), World Values Study Group (1981-1984/1990-1993).

Civic Cooperation: "reflects respondents' own stated willingness to cooperate when faced with a collective action problem; it thus can be thought of as 'trustworthiness.'" from Knack and Keefer (1997), p. 1258. Knack and Keefer (1997), World Values Study Group (1981-1984/1990-1993).

Confidence in Government: From Knack and Keefer (1997): "Respondents were asked 'how much confidence' they had in various governmental and societal institutions, with responses ranging from 'a great deal,' to 'quite a lot,' to 'not very much,' to 'none at all.' The index was built from responses to items concerning the education system (largely government-run in most countries), the legal system, the police, and civil service. For each of these, we calculated the percentage of respondents in each country with either 'a great deal' or 'quite a lot' of confidence. The mean of the four percentages is used as a measure of perceived overall government performance." Knack and Keefer (1997), World Values Study Group (1981-1984/1990-1993).

10 Variables for Calculation of Indirect Utility

The expression for indirect utility is in a theory appendix available from the author. For the calculations of the effects of a large change, as described in the text, I examine the proportional change in indirect utility associated with reducing the barriers implied by measured border effects. The details for the two scenarios are in the text. The proportion of the traded goods in consumption (μ^g) is taken from *The OECD input-output database* (1995) and is an average over all countries in the sample. The measure of transport costs is based on Hummels (1999), Table 3, Panel 1. I used the estimated coefficients for the effects of distance on transport costs for the U.S. in order to calculate distance-based measures of transport costs for the bilateral pairs in my sample. I used the average value to weight for the U.S.. The estimates are quite reasonable, with the ad valorem transport cost factor ranging between 2 percent and 12 percent. The number used in the calculations is the average over all pairs in the sample (8 percent). β^g and p_{cc}^g are assumed to be 1.

References

- [1] Central Intelligence Agency. *The world factbook 1990, electronic version*. Washington, D.C.: CIA, 1990.
- [2] COMPUSTAT Database (Various years).
- [3] Feenstra, Robert C. "U.S. Exports, 1972-1994: With State Exports and Other U.S. Data." National Bureau of Economic Research (Cambridge, MA) Working Paper No. 5990, April 1997.
- [4] Feenstra, Robert C.; Lipsey, Robert E. and Bowen, Harry P. "World Trade Flows, 1970-1992, with Production and Tariff Data." National Bureau of Economic Research (Cambridge, MA) Working Paper No. 5910, January 1997.
- [5] Fitzpatrick, Gary L. and Modlin, Marilyn J. *Direct-Line distances: International edition*. Metuchen, New Jersey: Scarecrow Press, 1986a.
- [6] _____. *Direct-Line distances: United States edition*. Metuchen, New Jersey: Scarecrow Press, 1986b.
- [7] Grubel, Herbert G. and Lloyd, Peter J. *Intra-Industry trade: The theory and measurement of international trade in differentiated products*. London: MacMillan, 1975.
- [8] Harrigan, James. "Factor Endowments and the International Location of Production: Econometric Evidence for the OECD, 1970-1985." *Journal of International Economics*. August 1995, 39(1-2), pp. 123-141.
- [9] _____. "Openness to Trade in Manufactures in the OECD." *Journal of International Economics*, February 1996, 40(1-2), pp. 23-39.
- [10] Helliwell, John. *How much do national borders matter?* Washington, D.C.: The Brookings Institution, 1998.
- [11] Heston, Alan; Summers, Robert; Nuxoll, Daniel and Aten, Bettina. *Penn World Tables Version 5.6*. Center for International Comparisons at the University of Pennsylvania (CICUP), 1995. An updated version of data described in Summers, Robert and Heston, Alan. "The Penn World Table (Mark 5): An Expanded Set of International Comparisons, 1950-1988." *Quarterly Journal of Economics*, May 1991, 106(2), pp. 327-368. Available online at CICUP website: <http://pwt.econ.upenn.edu/>.
- [12] Hummels, David. "Toward a Geography of Trade Costs." Mimeo, University of Chicago, 1999.

- [13] Hummels, David and Levinsohn, James. "Monopolistic Competition and International Trade: Reconsidering the Evidence." National Bureau of Economic Research (Cambridge, MA) Working Paper No. 4389, June 1993.
- [14] Knack, Stephen, and Keefer, Philip. "Does Social Capital have an Economic Payoff? A Country Investigation." *Quarterly Journal of Economics*, November 1997, 112(4), pp. 1251-88.
- [15] Lee, Jong-Wha and Swagel, Phillip. "Trade Barriers and Trade Flows across Countries and Industries." *Review of Economics & Statistics*, August 1997, 79(3), pp. 372-82.
- [16] Maskus, Keith. "Comparing International Trade Data and National Characteristics Data for the Analysis of Trade Models," in Peter Hooper and J. David Richardson, eds., *International economic transactions: Issues in measurement and empirical research*. (National Bureau of Economic Research, Studies in Income and Wealth, Volume 55). Chicago: University of Chicago Press, 1991.
- [17] OECD. *The OECD input-output database*, 1995.
- [18] OECD. *Labour force statistics 1977/1997: 1998 Edition*, 1998.
- [19] OECD. *OECD national accounts statistics*, Various Years.
- [20] OECD. *The OECD STAN database*, Various Years.
- [21] Rauch, James E. "Networks Versus Markets in International Trade." *Journal of International Economics*, June 1999, 48(1), pp. 7-36.
- [22] Richardus, Peter and Adler, Ron K. *Map projections for geodesists, cartographers, and geographers*. Amsterdam, Netherlands: North-Holland, 1972.
- [23] Scherer, F.M. and Ross, D. *Industrial market structure and economic performance, third edition*. Boston: Houghton-Mifflin Company, 1990.
- [24] Shiells, Clinton R.; Stern, Robert M. and Deardorff, Alan V. "Estimates of the Elasticities of Substitution between Imports and Home Goods for the United States." *Weltwirtschaftliches Archiv*, 1986, 122(3), pp. 497-519.
- [25] UNCTAD. *Micro TCM System*, 1991.
- [26] United Nations. *U.N. demographic yearbook*. New York: United Nations, Dept. of Economic and Social Affairs, Statistical Office, Various Years.
- [27] United Nations. *U.N. national accounts statistics*. New York: United Nations, Various years.

- [28] U.S. Bureau of the Census. *U.S. exports, schedule B, commodity by country*. FT446, Washington, D.C.: U.S. Bureau of the Census, 1978-1988.
- [29] U.S. Bureau of the Census. *U.S. Exports, Harmonized System, Commodity by Country*. FT447, Washington, D.C.: U.S. Bureau of the Census, 1989-1994.
- [30] U.S. Bureau of Economic Analysis. *U.S. direct investment abroad: Operations of U.S. parent companies and their foreign affiliates*. Washington, D.C.: U.S. Bureau of Economic Analysis, 1985-1994.
- [31] Wei, Shang-Jin. "Intra-national Versus Inter-national Trade: How Stubborn are Nations in Global Integration?" National Bureau of Economic Research (Cambridge, MA) Working Paper No. 5531, April 1996.
- [32] World Bank. World development indicators (CD-ROM).
- [33] World Economic Forum. *The World competitiveness report 1990*. Geneva: The World Economic Forum, 1990.
- [34] World Values Study Group. *World values survey*, 1981-1984/1990-1993.