

The Wind of Change: Maritime Technology, Trade and Economic Development

Luigi Pascali

ONLINE APPENDIX

A Additional Descriptive Statistics and Results

Table A.1: Percentage proportion of merchandise imported by land and by sea in 1900

	Land and River	Sea
Argentina	0.1	99.9
Belgium	52.8	47.2
British India	0.06	99.94
Denmark	2.8	97.2
France	31.9	68.1
Great Britain	0	100
Holland	49.4	50.6
Italy	33.5	66.5
Norway	6.9	93.1
Portugal	9.2	90.8
Russia	45	55
Spain	19.6	80.4
Sweden	1.9	98.1
United States	5	95
Uruguay	0.5	99.5

Source: Statistical abstract for the principal and other foreign countries (1901)

Table A.2: List of countries with available bilateral trade data

Country	
Aden	India - British Possessions
Algeria	Italy
Argentina	Jamaica
Australia	Japan
Austria-Hungary	Java
Azores	Korea
Barbados	Lagos
Belgium	Liberia
Bermuda	Libia-Tripoli
Bolivia	Macau
Brazil	Madagascar
British Honduras	Maldiv Islands
Bulgaria	Malta
Canada	Martinique
Cape of Good Hope	Mauritius
Ceylon	Mexico
Channel Islands	Morocco
Chile	Mozambique
China	Netherlands
Colombia	New Zealand
Congo	Nicaragua
Costa Rica	Norway
Cuba	Persia
Cyprus	Peru
Dahomey	Philippines
Denmark	Portugal
Dominican Republic	Puerto Rico
Dutch Guyana	Romania
Ecuador	Russia
Egypt	Saint Pierre
El Salvador	Senegal
Fiji	Serbia
Finland	Seychelles
France	Siam
French Guyana	Sierra Leone
Gambia	Singapore
Germany	Spain
Gold Coast	Straits Settlements
Greece	Sweden
Greenland and the Faroe Islands	Trinidad and Tobago
Guadaloupe	Tunisia
Guatemala	United Kingdom
Guyana	United States
Haiti	Uruguay
Haiti and Santo Domingo	Venezuela
Hawaii	Virgin Islands
Hong Kong	
Iceland	

Table A.3: Data availability by country for the dataset used in section 5

Country	Export, GDP, Population, Urban, Colony	Contraints on executive	Optimized shipping times	Share of exports in non-agricultural products
Argentina	1	1	1	1
Australia	1	1*	1	1
Austria-Hungary	1	1	1	1
Belgium	1	1	1	1
Brazil	1	1	1	1
Canada	1	1	1	1
Cape of Good Hope	1	1*	1	1
Ceylon	1	1*	1	.
Chile	1	1	1	.
China	1	1	1	.
Colombia	1	1	1	.
Cuba	1	1*	1	.
Denmark	1	1	1	1
Dutch East Indie	1	1*	1	1
Ecuador	1	1	1	.
Finland	1	1*	1	1
France	1	1	1	1
Germany	1	1	1	1
Greece	1	1	1	1
India - British Possessions	1	1*	1	1
Italy	1	1	1	1
Japan	1	1	1	1
Mexico	1	1	1	.
Netherlands	1	1	1	1
New Zealand	1	1	1	1
Norway	1	1	1	1
Peru	1	1	1	.
Philippines	1	1	1	.
Portugal	1	1	1	1
Romania	1	1	1	1
Siam	1	1*	1	.
Spain	1	1	1	.
Sweden	1	1	1	1
United Kingdom	1	1	1	1
United States	1	1	1	1
Uruguay	1	1	1	1
Venezuela	1	1	1	.

Note: The score on the variable "Constraints on the executive" comes from the POLITY IV dataset, with the exceptions of those countries that were not independent in 1860. For this subset of countries, denoted by the bold 1*, the scores were constructed by the author.

Table A.4: The shift from sail to steam: short versus long distances

	Dep. Variable = Log (Export/Population)			
	SAMPLE:			
	Above Mean Maritime Distance	Below Mean Maritime Distance	Above Mean Great-Circle Distance	Below Mean Great-Circle Distance
ln(Steam Dist) x I(year<=1860)	-	-	-	-
ln(Steam Dist) x I(1861-1865)	0.473 (0.674)	-0.416 (0.354)	0.232 (0.532)	-0.201 (0.282)
ln(Steam Dist) x I(1866-1870)	-0.412 (0.572)	-0.0800 (0.186)	-0.440 (0.510)	0.124 (0.195)
ln(Steam Dist) x I(1871-1875)	-0.587 (0.709)	-0.339 (0.161)	-0.685 (0.675)	-0.167 (0.181)
ln(Steam Dist) x I(1876-1880)	-0.583 (0.718)	-0.300 (0.177)	-0.662 (0.682)	-0.202 (0.185)
ln(Steam Dist) x I(1881-1885)	-0.770 (0.590)	-0.151 (0.202)	-0.788 (0.622)	-0.0713 (0.203)
ln(Steam Dist) x I(1886-1890)	-1.012 (0.554)	-0.140 (0.199)	-0.778 (0.578)	-0.0883 (0.199)
ln(Steam Dist) x I(1891-1895)	-1.356 (0.530)	-0.193 (0.184)	-0.996 (0.567)	-0.160 (0.183)
ln(Steam Dist) x I(1896-1900)	-1.024 (0.539)	-0.222 (0.178)	-0.624 (0.548)	-0.179 (0.177)
ln(Sail Dist) x I(year<=1860)	-	-	-	-
ln(Sail Dist) x I(1861-1865)	-0.162 (0.685)	0.389 (0.321)	0.137 (0.519)	0.278 (0.262)
ln(Sail Dist) x I(1866-1870)	0.668 (0.578)	0.175 (0.179)	0.746 (0.494)	0.0986 (0.180)
ln(Sail Dist) x I(1871-1875)	0.779 (0.595)	0.384 (0.145)	0.917 (0.554)	0.318 (0.171)
ln(Sail Dist) x I(1876-1880)	1.090 (0.657)	0.384 (0.157)	1.114 (0.621)	0.353 (0.179)
ln(Sail Dist) x I(1881-1885)	1.155 (0.614)	0.338 (0.164)	1.134 (0.621)	0.332 (0.180)
ln(Sail Dist) x I(1886-1890)	1.477 (0.555)	0.283 (0.145)	1.242 (0.583)	0.348 (0.155)
ln(Sail Dist) x I(1891-1895)	1.751 (0.516)	0.329 (0.130)	1.425 (0.557)	0.467 (0.137)
ln(Sail Dist) x I(1896-1900)	1.596 (0.514)	0.403 (0.130)	1.229 (0.537)	0.535 (0.131)
YEAR FE	YES	YES	YES	YES
PAIR FE	YES	YES	YES	YES
r2	0.758	0.882	0.759	0.868
N	14237	9648	13448	10437

The table reports OLS estimates on yearly data. Standard errors (reported in parentheses) are three-way clustered (exporter, importer and year).

Table A.5: Geographical isolation and trade (unweighted regressions)

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable is:					
	Log-Change Export/GDP			Log-Change Export/Population		
Log-Change Distance (to all countries)	-0.983 (0.701)			-1.899 (0.544)		
Log-Change Distance (to United Kingdom)		-0.796 (0.495)			-1.524 (0.380)	
Log-Change Distance (to top 5 trading countries)			-1.486 (0.937)			-2.745 (0.746)
Intercept	-0.155 (0.609)	-0.00771 (0.453)	-0.0375 (0.469)	-0.586 (0.456)	-0.278 (0.324)	-0.293 (0.356)
r ²	0.0788	0.105	0.0986	0.202	0.255	0.220
N	25	24	25	50	49	50
WEIGHTED (by Log Population)	NO	NO	NO	NO	NO	NO

The table reports OLS estimates. The unit of observation is the country. The dependent variable is the log-change of either export/GDP or export/population of the country between 1850 and 1905. "Log-Change Distance" is the weighted average of the log changes in shipping times between the country and the other countries of the world generated by the introduction of the steamship (see equation 5 in the main text). Robust standard errors are reported in parentheses.

Table A.6: Duration of voyages by sail and steam (years: 1864-1914)

	(1)	(2)
Dep. variable = Duration actual voyages (days)		
Steamship (dummy)	-0.489 (0.224)	-0.408 (0.285)
Directed Route FE	YES	YES
Year FE	NO	YES
r ²	0.461	0.496
N	1667	1667

The table reports OLS estimates. The unit of observation is the voyage in the Atlantic Canada Shipping Project. The dependent variable is the duration of the voyage. "Steamship" is a dummy that identifies voyages carried by steam vessels. Standard errors (reported in parentheses) are three-way clustered (port of origin, destination and year).

Table A.7: Trade, population and urbanization rates

PANEL A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Dependent variable (in log) is:								
	Population			Urban Pop (>50000)			Urban Pop (>100000)		
	(OLS)	(2SLS)	(2SLS)	(OLS)	(2SLS)	(2SLS)	(OLS)	(2SLS)	(2SLS)
Log (Export/Population)	-0.152 (0.059)	-1.302 (0.297)	-1.196 (0.285)	0.003 (0.008)	-0.082 (0.050)	-0.075 (0.053)	-0.152 (0.059)	-0.087 (0.068)	-0.083 (0.067)
COUNTRY DUMMIES	YES	YES	YES	YES	YES	YES	YES	YES	YES
YEAR DUMMIES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	344	344	344	344	344	344	344	344	344
F		16.77	16.56		16.77	16.56		16.77	16.56
WEIGHTED	NO	NO	YES	NO	NO	YES	NO	NO	YES

The table reports OLS and 2SLS estimates. The unit of observation is country-year. The dependent variable is the log of population (columns 1-3) or the log of the population share living in cities with more than either 50,000 citizens (columns 4-6), or 100,000 citizens (columns 7-9). Observations are un-weighted in columns 1, 2, 4, 5, 7, and 8 and weighted by the log-population of the country in 1860 in columns 3, 6 and 9. F is the Kleiberg-Paap Wald F statistics for weak identification. Panel B reports the first-stage estimates. Standard errors (reported in parentheses) are two-way clustered (country and year) corrected to account for the fact that the instrument depends on the (estimated) parameters of the bilateral trade equation.

Table A.8: Trade and development: the role of local institutions (unweighted regressions)

	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent variable (in log) is:					
	Per-Capita GDP			Population		
	(OLS)	(2SLS)	(2SLS)	(OLS)	(2SLS)	(2SLS)
Log Export/GDP	-0.173 (0.0419)	-0.442 (0.123)		-0.349 (0.124)	-1.546 (0.368)	
Log Export/Population			-0.332 (0.114)			-1.524 (0.293)
Log Export/GDP * Exec Constraints	0.0280 (0.0102)	0.0709 (0.0226)		0.0249 (0.0176)	0.148 (0.0674)	
Log Export/Population * Exec Constraints			0.0433 (0.0119)			0.117 (0.0370)
COUNTRY DUMMIES	YES	YES	YES	YES	YES	YES
YEAR DUMMIES	YES	YES	YES	YES	YES	YES
F		13.11	9.893		13.11	9.893
N	344	344	344	344	344	344
WEIGHTED	NO	NO	NO	NO	NO	NO

The table reports OLS and 2SLS estimates. The unit of observation is country-year. The dependent variable is either the log of per-capita GDP or population. "Exec Constraints" is the score in the POLITY IV variable "Constraints on the executive" in 1860. The excluded instruments are constructed according to equations 10 and 11. Observations are unweighted. F is the Kleiberg-Paap Wald F statistics for weak identification. Standard errors (reported in parentheses) are two-way clustered (country and year).

Table A.9: Trade and development: colonies versus independent states

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variable (in log) is:							
	Per-Capita GDP		Population		Urban Pop (>50000)		Urban Pop (>100000)	
Log Export/GDP	-0.201 (0.0812)	-0.191 (0.0896)	-1.041 (0.191)	-0.973 (0.164)	-0.0659 (0.0302)	-0.0649 (0.0286)	-0.0698 (0.0439)	-0.0710 (0.0408)
Log Export/GDP * Colony 1850	-0.0968 (0.252)	-0.137 (0.254)	0.124 (0.663)	-0.0285 (0.585)	-0.0813 (0.108)	-0.120 (0.0978)	-0.102 (0.0845)	-0.111 (0.0816)
COUNTRY DUMMIES	YES	YES	YES	YES	YES	YES	YES	YES
YEAR DUMMIES	YES	YES	YES	YES	YES	YES	YES	YES
F	3.720	3.770	3.720	3.770	3.720	3.770	3.720	3.770
N	344	344	344	344	344	344	344	344
WEIGHTED	NO	YES	NO	YES	NO	YES	NO	YES

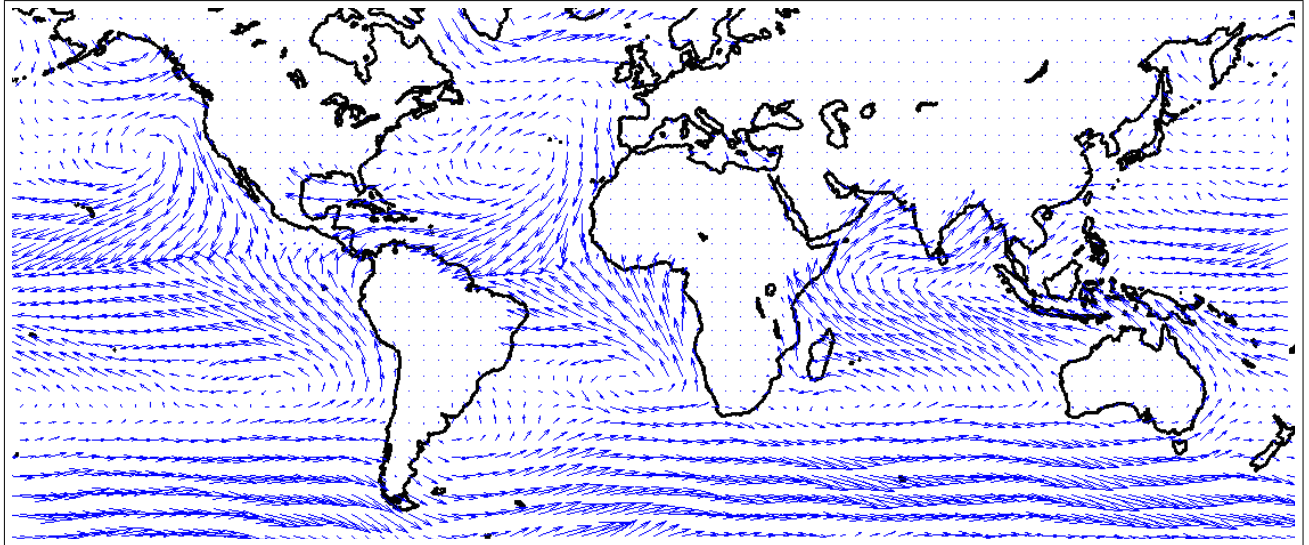
The table reports 2SLS. The unit of observation is country-year. The dependent variable is either the log per-capita GDP (columns 1,2) or the log of population (columns 3, 4) or the log of the population share living in cities with more than 50,000 citizens (columns 5, 6), or 100,000 citizens (columns 7, 8) . "Colony 1800" is a dummy equal to one if the country was a colony in 1800. Observations are un-weighted in columns 1,3, 5 and 7 and weighted by the log-population of the country in columns 2, 4, 6 and 8. F is the Kleiberg-Paap Wald F statistics for weak identification. Standard errors (reported in parentheses) are two-way clustered (country and year).

Table A.10: Trade and economic divergence: the role of initial sectoral composition

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dep. Variable = Log Per-Capita GDP							
Log Export/GDP	-0.296 (0.102)	-0.290 (0.0944)	-0.351 (0.0976)	-0.349 (0.0935)				
Log Export/Population					-0.590 (0.258)	-0.551 (0.233)	-0.660 (0.288)	-0.620 (0.258)
Log Export/GDP	-0.158	-0.138						
*Above mean share non-agric. export	(0.117)	(0.116)						
Log Export/GDP			-0.382	-0.383				
*Above top 25pc share non-agric. export			(0.0585)	(0.0408)				
Log Export/Population					-0.190	-0.161		
*Above mean share non-agric. export					(0.158)	(0.151)		
Log Export/Population							-0.335	-0.318
* Above top 25pc share non-agric. export							(0.0911)	(0.0666)
COUNTRY DUMMIES	YES	YES	YES	YES	YES	YES	YES	YES
YEAR DUMMIES	YES	YES	YES	YES	YES	YES	YES	YES
F	8.929	7.106	11.44	7.658	3.110	2.735	2.516	2.444
N	132	132	132	132	132	132	132	132
WEIGHTED	NO	YES	NO	YES	NO	YES	NO	YES

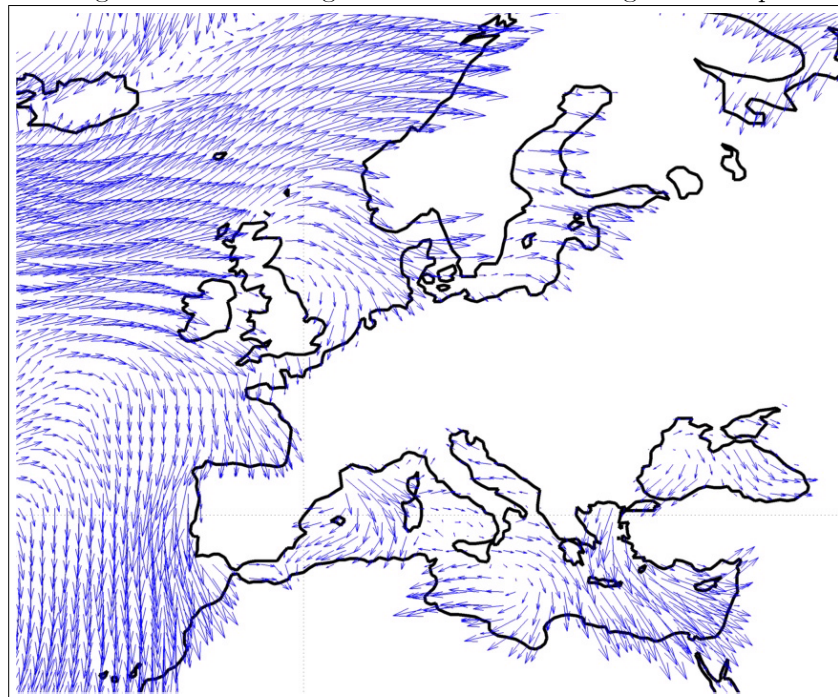
The table reports 2SLS estimates. The unit of observation is country-year. The dependent variable is the log of per-capita GDP. "Above mean share non agric. export" ("Above top 25pc share non-agric. export") is a dummy equal to 1 if the share of non-agricultural exports was above the average (the top 25th percentile) share across all countries in the sample in 1860. Observations are un-weighted in columns 1,3, 5 and 7 and weighted by the log-population of the country in columns 2, 4, 6 and 8. F is the Kleiberg-Paap Wald F statistics for weak identification. Standard errors (reported in parentheses) are two-way clustered (country and year).

Figure A.1: Prevailing sea surface winds throughout the world



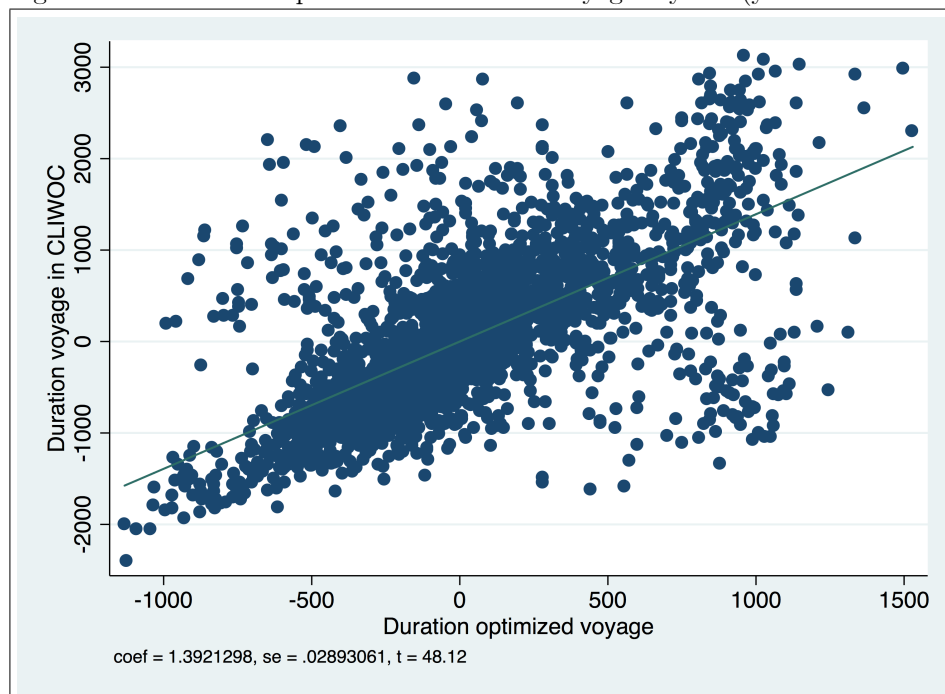
The figure reports average winds in May (between 2000 and 2002), with direction defined by the direction of the arrow and speed by the length of the arrow.

Figure A.2: Prevailing sea surface winds throughout Europe



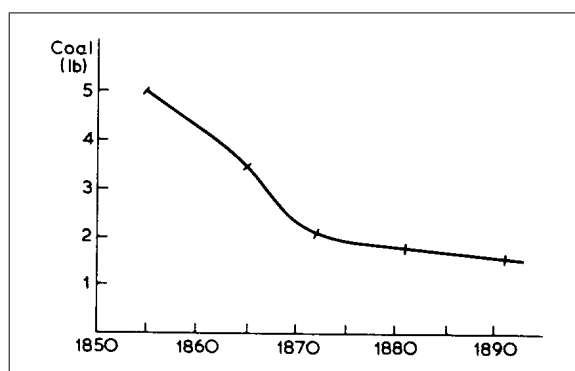
The figure reports average winds in May (between 2000 and 2002), with direction defined by the direction of the arrow and speed by the length of the arrow.

Figure A.3: Actual and predicted duration of voyages by sail (years: 1742-1854)



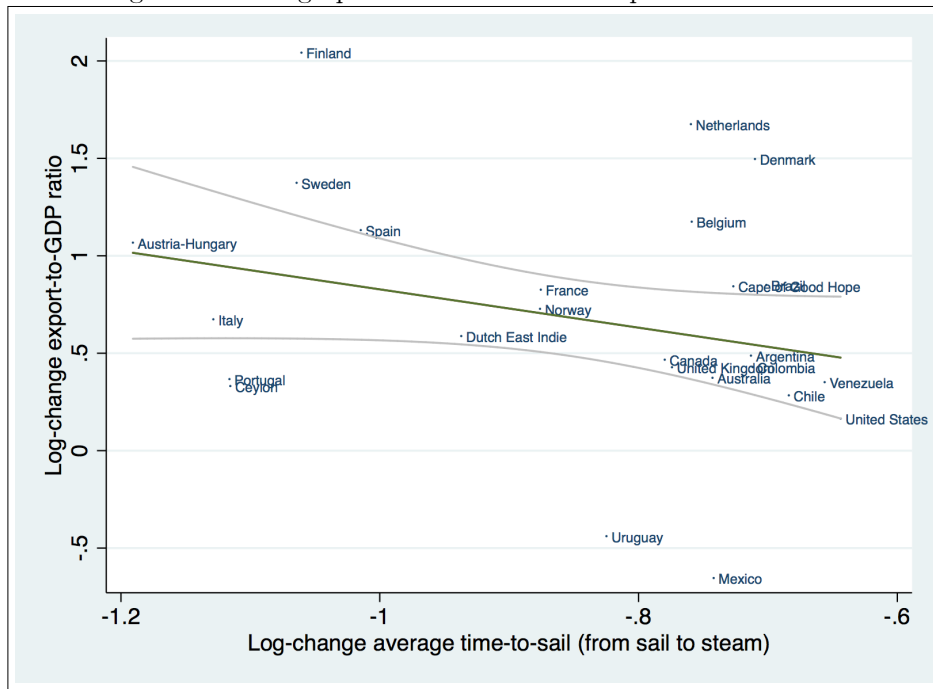
Partial scatter plot of voyage durations in the CLIWOC database against the optimized sailing times (year fixed effects are partialled out).

Figure A.4: Coal consumption per horsepower per hour



Source: Graham (1956)

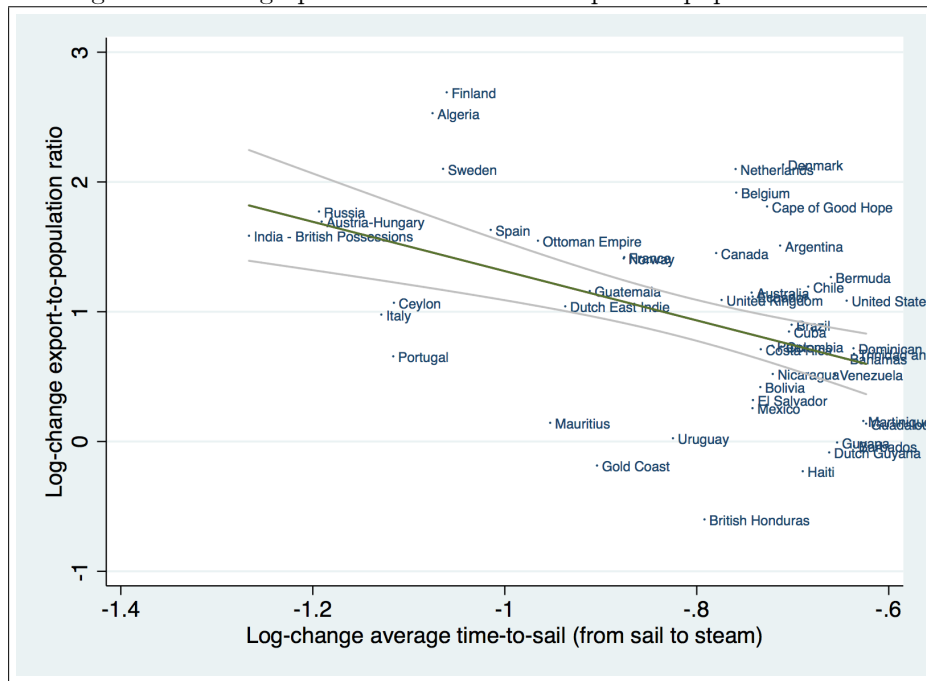
Figure A.5: Geographic isolation and the export-to-GDP ratio



The central line depicts the estimated marginal effect of the log change in the average shipping time from a country to the rest of the world, induced by the steamship, on the log change in his export-to-GDP ratio between 1850 and 1905.

The other two lines define the 90 percent confidence boundaries.

Figure A.6: Geographic isolation and the export-to-population ratio



The central line depicts the estimated marginal effect of the log change in the average shipping time from a country to the rest of the world, induced by the steamship, on the log change in his export-to-population ratio between 1850 and 1905. The other two lines define the 90 percent confidence boundaries.

Figure A.7: Sample in Tables 5-9

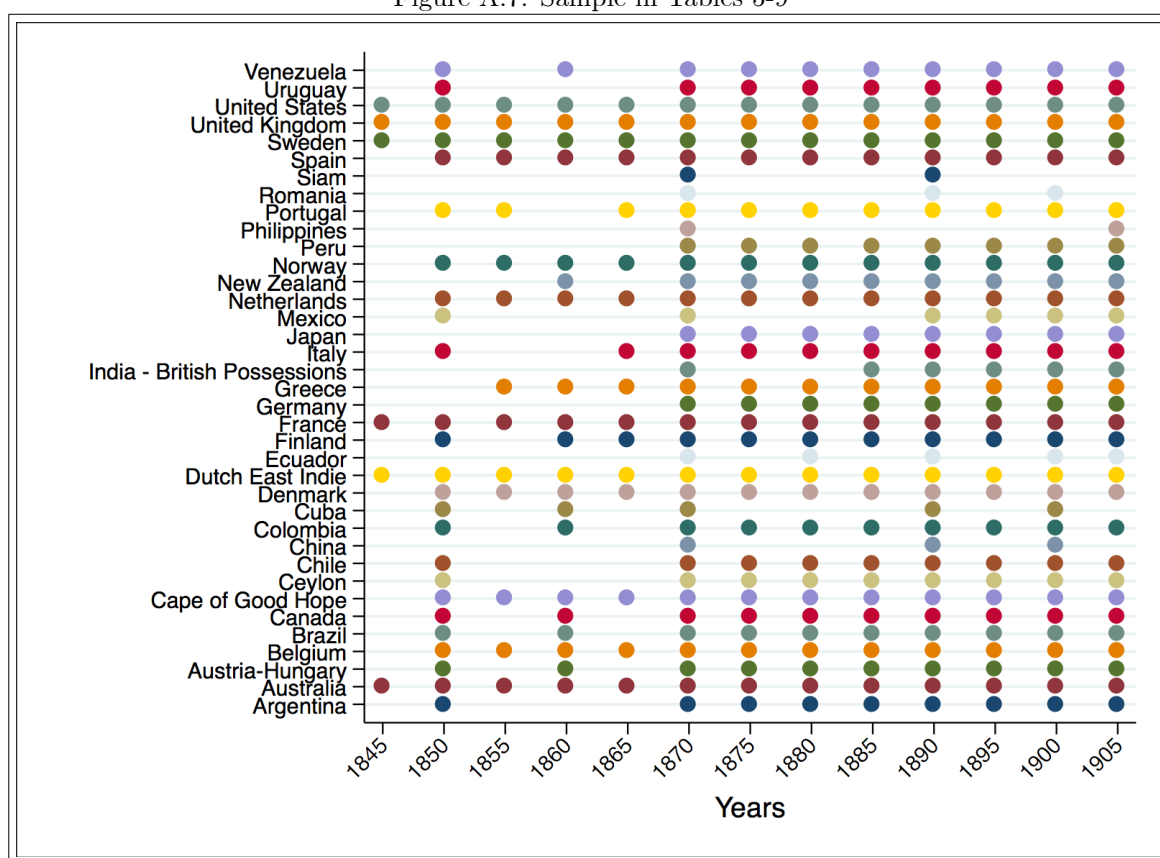
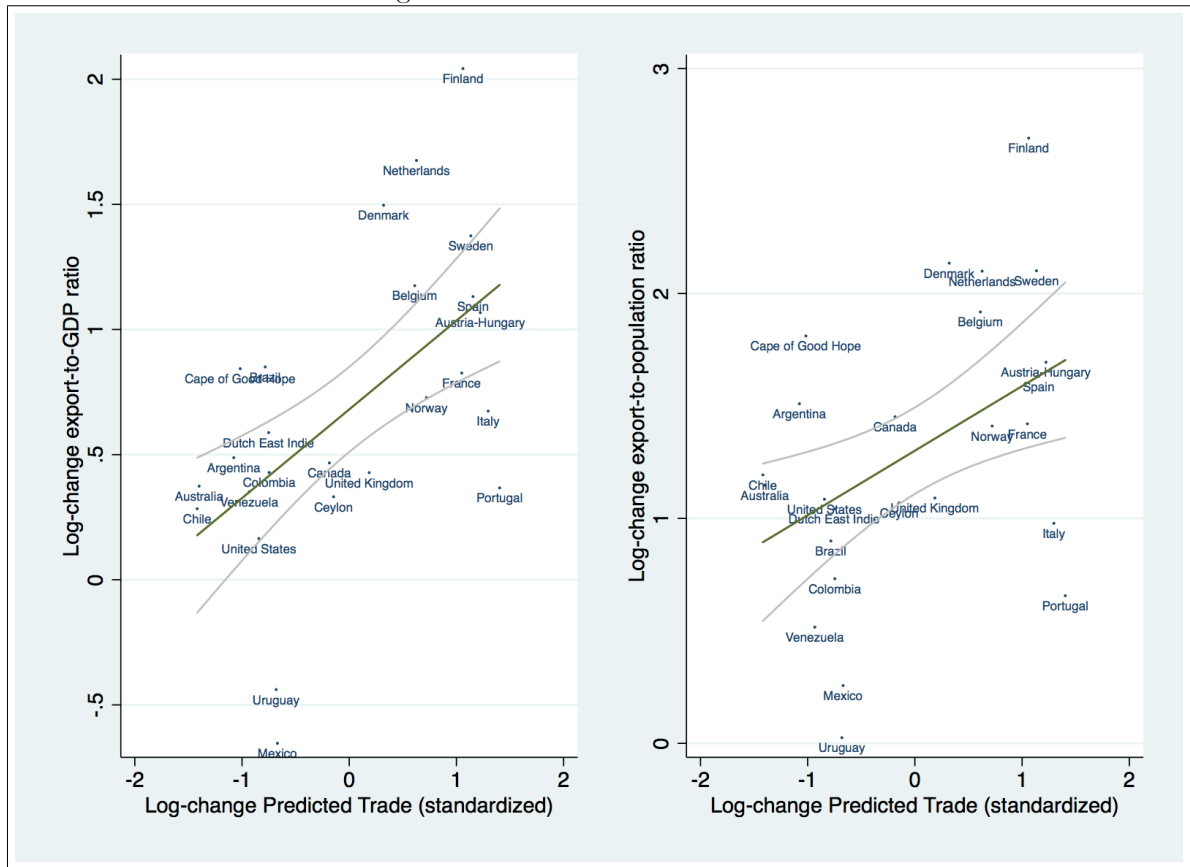


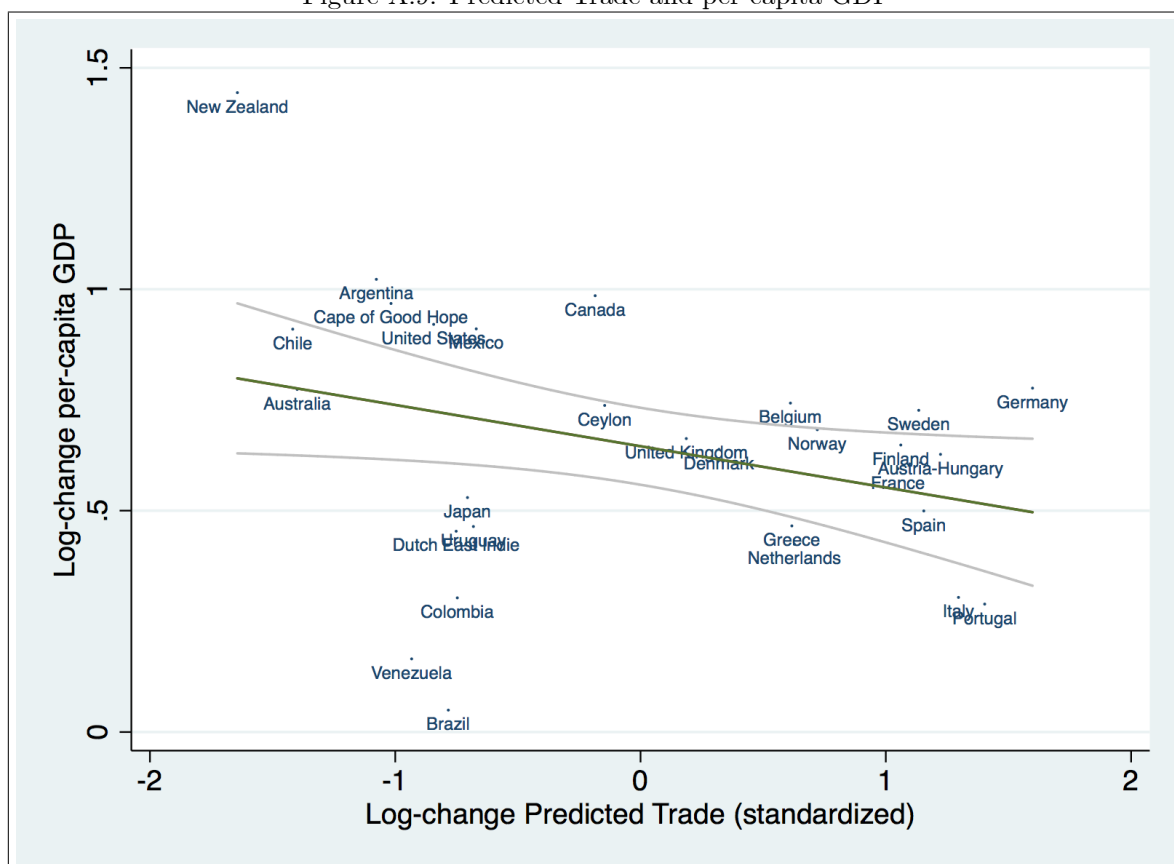
Figure A.8: Predicted trade and trade



The central line depicts the estimated marginal effect of the log change in predicted, induced by the steamship, on the log change in his export-to-GDP (first panel) and export-to-population ratio (second panel) between 1850 and 1905.

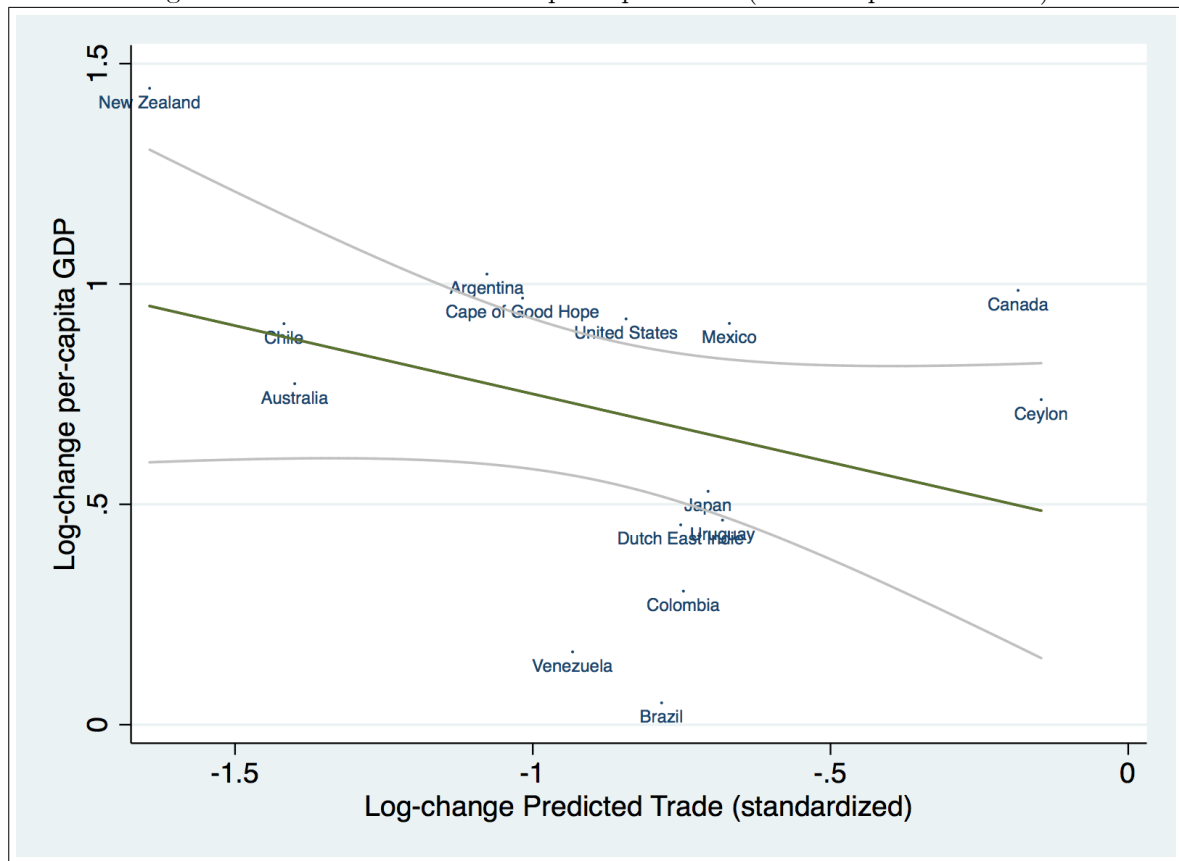
The other two lines define the 90 percent confidence boundaries.

Figure A.9: Predicted Trade and per-capita GDP



The central line depicts the estimated marginal effect of the log change in predicted trade (as defined in equation (8)) on the log change in per-capita GDP between 1850 and 1905. The other two lines define the 90 percent confidence boundaries.

Figure A.10: Predicted trade and per-capita GDP (non-European countries)



The central line depicts the estimated marginal effect of the log change in the average shipping time from a country to the rest of the world, induced by the steamship, on the log change in his export-to-GDP ratio between 1850 and 1905.

The other two lines define the 90 percent confidence boundaries.

B Data Sources

The following data appendix reports the sources that were used to assemble the dataset on trade, population and urban population

B.1 Trade Data

Andre Kroupa S. M. International trade relations of Venezuela. unpublished thesis. 1942.

Annales du Commerce Extérieur, France. Paris: Imprimerie et Librairie Administratives de Paul Dupont. (selected years since 1843).

Annuaire de l'économie politique et de la statistique. Paris: Guillaumin Editeurs. (selected year from 1853).

Annuaire statistique de la Belgique. Bruxelles: Ministère de l'intérieur.(all years 1870-1901).

Bulmer-Thomas, V. The economic history of Latin America since Independence. Cambridge: Cambridge University Press. 2003.

Korthals Altes, W. L. Changing Economy in Indonesia Volume 12a General Trade Statistics 1822-1940. Amsterdam: Royal Tropical Institute. 1992.

Colombia. Washington: Bureau of the American Republics. 1892.

Duignam, P. and Gann, L. H. Colonialism in Africa, 1870-1960: the economics of colonialism. London: Cambridge University Press. 1975.

De Bourgade La Dardye, E. Paraguay: The Land and the People, Natural Wealth and Commercial Capabilities. London: George Philip & son. 1892.

Dietz, J. L. Economic History of Puerto Rico. Princeton: Princeton University Press. 1987.

Documents statistique sur le Royaume de Belgique, Bruxelles: Ministre de l'intérieur (selected years from 1840).

Enquete sur le commerce et la navigation de l'Algerie. Alger: Typographie Bastide. 1863.

Foreign Commerce of the American Republics and Colonies. Washington: Bureau of the American Republics. 1891.

Gastrell, W. S. H. Our trade in the world in relation to foreign competition: 1885-1895. London: Chapman & Hall. 1897.

Hanson, J. R., Trade in Transition: Exports from the Third World. New York: Academic Press. 1980.

- Herrera Canales, I. *Estadística del Comercio Exterior de Mexico (1821-1875)*. Mexico City: SEP. 1977.
- Historical and statistical abstract of the colony of Hong Kong. Hong Kong: Noronha. 1911
- Historisk Statistik för Sverige: 1732-1970. Lund: Statistiska Centralbyran. 1972.
- McCulloch, J. R. *A descriptive and statistical account of the British Empire*. London: Longman.
- McGreevey W. P. *An economic history of Colombia 1845-1930*. Cambridge: Cambridge University Press. 1971.
- Mitchell, Brian R. 2003a. *International Historical Statistics: Africa, Asia, and Oceania 1750- 2000*. New York: Palgrave Macmillan.
- Mitchell, Brian R. 2003b. *International Historical Statistics: Europe 1750-2000*. New York: Palgrave Macmillan.
- Mitchell, Brian R. 2003c. *International Historical Statistics: The Americas 1750-2000*. New York: Palgrave Macmillan.
- Mulhall, M. G. *The Dictionary of Statistics*. London: Routledge. (various years).
- Notices statistiques sur les colonies francaises. Paris: Berger-Levrault. 1883.
- Page, W. *Commerce and industry – tables of statistics for the British Empire from 1815*. London: Constable and Company. 1919.
- Pamuk, S. *The Ottoman Empire and European capitalism, 1820-1913: trade, investment and production*. Cambridge: Cambridge University Press. 2010.
- Randall, L. *A Comparative Economic History of Latin America 1500-1914, Volume 1: Mexico*. Ann Arbor: University Microfilms International. 1977.
- Releve' du commerce de la Belgique avec les Pays Etrangers. Bruxelles: Ministre des Finances (selected years from 1841).
- Report on the commercial relations of the United States with all foreign nations. Washington: Cornelius Wendell Printer. 1856.
- Reynold E. *Trade and economic change on the Goald Coast, 1807-1874*. New York: Longman.
- Statistical Abstract of foreign countries. Washington: Government Printing Office. 1909.
- Statistical Abstract relating to British India. Calcutta: Superintendent Government Printing. (selected years from 1867).
- Statistical Abstract for the British Empire. London: Her Majesty's Stationery Office. (selected

years from 1889).

Statistical abstract for the principal and other foreign countries. London: Her Majesty's Stationery Office. (all years from 1860 to 1902).

Statistical Abstract for the Several Colonial and Other Possessions of the United Kingdom. London: Her Majesty's Stationery Office. (all years from 1861).

Statistical abstract for the United Kingdom in each of the last fifteen years. London: Her Majesty's Stationery Office. (selected years from 1847).

Statistical Abstract Relating to British India. London: Eyre and Spottiswoode. (all years from 1840).

Statistical tables relating to British colonies, possessions, and protectorates. London: Her Majesty's Stationery Office. 1906.

Statistiche storiche dell'Italia: 1861-1975. Roma: ISTAT. 1976.

Tableau decennal du commerce de la France. Paris: Imprimerie Imperiale (selected years from 1858).

Tableau général du commerce avec les pays etrangers. Bruxelles: Ministre de Finances. (selected years from 1855).

Tableau général du commerce de la France. Paris: Imprimerie royale. (selected years from 1852)

Tableaux et Relevés de population, de cultures, de commerce, de navigation, etc. Paris: Imprimerie Royale. (selected years since 1853).

Venezuela. Washington: Bureau of the American Republics. (selected years).

B.2 Population

Annuaire de l'économie politique et de la statistique. Paris: Guillaumin Editeurs. (selected year from 1853).

Annuaire Statistique et Historique Belge, (each year from 1854 to 1867)

Banks, A. S. and Wilson, K.A. Cross-national time-series data archive. Databanks International.

Census of the British Empire. Report with summary and detailed tables for the several colonies. (selected years from 1861)

Maddison, A. (2004). The World Economy: Historical Statistics. OECD Development Centre.

Manning, P. African population. Projections 1850-1960, in K. Ittmann, D. D. Cordell and G.

Maddox, eds, The demographics of empire: the colonial order and the creation of knowledge. Ohio University Press. 2010.

Mitchell, Brian R. 2003a. International Historical Statistics: Africa, Asia, and Oceania 1750- 2000. New York: Palgrave Macmillan.

Mitchell, Brian R. 2003b. International Historical Statistics: Europe 1750-2000. New York: Palgrave Macmillan.

Mitchell, Brian R. 2003c. International Historical Statistics: The Americas 1750-2000. New York: Palgrave Macmillan.

Statistical abstract relating to British India. Calcutta: Superintendent Government Printing. (selected years from 1867).

Statistical abstract for the British Empire. London: Her Majesty's Stationery Office. (selected years from 1889).

Statistical abstract for the principal and other foreign countries. London: Her Majesty's Stationery Office. (all years from 1860 to 1902).

Statistical abstract for the several colonial and other possessions of the United Kingdom. London: Her Majesty's Stationery Office. (all years from 1861).

Tableaux et releves de population, de cultures, de commerce, de navigation, etc. Paris: Imprimerie Royale. (selected years from 1850).

Statistical tables relating to British colonies, possessions, and protectorates. London: Her Majesty's Stationery Office. 1906

Vogel, P. C. Le Portugal et ses colonies. Paris: Guillaumin. 1860.

www.populstat.info

B.3 Urban Population - City-level data

Anderson, L. Following Curupira: Colonization and migration in Pará, 1758 to 1930.

Atiqullah , M. Growth of Dacca City: Population and Area (1608–1981). Social Science Research Project, University of Dacca Press.

Bairoch, P. The Population of European cities from 800 to 1850. Geneva: Geneva university. 1988.

Boomgaard, P. and Gooszen, A. J. Changing Economy in Indonesia, Vol 11, population trends 1795-1942. Amsterdam: Royal Tropical Institute. 1991.

- Brennan, J. R., Burton, A. and Lawi, Y. Dar es Salam: Histories from an Emerging Metropolis. Nairobi: The British Institute in Eastern Africa. 2007.
- Brown, S. H. Public Health in Lagos, 1850-1900: Perceptions, Patterns, and Perspectives, *The International Journal of African Historical Studies* 25. 1992.
- Census of the Philippine Islands, taken under the direction of the Philippine commission in the year 1903. Washington, US Government Printing Office. 1905
- Chandler, T. Four Thousand Years of Urban Growth: An Historical Census. Edwin Mellen Pr. 1987.
- Chase-Dunn, C. and Manning, E. S. City systems and world systems: Four millennia of city growth and decline. *Cross-Cultural Research* 36. 2002
- Collier, S. Chile: The making of a republic, 1830-1865. Cambridge: Cambridge University Press. 2003
- Curto, J. C. The Anatomy of a Demographic Explosion: Luanda 1844-1850. *The International Journal of African Historical Studies*. 32. 1999
- Dumper, M. R. T. Cities of the Middle East and North Africa: A Historical Encyclopedia, ABC-CLIO. 2006.
- Eggiman, G. Statistiques des villes du tiers monde - Geneva: Centre d'Histoire Economique Internationale de l'Universite de Geneve. 1999.
- Issawi, C. The Fertile Crescent 1800-1914. Oxford: Oxford University Press. 1988.
- Kraas, F., Gaese, H and Kyi, M. M. Megacity Yangon: transformation processes and modern developments. LIT Verlag Munster. 2006.
- Malte-Brun, C. Universal Geography, Edinburgh: Adam Black. 1827.
- Mitchell, Brian R. International Historical Statistics: Africa, Asia, and Oceania 1750- 2000. New York: Palgrave Macmillan. 2003a.
- Mitchell, Brian R. International Historical Statistics: Europe 1750-2000. New York: Palgrave Macmillan. 2003b.
- Mitchell, Brian R. International Historical Statistics: The Americas 1750-2000. New York: Palgrave Macmillan. 2003c
- Pinedo-Vasquez, M., Ruffino, M.L., Padoch, C. and Brondízio, E. The Amazon Várzea: The Decade Past and the Decade Ahead. Springer. 2011.

- Heilprin, A. and Heilprin, L. Geographical Dictionary Of The World In The Early 20th Century. New Delhi: Logos Press. 1984.
- Page, W. Commerce and industry – tables of statistics for the British Empire from 1815. London: Constable and Company. 1919.
- Report of the census of Porto Rico. Washington: Government Printing Office. 1900.
- Saitō, S. Urban population during Edo period", Chiiki Kaihatsu 9. 1984.
- Satterthwaite The transition to a predominantly urban world and its underpinnings. Human Settlements Discussion Paper Series.
- Sluglett, P. The Urban Social History of the Middle East, 1750-1950. Syracuse University Press. 2008.
- Statistical abstract relating to British India. Calcutta: Superintendent Government Printing. (selected years from 1867).
- Tableaux et releves de population, de cultures, de commerce, de navigation, etc. Paris: Imprimerie Royale. (selected years from 1850).
- Verrest, H. Home Based Economic Activities and Caribbean Urban Livelihoods, Vossiuspers Uva. 2007.
- Weber, A. F. The Growth of the cities in the nineteenth century. New York: Mc Millan Company. 1899.
- Witt, M. A. Singapore, A concise profile 2012, Insead Case Study. 2012.
- World and its peoples. Vol11 – Western Balkans. London: Marshall Cavendish. 2010
- www.populstat.info
- www.worldcitypop.com

C A comment to Figure 10

The purpose of this section is to illustrate how patterns of winds and the opening of the Suez canal shape $\Delta \log Dist_i$, the proportional reduction in the average time-to-sail induced by the steamship. Figure 10 reports the different values of $\Delta \log Dist_i$ across all the polities of the world in 1900 which are not landlocked; Figures A.1 and A.2 in the Appendix A report the prevailing wind patterns throughout the world and throughout Europe. Remember that $\Delta \log Dist_i$ is a weighted proportional change in the time-to-sail from country i to all the other countries of the world, using the share of world trade of these countries as weights. Notice that the United Kingdom accounted for approximately one quarter of the entire world trade, while the other ports located on the English Channel and the North Sea for approximately one third (the rest being concentrated between the United States, Southern ports of France, Austria-Hungary, Russia and Italy). Therefore, the majority of $\Delta \log Dist_i$ is explained by proportional changes in the time-to-sail from country i to the United Kingdom and the North Sea.

In order to show how this is related to patterns of winds and the Suez canal, let me discuss separately six different areas of the world, composed of countries that experienced similar $\Delta \log Dist$. (they are discussed in order of decreasing $-\Delta \log Dist$).

1. Countries facing the Red Sea, Gulf of Aden, Persian Gulf and Arabian Sea.

Following the introduction of the steamship, these countries experienced the largest reduction in shipping times to England and the North Sea for two reasons. First, in order to reach Europe, sailing ships were constrained to sail into the wind until they reached Cape of Good Hope (therefore, for approximately one third of their voyage), which made these journeys extremely slow. Second, steamships could pass through the Suez Canal and cut by more than half the length of their voyages to Europe.

2. Other Countries in Southeast Asia and in Southeastern Africa.

For these countries, the main benefit of the steamship was the possibility of crossing the Suez Canal, which alone reduced the length of the voyages by approximately 40–60 percent depending on the country.

3. Countries on the Mediterranean Sea

Additionally, the steamship disproportionately helped countries on the Mediterranean Sea. As seen in Figure 3, once sailing ships reached the Alboran Sea and the Strait of Gibraltar, they would have no alternative but to sail against the wind until the British ports and the North Sea. Notice

that there is a considerable variation in $\Delta \log Dist_i$ across the different countries in the Mediterranean Sea, as well. Here, the ports that were affected the most by the introduction of the steamship were those on the Adriatic Sea. Sailing ships were constrained to sail into the wind when leaving these ports, throughout the Adriatic Sea. Additionally, the other ports located in the central part of the Mediterranean Sea benefitted disproportionately more from the steamship, as winds tend to blow to the southeast here, and sailing ships were constrained to sail against the wind until reaching the Balearic Sea before leaving the Mediterranean Sea.

4. Countries on the Baltic Sea

These countries benefitted substantially from the steamship because winds tend to blow from west to east in the Baltic Sea. This implies sailing into the wind to reach the United Kingdom, Germany, the Netherlands, Belgium and the Northern ports of France for approximately one third of the voyage.

5. Countries in Oceania

These countries did benefit from the introduction of the steamship because steamships could pass through the Suez Canal. However, before the steamships, sailing ships had favorable winds when reaching Europe throughout their voyages. In fact, they could sail downwind for approximately 60–70% percent of their voyage (in the Indian Ocean and in the Southern part of the Atlantic) without deviating from the minimum maritime distance route.

6. Countries in the Americas

These were the countries that benefitted the least from the steamship. The reason is that the clockwise winds on the Northern Atlantic (“the trade winds”) and the counterclockwise winds in the Southern Atlantic were particularly favorable to reach Europe using the sailing ship. Ships sailing from North America could exploit the “trade winds” and sail eastwards with the wind in their favor. Ships coming from ports in South America would sail northward until 30 N latitude with the wind in favor, reach the “trade winds” and then sail straight to Europe.