

Appendix A: Welfare gains/losses

The percentage change in real income associated with a change in trade costs equals the percentage fall in the share of a country's consumption of its own goods raised to a power equal to the elasticity of trade with respect to trade costs (Helpman 2014, 5). Welfare costs, therefore, rise with the import-penetration ratios of states. Because large states typically produce more of what they consume at home, these ratios are relatively low for major trading nations even in the contemporary era. In 2000, for example, the United States had an import penetration ratio of seven percent (Arkolakis, Costinot, and Rodriguez-Clare 2012, 95).

The formula to calculate welfare losses or gains is $\omega = \hat{\lambda}^{1/\epsilon}$, where ω is the change in real income associated with a foreign shock; $\hat{\lambda}$ is the change in the share of domestic expenditures on domestic products; and ϵ is the elasticity of substitution (how easily a good can be substituted with another product).

We calculate λ'/λ where λ' is the share of domestic expenditures of each belligerent in 1913 and λ is the share of domestic expenditures on domestic products in each year of the war (1 - import-penetration ratio of a state). Anderson and van Wincoop report most estimated elasticities are “in the range of 5 to 10” (2004, 716). In their study of trade between 1870 and 2000, Jacks, Meissner, and Novy (2011, 189) use “roughly the midpoint” elasticity of 8. Anderson and van Wincoop also note that higher elasticities are associated with more homogenous goods, so we would expect World War I elasticities to be relatively high. The estimate we use for the results we report in the text is -5. Nevertheless, to be conservative, we use trade elasticities between -3 and -9. We report the associated welfare losses immediately below.

We measure the difference in the gains from trade between 1913 and each year from 1914 to 1918. We then subtract from that the gains from trade in each year from 1914 to 1918. A positive value means that import penetration is higher in the wartime years, implying gains from trade. A negative value indicates the import penetration fell, generating a loss. We use Maddison's GDP data (sites.google.com/site/econgedata/maddison-data-on-population-gdp).

The welfare costs we estimate are overstated because Arkolakis, Costinot, and Rodriguez-Clare (2012) calculate import penetration using imports over gross output. Gross output always exceeds GDP, because it includes the value of intermediate goods. In 1997, for example, U.S. GDP was about 55 percent of gross output. We use GDP, the value of final goods, here because we don't have data on gross output. This systematically increases values of import penetration and the gains or losses from trade.

Table 4. Welfare losses at different trade elasticities

Elasticity	Year	Britain	Germany	U.S.
3	1914	-1.42	-0.37	
	1915	-0.70	-0.63	
	1916	-0.65	-0.57	
	1917	-1.12	-0.85	0.38
	1918	-0.47	-1.07	-0.11
5	1914	-0.83	-0.22	
	1915	-0.41	-0.38	
	1916	-0.37	-0.34	
	1917	-0.65	-0.51	0.23
	1918	-0.27	-0.64	-0.07
7	1914	-0.58	-0.16	
	1915	-0.29	-0.27	
	1916	-0.26	-0.24	
	1917	-0.45	-0.36	0.16
	1918	-0.19	-0.45	-0.05
9	1914	-0.45	-0.12	
	1915	-0.22	-0.21	
	1916	-0.20	-0.19	
	1917	-0.35	-0.28	0.13
	1918	-0.15	-0.36	-0.04

Appendix B: Trade Data Sources

Albania	<i>Statistika tregtare e importacion-it e eksportacion-it; Statistike e Tregtis se Jashtme te Mbretnis Shqiptare</i>
Argentina	<i>Anuario del Comercio Exterior</i>
Australia	<i>Oversea trade: bulletin. Australian statistics of oversea imports and exports and customs and excise revenue; Oversea trade and customs and excise revenue</i>
Austria	<i>Statistik des auswärtigen handels osterreichs</i>
Belgium	<i>Tableau annuel du commerce avec les pays étrangers; Annuaire Statistique de la Belgique</i>
Bolivia	<i>Comercio Especial de Bolivia; Anuario de los años: Comercio Exterior</i>
Brazil	<i>Comercio Exterior do Brasil</i>
Bulgaria	<i>Commerce avec les pays étrangers</i>
Canada	<i>Trade of Canada, Year ended Dec 31, 1950</i>
Chile	<i>Estadística Anual Vol VII: Comercio Exterior; Anuario Estadístico</i>
China	<i>Statistics of China's Foreign Trade during the Last Sixty-five Years; Trade of China</i>
Colombia	<i>Anuario Estadístico: Comercio Exterior</i>
Costa Rica	<i>Anuario Estadístico</i>
Cuba	<i>Importación y Exportación de la República de Cuba; Comercio Exterior</i>
Czechoslovakia	<i>Statistisches Handbuch; Commerce Extérieur de la République Tchecoslovaque; Foreign Trade of the Czechoslovak Republic</i>
Denmark	<i>Handelsstatistiske meddelelser; Statistisk Årbog</i>
Dominican Republic	<i>Report of the Nth Fiscal Period, Dominican Customs Receivership</i>
Ecuador	<i>Comercio Exterior del Ecuador en la década 1916 a 1925; League of Nations Memorandum on International Trade and Balance of Payments; Informe que el Ministro de Hacienda Y Crédito Público; Ecuador en Cifras 1938-42</i>
Egypt	<i>Annual Statement of the Foreign Trade of Egypt</i>
El Salvador	<i>Anuario Estadístico; Estadística de Comercio Exterior</i>
Finland	<i>Utrikeshandel: Arspublikation</i>
France	<i>Tableau général de la navigation maritime et des transports; Annuaire Statistique</i>
Germany	<i>Statistisches Jahrbuch für das Deutsche Reich; Monatliche Nachweise über den auswärtigen Handel Deutschlands</i>
Greece	<i>Statistique du commerce spécial de la Grèce; League of Nations</i>
Guatemala	<i>Memoria; Estadística Nacional, Revista mensual (Agosto de 1927)</i>
Haiti	<i>Annual Report of the Fiscal Department for the Fiscal Year</i>
Honduras	<i>Memoria del secretario de estado en el despacho de Hacienda y crédito público; Boletín de la Cámara de comercio</i>
Hong Kong	<i>Blue Book</i>
Hungary	<i>Hungarian Commerce and Industry for the Year; Commerce extérieur de la Hongrie en; Annuaire Statistique Hongrois; Statisztikai Evkonyv 1949-1955</i>
India	<i>Annual Statement of the Sea-Borne Trade of British India</i>

Indonesia	<i>Verslag van bestuur en staat van Nederlandsch-Indie, Suriname en Curacao van; Indisch Verslag</i>
Ireland	<i>Trade Statistics; Database of Irish Historical Statistics</i>
Italy	<i>Anuario Statistico Italiano; Barbieri</i>
Jamaica	<i>Blue Book; Trade Report</i>
Japan	<i>Nihon gaikoku bo-eki nenpyo (Annual return of the foreign trade of Japan)</i>
Malaysia	<i>Foreign imports and exports</i>
Mexico	<i>Anuario estadístico del comercio exterior de los Estados Unidos Mexicanos; Estadística del comercio exterior; Anuario estadístico, comercio exterior y navegación</i>
Netherlands	<i>Jaarstatistiek van den in-, uit- en doorvoer</i>
New Zealand	<i>Statistics of Trade and Shipping; Statistical Report on the External Trade of New Zealand</i>
Nicaragua	<i>Report of the Collector-General of Customs</i>
Norway	<i>Norges Handel</i>
Panama	<i>Boletin; Anuario de comercio exterior</i>
Paraguay	<i>Comercio Exterior del Paraguay Anos 1921-1927; League of Nations Memorandum on International Trade and Balance of Payments; Memoria Estadística del Comercio Especial Del Peru; Extracto Estadístico Del Peru 1940; Anuario del Comercio Exterior</i>
Peru	<i>Annual Report of the Insular Collector of Customs; Yearbook of Philippine Statistics</i>
Philippines	<i>Annuaire du commerce extérieur de la République Polonaise.</i>
Poland	<i>Comércio externo</i>
Portugal	<i>Anuarul Statistic al Romaniei</i>
Romania	<i>Annual statement of the trade and shipping; Trade of the Union of South Africa, and South-West Africa</i>
South Africa	<i>Estadística del Comercio Exterior de Espana; Resumen Mensual de Estadística del Comercio Exterior de Espana; Barbieri</i>
Spain	<i>Ceylon Blue Book</i>
Sri Lanka	<i>Handel Berattelse for ar</i>
Sweden	<i>Schweiz. Handelsstatistik. Jahresbericht</i>
Switzerland	<i>Annual statement of the foreign trade and navigation of the Kingdom of Thailand</i>
Thailand (Siam)	<i>Statistique Annuelle du Commerce Exterieur de la Turquie; Annuaire Statistique</i>
Turkey	<i>Annual Statement of the Trade of the United Kingdom</i>
United Kingdom	<i>United States Statistical Abstract</i>
United States	<i>Vneshniaia torgovlia SSSR za 1918-1940 gg. : statisticheskiĭ obzor</i>
USSR	<i>El Anuario Estadístico del Uruguay; Comercio exterior del Uruguay</i>
Uruguay	<i>Esatdistica Mercantil y Maritima</i>
Venezuela	<i>Statistique du commerce exterior du royaume de Yougoslavie</i>
Yugoslavia	

Appendix C: List of countries in the sample, wartime status, and data availability

Country	Bloc	Imports	Country	Bloc	Imports
Albania		1925-29	Indonesia		1915-29
Argentina		1910-29	Ireland		1924-29
Australia	E 1914-18	1901-29	Italy	E 1915-18	1900-29
Austria-Hungary	CP 1914-18	1900-17	Jamaica		1920-29
Austria		1922-29	Japan	E 1914-18	1900-29
Belgium	E 1914-18	1900-29	Latvia		1922-29
Belize		1919-29	Lithuania		1925-28
Bolivia		1916-29	Malaysia		1929
Brazil	E 1915-18	1900-29	Malta		1920-29
Bulgaria	CP 1914-18	1916-29	Mexico		1906-12, 1916-29
Canada	E 1914-18	1900-29	Netherlands	N 1914-18	1900-29
Chile		1900-29	New Zealand	E 1914-18	1902-04, 1907, 1910-29
China	E 1917-18	1900-29	Nicaragua		1913-29
Colombia		1917-29	Norway	N 1914-18	1900-29
Congo, Belgian		1918-29	Panama		1924-27, 1929
Costa Rica		1919-29	Paraguay		1921-29
Cuba	E 1917-18	1903-04, 1906-29	Peru		1900-29
Cyprus		1919-29	Philippines	E 1917-18	1915-29
Czechoslovakia		1920-29	Poland		1924-29
Denmark	N 1914-18	1900-29	Portugal	E 1915-18	1900-29
Dominican Republic	E 1914-18	1908, 1911-29	Romania		1920-29
Ecuador		1900-29	Sierra Leone		1922-29
Egypt		1916-29	South Africa	E 1914-18	1915-29
El Salvador		1914-29	Spain	N 1914-18	1900-29
Estonia		1923-28	Sri Lanka	E 1914-18	1917-29
Fiji		1919-29	Sweden	N 1914-18	1900-29
Finland	E 1914-18	1911-29	Switzerland	N 1914-18	1900-29
France	E 1914-18	1900-29	Tanganyika		1921-29
Gambia		1920-29	Thailand	E 1917-18	1912-29
Germany	CP 1914-18	1900-29	Trinidad & Tobago		1920-29
Ghana		1928	Tunisia	E 1914-18	1917-29
Greece	E	1901-29	Turkey	CP 1914-18	1900, 1905, 1908 1913-14, 1920-29
Guatemala		1906-07, 1910-29	United Kingdom	E 1914-18	1900-29
Guyana, British	E	1918-29	United States	E 1917-18	1900-29
Haiti		1917-29	USSR/Russia	E 1914-18	1900-16, 1924-29
Honduras		1921-29	Uruguay		1900-29
Hungary		1924-29	Venezuela		1900-29
Iceland		1918-29	Yugoslavia		1900-12, 1920-29
India	E 1914-18	1915-29			

Note: E = Entente, CP = Central Powers, N = European neutrals.

Appendix D: UN Trade Data and Authors' Trade Data

