No Sugar Coating: Quantifying the Welfare Losses from the US-Cuba Trade Policy*

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Abstract

What are the consequences of comparative advantage-driven specialization for developing countries navigating uncertain international relations? We address this question by studying the Cuban economy in the first half of the twentieth century through the lens of a quantitative Ricardian model of trade. Using newly digitized historical trade data, we recover Cuba's revealed comparative advantage before and after the imposition of large trade barriers on its main product, sugar. We perform a counterfactual analysis to provide a quantitative answer to a long-standing question about the Cuban economy: the 'road not taken'. What would the Cuban economy have looked like in later years if its economic integration had remained the same as at the beginning of the twentieth century? The answer to this question sheds light on our understanding of the possible consequences of trade policy for extremely specialized developing countries.

JEL Codes: F11, N76.

Key Words: Comparative advantage, welfare gains from trade, Cuba, sanctions.

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1 Introduction

Neoclassical international trade theory posits that comparative advantage and the ensuing specialization in production are sources of welfare gains when an economy is open to trade. However, this conclusion relies on the stability of a country's sources of comparative advantage, and of its relationships with its trading partners.

In this paper, we ask: what are the consequences of comparative advantage-driven specialization for developing countries navigating uncertain international relations? Comparative advantage and the implied specialization patterns may be affected by trade policy, foreign ownership, and political factors. In particular, if for whatever reason favorable trading conditions end, a country could find itself in a "specialization trap", leading to persistent stagnation.

We address this question by studying the Cuban economy in the first half of the 20th century through the lens of a quantitative Ricardian model of trade (Costinot et al., 2012). Using newly digitized and assembled historical data at the country-industry level, we quantify the extent of Cuba's comparative advantage in the early 1900s, when the economy was widely open to international trade. We then use counterfactual analysis to provide an estimate of the welfare losses generated by the policies restricting trade that the US imposed on the Cuban economy starting in the second decade of the 20th century. Our exercise gives a quantitative answer to the historical literature on "the road not taken" (Ward and Devereux, 2012), which made inferences on what Cuba's living standards would be today had those policies not been enacted.

We believe that the Cuban case is an interesting laboratory for understanding and quantifying the effects of trade sanctions. In the period of interest, Cuba was highly specialized in sugar production and highly dependent on the United States as the main destination for its sugar exports. Just prior to the beginning of WWI, sugar accounted for more than 70% of Cuba's exports, and 86% of Cuba's total exports were directed to the United States. These numbers imply that Cuba was also highly vulnerable to the trade policy of the United States.

Our analysis sheds light not only on the impact of sanctions and on the persistence of their effects, but also on the combined effect of sanctions and extreme specialization, which is particularly relevant for developing countries. In addition, the peculiarities of the Cuban context, such as the specialization in a relatively homogeneous commodity and the existing evidence on the efficiency of the sugar sector, allow us to closely tie the economic and historical context to the assumptions of the model. Lastly, Cuba has been and is still an important country for geopolitical reasons.

The Cuban case is not the only example of a highly specialized developing country that is also highly

dependent on a primary trading partner. In the mid-19th century, guano fertilizer accounted for approximately 80% of Peru's exports, with about 50% destined for the United Kingdom (Mathew, 1970). In the early 20th century, approximately 70% of Brazilian coffee exports went to the United States, representing two-thirds of Brazil's total exports (de Bivar Marquese, 2020). In the mid-20th century, Senegal exported all of its groundnuts (90% of exports) to France (Bienek, 2024). Jute and jute-related products have represented over 80% of export for the Bengal region, East Pakistan and Bangladesh. During the British colonial period, almost all raw jute shipped to mills in Scotland. After Partition in 1947, East Pakistani raw jute shipped almost exclusively to India. After independence in 1971, Bangladesh diversified from one to three main export destinations but jute still accounted for 70% of exports. More recently, China has purchased more than half of Angola's crude oil exports during the last two decades, with crude oil comprising approximately 90% of Angolan exports.We believe that our analysis of the Cuban experience can serve as a cautionary tale to illustrate the risks of extreme specialization in agricultural products or natural resources, especially for developing countries serving primarily one large trading partner.

In addition, the peculiarities of the Cuban context, such as the specialization in a relatively homogeneous commodity, sugar, and the existing evidence on the efficiency of the sugar sector, allow us to closely tie the economic and historical context to the assumptions of the model. Lastly, Cuba has been and is still an important country for geopolitical reasons.In addition, to estimate comparative advantage, we build a novel data set of detailed historical trade flows at the country-industry level, covering the majority of world trade flows.[1] Following the methodology in Costinot et al. (2012), we estimate revealed comparative advantage (henceforth, RCA) for a sizable set of countries and industries in selected years.

Our estimates confirm the naive prior that Cuba had a strong comparative advantage in sugar and tobacco products. In addition, they illustrate the extent of competition in the sugar industry in the first half of the 20th century. Indonesia appears as the only competitor in the cane sugar industry, but several European countries display high estimated productivity in the highly substitutable beet sugar sector.

Our estimates are the starting point of a counterfactual analysis focusing on the effect of trade sanctions on Cuba. We identify two "waves" of sanctions. The first wave, from 1917 to the onset of WWII, is a series of tariffs, quotas, and other restrictions limiting trade between Cuba and the US, with varying characteristics and severity over time. The second, from 1948 to the Cuban Revolution (1958-1959), the elimination of trade in sugar (1960) and the Embargo (1962), culminated in the complete termination of trade relationships between the two countries. Our analysis focuses on the

[1]Section 3 and the Appendix contain a description of the data and of the data collection process.

first wave, arguing that this period was mainly characterized by changes in economic fundamentals in Cuba. The rise of communism and the revolution make the second wave of sanctions harder to analyze through the lens of a simple model of trade, so we confine some suggestive results about this period to Appendix C.

The goal of the counterfactual analysis is to provide a quantification of the welfare losses induced by the trade sanctions imposed by the US. With the data we assembled, we study the Cuban economy in the two years 1912 and 1947. We chose these two years as they are characterized by similar trade policy measures between Cuba and the United States. As we explain in Section 2, the United States imposed trade sanctions on Cuba when it entered WWI in 1917, first in the form of tariffs, and then culminating in a system of domestic and foreign sugar quotas in 1934. The United States suspended quotas during WWII only to resume them in 1948. For this reason, we start our counterfactual analysis with a comparison of the gains from trade for the Cuban economy in 1912 compared to 1947. We perform gains from trade calculations using the multisector version of the Arkolakis et al. (2012) (henceforth, ACR) formula. Our calculations suggest that the welfare gains from trade for the Cuban economy were more than twice as high in 1912 than in 1947, despite the similar extent of trade restrictions that characterized these two years.[2]

In our second counterfactual, we aim to quantify the welfare differential that is due to changes in comparative advantage. Despite the similar trade policy outlook between Cuba and the US, the RCA estimates for 1912 and 1947 are quantitatively very different.We attribute these differences to the numerous trade policies that were implemented *between* these two years. Our hypothesis is that, had these policies not occurred, Cuba would have retained its strong comparative advantage, and the 1947 estimates would not be so different from the 1912 ones. The structure of the model helps us overcome limitations in the data.

We quantify the welfare effects of changes in Cuba's RCA by constructing a counterfactual economy where we "freeze" Cuba's comparative advantage with the US to its 1912 levels. More precisely, we impose that the 1947 RCA pattern between Cuba and its main trading partner (the US) is unchanged with respect to what is implied by the 1912 estimates. At the same time, we keep the 1947 RCA estimates unchanged for all the other countries in the sample. The welfare differences between the real and counterfactual 1947 economies should thus be interpreted as quantifying the cumulative effects that the policy changes enacted in the 1912-1947 period had welfare purely through the channel of changes in comparative advantage. Our calculations suggest that about

[2]We have extended our gains from trade calculations also to quantify the losses induced by the Embargo. Preliminary calculations reveal that realized welfare gains from trade for the Cuban economy in 1962 are close to zero: the Embargo had the effect of bringing Cuba to quasi-autarky, with limited substitution away from the US and towards other trading partners.

half of the gains from trade differential between 1912 and 1947 can be attributed to changes in comparative advantage.

This paper contributes to a recent and active literature on the effects of trade sanctions, including but not limited to Haidar (2017), on export deflection following sanctions on Iran, Ahn and Ludema (2020) and Crozet et al. (2021) on firm-level responses to sanctions, Itskhoki and Mukhin (1995) on the welfare implications of sanctions, and Kwon et al. (2024), on the extraterritorial effects of sanctions, including in Cuba.

Similar to Haidar (2017), Ahn and Ludema (2020), and Crozet et al. (2021), we focus on a particular historical setting to examine sanctions imposed on a specific country. We share with Crozet et al. (2021) and Kwon et al. (2024) the focus on Cuba, but the sample period in our analysis is much prior to theirs, requiring the use of historical data. Thanks to the extent of our sample period, we are able to evaluate the welfare implications of trade sanctions over a long time horizon.

Several papers in economic history have delved into the peculiarities of Cuba's economic development. The seminal insights of Dye (1993), Dye (1994a), and Dye (1994b), summarized and enriched in Dye (1998), provide us with facts that motivate the assumptions on which we base our analysis. Importantly, Dye's work provides us with information on sugar prices that motivates our attribution of Cuba's specialization to technology-driven comparative advantage (and then the use of a Ricardian model). Our work is also closely related to Ward and Devereux (2012) and to the literature on "the road not taken", attempting to quantify long-run changes in welfare for the Cuban economy. The analysis in Ward and Devereux (2012) is descriptive, and teaches us how to navigate existing sources to discipline the quantitative model we use in our analysis.

Lastly, this paper borrows its methodology from a large literature focused on assessing the welfare gains from trade using quantitative Ricardian models, and most importantly from Costinot et al. (2012)'s empirical analysis of a multi-sector version of the Eaton and Kortum (2002) model. Part of our counterfactual analysis also makes use of the multi-sector version of the gains from trade formula developed by Arkolakis et al. (2012).

The rest of the paper is organized as follows. In Section 2 we provide information on the historical context behind our analysis, the Cuban economy from the time of independence to the embargo. Section 3 describes the construction of the data and provides a detailed qualitative picture of the Cuban economy. Section 4 illustrates the empirical methodology and the estimates of revealed comparative advantage for the years of interest. Section 5 describes the welfare counterfactuals, and Section 6 concludes.

2 Historical Context: The United States, Cuba, and Sugar, 1900-1962

Cuba was under Spanish control from the time of early colonization in the 15th century until the late 19th century, with multiple attempts at independence throughout the 1800s. In 1895, the Cubans initiated another war for independence. The United States entered the war in early 1898, after the explosion of the U.S.S. Maine, beginning an episode known as the the Spanish-American War. Spain and the United States signed an armistice in August 1898, in which Spain ceded control of the island to the United States. In 1902 the United States transferred political authority to Cuba, allowing it to become independent (Dosal, 2006). Two important government treaties arising from this period include the 1901 Platt Amendment and the 1903 US-Cuba Commercial Convention, often referred to as the treaty of reciprocity. The Platt Amendment ended U.S. military occupation of Cuba and gave the US the right to intervene in Cuban affairs in order to defend Cuban independence. The US-Cuba Commercial Convention outlined a series of reciprocal preferential trade measures across multiple industries. This included a 20 percent reduction in the US general duty on imports of Cuban sugar that remained in place until 1960 (Ballinger, 1975).

The United States and Cuba's highly dependent trade relationship surrounding sugar predates Cuban independence. Cuba had been exporting 80% or more of its sugar to the United States since 1880 (Dye, 1998). Cuban sugar averaged 40% of US sugar consumption during this same time period (Ballinger, 1975). The preferential tariff rate established by the US-Cuba Commercial Convention helped secure Cuba's status as the number one source of foreign sugar imports for the US. However, the entry of the United States into WWI in 1917 marked the start of a long series of measures imposed by the US to control one of its critical agricultural food supplies: sugar. Five months after entering WWI, the US led the creation of the International Sugar Committee to regulate the distribution of the world's sugar exports between the US and Allied countries, to which Cuba was subject. While the International Sugar Committee dissolved in 1920, ending quantity allocations, the following years would see a series of increasing US sugar tariffs designed to promote domestic production of sugar.

For Cuba, the 1920s started as a promising decade with high sugar prices. The global supply of sugar was still below pre-war levels due to the destruction of beet sugar production in Europe. Meanwhile, many economies had recently lifted their wartime consumption restrictions, causing an increase in global demand. Rising prices attracted speculators. In Cuba, many farmers chose to hold onto their crop rather than sell, resulting in a period known as the "dance of the millions." When prices fell at the end of 1920, it triggered a severe recession in Cuba, whose consequences

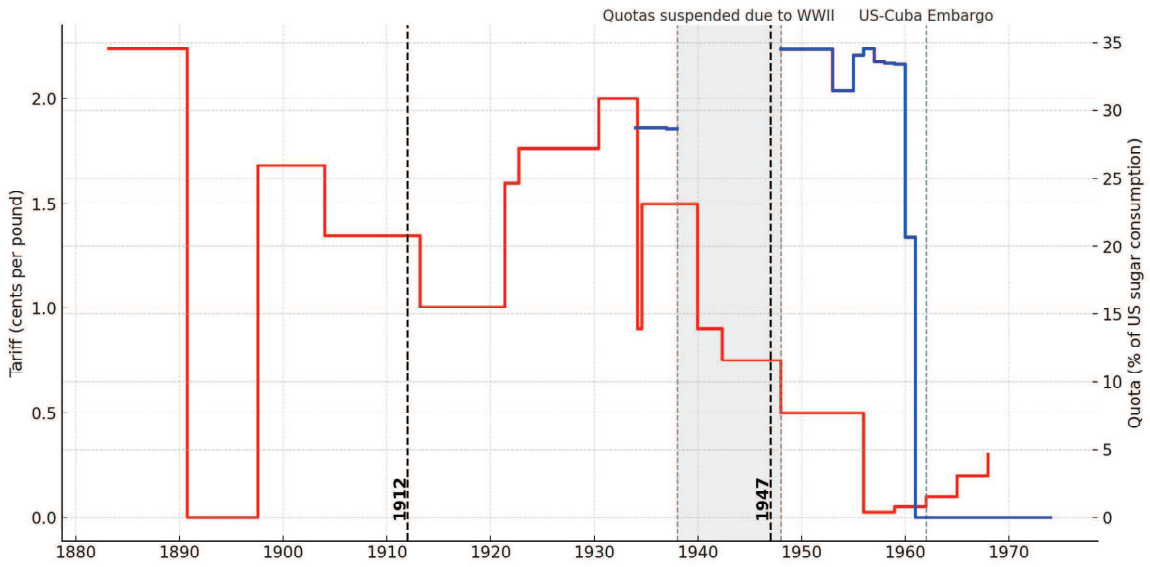


Figure 1: US-imposed tariffs and quotas on Cuban raw sugar.
Source: Ballinger (1975)

were worsened by the subsequent passage of the US's 1921 Emergency Tariff Act and the Fordney-McCumber Tariff Act in 1922. While Cuba continued to receive a 20% preferential tariff rate, it did not escape the moves toward protectionism. The 1921 Emergency Tariff Act raised the tariffs on raw sugar and refined sugar by 59%. The 1922 Fordney-McCumber Tariff Act and 1930 Smoot Hawley Tariff Act led to sugar tariffs that were 1.9 times higher than at the start of the decade (Ballinger, 1975). Figure 1 illustrates the changes in tariffs and quotas on Cuban sugar from the end of the nineteenth century to the 1970s.[3] With a few exceptions, world sugar prices remained low throughout the 1920s, causing financial distress for Cuban sugar producers. Throughout the decade, Cuba attempted to raise the world price of sugar by restricting its sugar production and exports and by trying to persuade other exporting countries to restrict supply collectively. No attempts were successful. The severe economic repercussions of low sugar prices, worsened by the Great Depression, were among the driving forces behind the First Cuban Revolution in 1933-1934. Those years witnessed the repeal of the Platt Amendment and the ratification of a new overall trade treaty with the US, the Reciprocal Trade Agreements Act (RTAA) of 1934 (Ballinger, 1975).

For sugar producers in the US, it was clear that tariffs would not be able to produce the desired sugar prices or stop the flow of imported sugar. The US Sugar Act of 1934 created a new sugar allotment system based on quotas that stipulated quantity levels for both domestic production and imports of foreign sugar. The Cuban quota was equivalent to about 30% of the calculated

[3]Appendix Figures B.1-B.2 illustrate the differential evolution of tariffs on Cuba compared to full duty countries for raw and refined sugar, respectively.

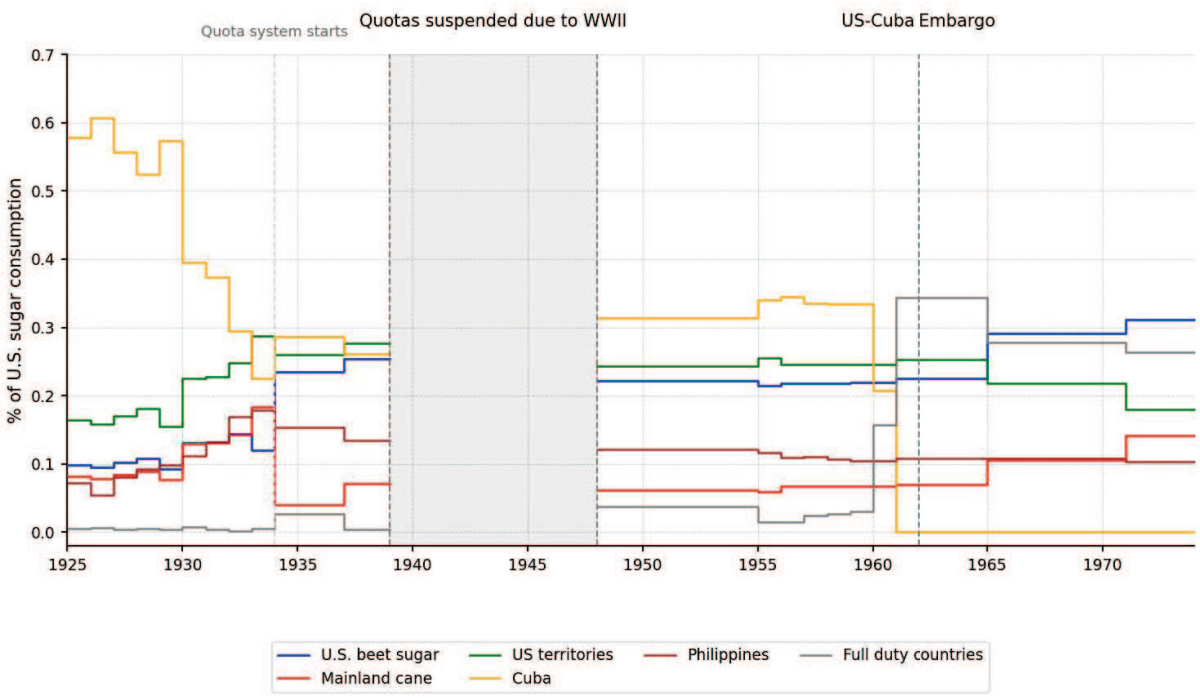


Figure 2: US Sugar Consumption by Origin and Type of Sugar.
Source: Ballinger (1975), US Sugar Acts of 1934, 1937, 1948, 1951, 1956.

US sugar consumption needs, the largest single source of sugar production. However, this was a decline as compared to the second-half of the 1920s when Cuban sugar represented more than 50% of US sugar consumption (Ballinger, 1975). Figure 2 shows the evolution of the origins of US sugar consumption before and after the introduction of the quota system.

The US renewed the Sugar Act in 1937, but suspended quotas in April 1942, as it became more deeply involved in WWII. It did not resume sugar quotas until January 1, 1948, when the Sugar Act of 1948 became effective. Throughout WWII, the US and the allied countries took action to secure their collective supplies of sugar. Together, they created a wartime government agency, the Combined Food Board, to oversee the purchases and distribution of sugar from their main import sources. Even after the war ended in 1945, the Board continued to allocate sugar supplies from exporting countries among a growing number of sugar-importing countries. From 1942 to 1947, Cuba sold its entire sugar crop through this mechanism (Ballinger, 1975).

As Figure 2 shows, when the US quota system resumed in 1948, Cuba was the preferred foreign supplier of sugar. However, in Cuba, the 1950s witnessed unprecedented political unrest. The 1952 Coup d'état marked the end of democracy and the beginning of dictatorship, followed by the

Cuban Revolution, which started in 1953, and Fidel Castro's ascent to power in 1958. Castro's government proceeded to enact a series of agrarian reforms which featured the nationalization of US-owned industries. As tensions escalated between the US and Cuba, one of the US's early economic sanctions was focused on Cuban sugar. In July 1960, the US amended the US Sugar Act and set the Cuban quota at zero for the remainder of 1960 and the first three months of 1961. It would remain at zero until 1974, when the Sugar Act failed to be renewed (Ballinger, 1975).

Our reading of Cuba's history and of the policies that were imposed on the economy during the first half of the century lead us to identify the years from independence to the beginning of WWI as the ones least affected by policy distortions. In particular, in 1912, Cuba experienced the lowest tariffs of the pre-WWI period. For this reason, our baseline quantification of Cuba's openness and estimation of comparative advantage will rely on data from 1912. Similarly, 1947 is a year that witnessed low tariffs and no imposition of quotas. Accordingly, we will use 1947 year data for our counterfactuals.

2.1 The Cuban Economy and the Role of Sugar

In the first decades of the 20th century, Cuba was a rich open economy. Tafunell (2009) reports that Cuban consumption in 1913 was the highest in Latin America. Ward and Devereux (2012) estimate that during the early 1920s, Cuban income per capita was about 80 percent of the European average at the beginning of the century (see Appendix Figure B.3) and that Cuban living standards were comparable to the poorer Southern States in the US, South Carolina and Mississippi.

Dye (1998) refers to the 1899-1929 period as the 'second great sugar expansion', as these were three decades of export-led growth. Obviously, sugar played a predominant role in the composition of Cuba's exports: in 1913, Cuba was producing 20% of the world's sugar and 30% of the world's cane sugar, and sugar accounted for more than 70% of Cuba's exports (see Appendix Figure B.4).

Dye (1998) explains that Cuba's specialization in sugar was the natural result of comparative advantage. Consistent with this hypothesis, US Commerce data show that Cuba was the lowest cost producer of sugar in the world. Moreover, Cuba's specialization was accompanied by the concentration of its sales to one main trading partner: in 1913, 86% (83%) of Cuba's sugar (total) exports were directed to the United States (see Appendix Figure B.5).

Dye (1998) summarizes the principles guiding our modeling structure:

> *'The steady ascension of sugar reflects a latent comparative advantage that, once discovered, resulted in a rapid shift of resources into that sector of the economy. The*

concentration of productive resources into this single activity might have resulted in greater aggregate instability if the market for Cuban sugar had not been so robust.'
A. Dye, "Cuban Sugar in the Age of Mass Production" (1998)

Several sources report that the second great sugar expansion was followed by a slowdown of the economy starting in the late 1920s, as sugar prices remained low and the US began to import sugar from other countries through its quota system. As Figure 2 shows, the US increased its consumption of sugar from its overseas territories (Hawaii, Puerto Rico, and the Virgin Islands) and from the Philippines in the late 20s. Concurrently, Cuba's income per capita grew by only 3% between 1925 and 1955 (compared to 28% in Argentina, 23% in Chile, and 55% in the United States) and –in relative terms– fell from 45% of the US level in 1925 to 27% in 1955, while output per worker fell from 54% to 32% of the US level. As Figure 1 illustrates, these years were characterized by increases in tariffs and by the introduction of quotas imposed on Cuba.

3 Data

3.1 Data Sources and Collection Process

While the goal of this project is to quantitatively assess the effect of US trade policy on the Cuban economy, our focus on comparative advantage naturally requires the collection of trade data for the major trading countries in the world.

Our primary sources are the foreign commerce sections of statistical yearbooks. We recover these sources either on country-specific government websites, or through interlibrary loans. For the earlier years, most yearbooks are already Google-scanned and available online at `www.hathitrust.org`. For later years, we requested physical copies and manually scanned them.

We describe here the features of the dataset. Appendix A gives a detailed description of the process of digitization and harmonization that led to its assembly.

We have identified primary sources so that our final dataset will cover information about bilateral trade flows for 19 countries: Argentina, Belgium, Brazil, Canada, Cuba, France, Germany, India, Indonesia, Italy, Japan, Netherlands, Norway, Portugal, Russia, Spain, United Kingdom, United States, and Uruguay.[4]

[4]Notice that since the data collection and harmonization is still in progress, the results in this draft of the paper are obtained from a smaller set of countries.

Trade flows recorded in the yearbooks are at the destination country and industry level.[5] The yearbooks differ in terms of the level of detail of the data by industry. Some countries offer extremely detailed industry classifications, while others are more coarse. We harmonize the data by industry across countries and years by building a conversion scheme that assigns to every industry in the yearbook an industry classification at the two-digits Standard Industrial Classification (SIC2) level. This amounts to 34 industries across agriculture, mining and manufacturing sectors. Given the focus of this project on Cuba, we retain a SIC4 classification for the industries that were most important for the Cuban economy, sugar and tobacco. The resulting list of industries is reported in Appendix A. For the purpose of cross-country analysis, the data is converted into a common currency (current US dollars) using historical exchange rates.[6]

The resulting dataset is representative of world trade flows in our sample period, accounting for about 80% of total exports in 1912. To test the accuracy of our data collection procedure, we contrast our data, aggregated across industries, with the CEPII Historical Bilateral Trade and Gravity Dataset (TRADHIST). Appendix Figures B.7 and B.8 show the correlations for exports and imports, respectively. Our data shows very high correlations with the TRADHIST data, above 0.9 for exports and above 0.98 for imports.

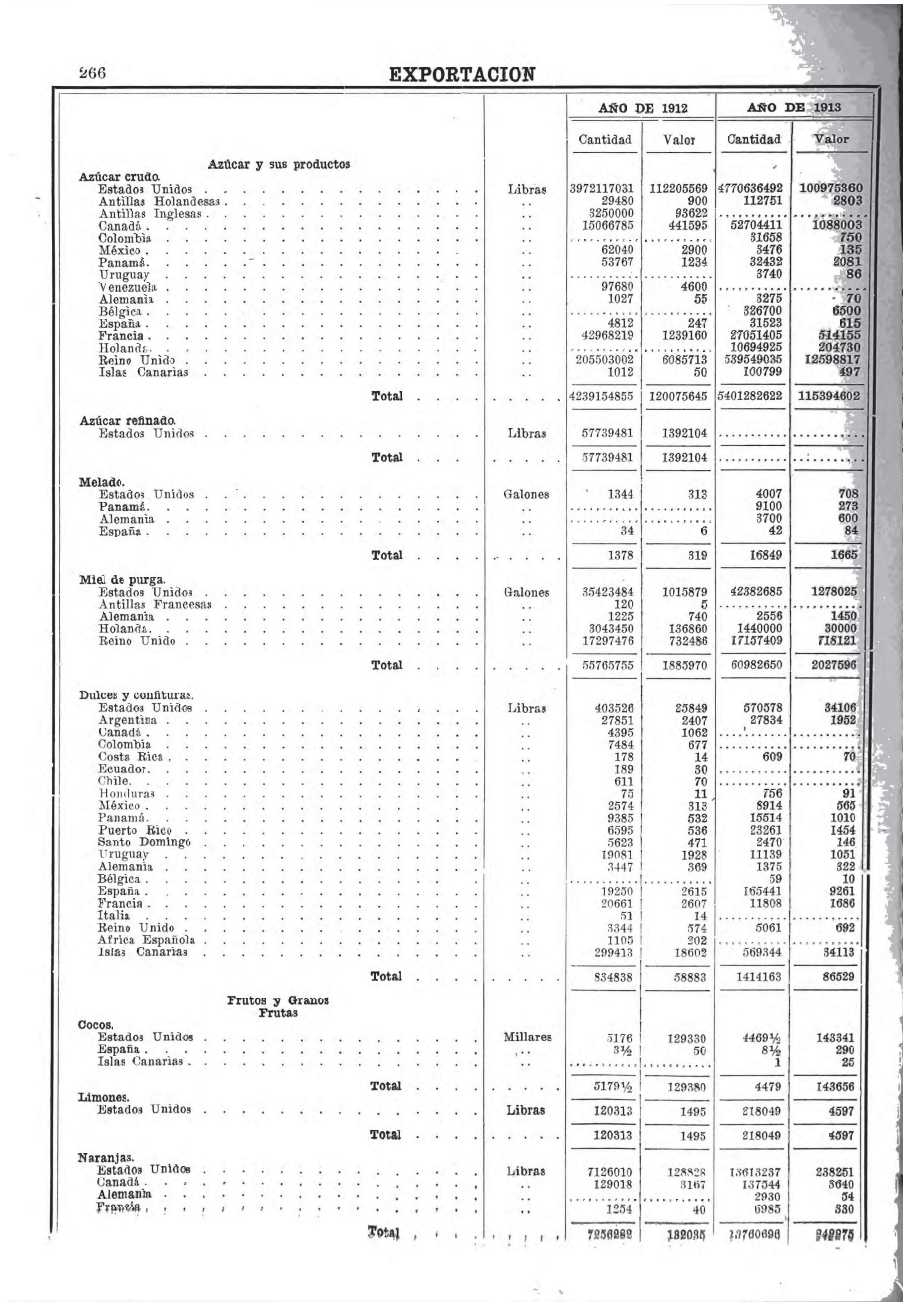
3.2 Cuban Trade Data

The source for Cuban trade data are *Comercio Exterior* (Foreign Commerce) yearbooks published by the Dirección General de Estadística (General Directorate of Statistics). The data present a remarkable level of detail, both at the country and industry level. Figure 3 shows a sample page of the 1913 yearbook. The classification is very detailed, with 78 industries and 55 countries reported in the yearbook.

Consistent with what other sources report, the data show that Cuba was very open to international trade. Table 1 reports import and export as a share of GDP in our years of interest.

[5] Historical trade data are publicly available at the country-pair level. Our contribution on the data front is to increase data availability at the industry level, which is essential to construct estimates of comparative advantage. Appendix A provides details of the construction of the trade flows data.

[6] `https://www.historicalstatistics.org/Currencyconverter.html`.



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		AÑO DE 1912		AÑO DE 1913	
		Cantidad	Valor	Cantidad	Valor
Azúcar y sus productos					
Azúcar crudo.					
Estados Unidos	Libras	3972117031	112205569	4770636492	100975360
Antillas Holandesas	..	29480	900	112751	2803
Antillas Inglesas	..	3250000	93622	.....	.....
Canadá	..	15066785	441595	52704411	1088003
Colombia	..	.....	.....	31658	750
México	..	62040	2900	3476	135
Panamá	..	53767	1234	32432	2081
Uruguay	..	.....	.....	3740	86
Venezuela	..	97680	4600	.....	.....
Alemania	..	1027	55	3375	70
Bélgica	..	.....	.....	326700	6500
España	..	4812	247	31523	615
Francia	..	42968219	1239160	27051405	514155
Holanda	..	.....	.....	10694925	204730
Reino Unido	..	205503002	6085713	539549035	12598817
Islas Canarias	..	1012	50	100799	497
	Total	4239154855	120075645	5401282622	115394602
Azúcar refinado.					
Estados Unidos	Libras	57739481	1392104	.....	.....
	Total	57739481	1392104	.....	.....
Melado.					
Estados Unidos	Galones	1344	313	4007	708
Panamá	..	.....	.....	9100	273
Alemania	..	.....	.....	3700	600
España	..	34	6	42	84
	Total	1378	319	16849	1665
Miel de purga.					
Estados Unidos	Galones	35423484	1015879	42382685	1278025
Antillas Francesas	..	120	5	.....	.....
Alemania	..	1225	740	2556	1450
Holanda	..	3043450	136860	1440000	30000
Reino Unido	..	17297476	732486	17157409	718121
	Total	55765755	1885970	60982650	2027596
Dulces y confituras.					
Estados Unidos	Libras	403526	23849	570578	34106
Argentina	..	27851	2407	27834	1952
Canadá	..	4395	1062	.....	.....
Colombia	..	7484	677	.....	.....
Costa Rica	..	178	14	609	70
Ecuador	..	189	30	.....	.....
Chile	..	611	70	.....	.....
Honduras	..	75	11	756	91
México	..	2574	313	8914	565
Panamá	..	9385	532	15514	1010
Puerto Rico	..	6595	536	23261	1454
Santo Domingo	..	5623	471	2470	146
Uruguay	..	19081	1928	11139	1051
Alemania	..	3447	369	1375	322
Bélgica	..	.....	.....	59	10
España	..	19230	2615	165441	9261
Francia	..	20661	2607	11808	1686
Italia	..	51	14	.....	.....
Reino Unido	..	3344	574	5061	692
Africa Española	..	1105	202	.....	.....
Islas Canarias	..	299413	18602	569344	34113
	Total	834838	58883	1414163	86529
Frutos y Granos					
Frutas					
Cocos.					
Estados Unidos	Millares	5176	129330	4469½	143341
España	...	3½	50	8½	290
Islas Canarias	..	.....	.....	1	25
	Total	5179½	129380	4479	143656
Limones.					
Estados Unidos	Libras	120313	1495	218049	4597
	Total	120313	1495	218049	4597
Naranjas.					
Estados Unidos	Libras	7126010	128828	13613237	238251
Canadá	..	129018	3167	137544	3640
Alemania	..	.....	.....	2930	54
Francia	..	1254	40	6985	330
	Total	7256282	132035	13760696	242275

Figure 3: A sample page from Cuba's *Comercio Exterior* yearbook.

Figure 4: Aggregate trade statistics from Cuba's *Comercio Exterior* yearbook.

	Export/GDP (%)	Import/GDP (%)
1912	72.44	52.73
1947	45.32	29.18

Table 1: Cuba's trade openness.
Source: Maddison Project and *Comercio Exterior* yearbooks, 1912-1913 and 1946-1947.

Already by looking at the first pages of the yearbook, it is apparent that the US was Cuba's main trade partner by a large margin. Figure 4 shows the distribution of Cuba's imports and exports by country, as illustrated in the introduction of the yearbook.

More systematically, Figure 5 shows the distribution of Cuba's exports by industry and by destination country for 1912, the year we use for our baseline estimation.[7] In 1912, the United States

[7]The industries corresponding to each SIC code are listed in Appendix A. The left panel of Figure 5 includes all countries that account for an export share of at least 0.5%. The right panel of Figure 5 includes all industries for which there are positive exports.

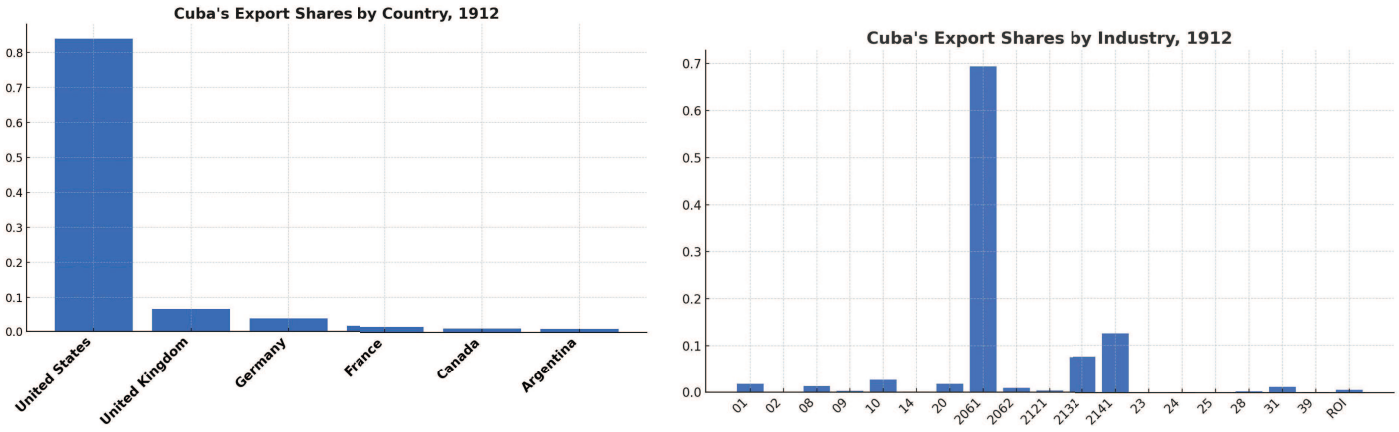

Figure 5: Cuba's export shares, by country and industry. 1912.
Source: Comercio Exterior, 1912-1913.

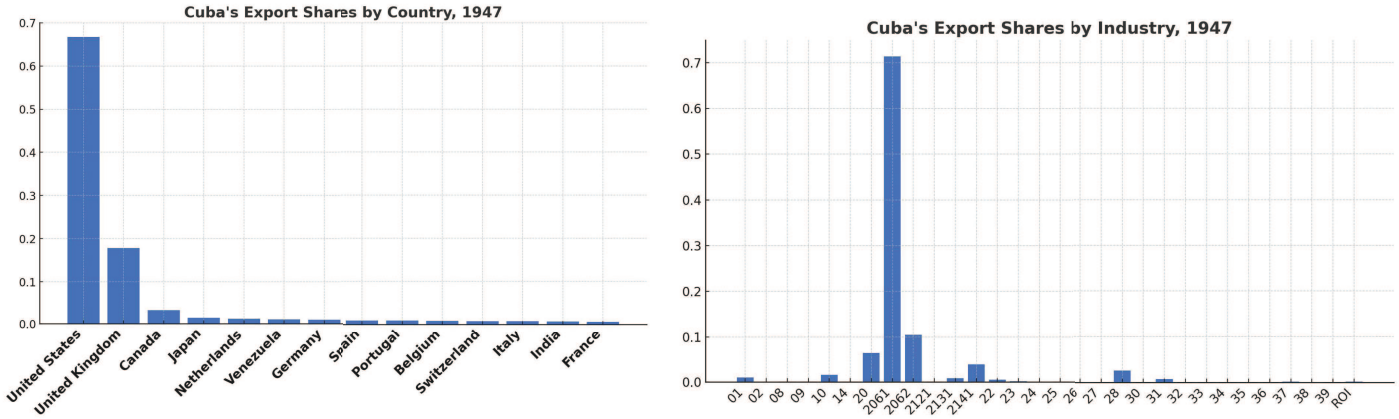

Figure 6: Cuba's export shares, by country and industry. 1947.
Source: Comercio Exterior, 1946-1947.

account for 84% of Cuba's exports, while any other destination country accounts for less than 7% of total export. 70% of Cuba's exports are in raw sugar manufacturing (industry SIC 2061), with chewing tobacco and tobacco leaf (industry SIC 2131 and 2141, respectively) as the next most important exported products. Notice also that refined sugar (industry SIC 2062) accounts for a very small share of exports, as the US were importing raw sugar and refining it domestically.

As explained in Section 2, a good comparison point to evaluate the effects of trade sanctions on sugar is the year 1947. During WWII, the US lowered tariffs on sugar and suspended quotas, only to reinstate them in 1948. This makes 1947 a non-war year with minimal restrictions on trade in sugar. Figure 6 shows the same data for 1947. At a first glance, Cuba's export shares in 1947

appear to be more diversified across countries than in 1912. The share of exports to the US declines from 84% to 67%. The Herfindal-Hirshman index computed using variation across trading partners declines from 0.71 in 1912 to 0.47 in 1947, confirming a reallocation of exports away from the US and towards other trading partners. Specialization by industry remains extreme, with raw sugar manufacturing accounting for about 70% of total exports, increased importance of refined sugar, and reduced export shares of tobacco industries.

4 Estimation: Inferring Cuba's Comparative Advantage

In this section, we present the theoretical model and the estimation methodology that we use to quantify the revealed comparative advantage measure used in our counterfactual exercises.

4.1 Model and Estimation Methodology

Our estimation of revealed comparative advantage (RCA) follows the methodology developed by Costinot et al. (2012), based on a multi-sector version of the Eaton and Kortum (2002) model.

The economy is composed by $i = 1, ..., I$ countries. Agents have Cobb-Douglas preferences across $k = 1, ..., K$ industries, with sectoral expenditure shares α_i^k, and CES preferences across varieties within an industry. There is one factor of production, labor, that is perfectly mobile across industries and immobile across countries. L_i denotes the endowment of labor of country i, which is paid a wage w_i.

Production technologies exhibit constant returns-to-scale, and feature intra-industry heterogeneity in labor productivity, á la Eaton and Kortum (2002): $z_i^k(\omega)$ is the number of units of good ω in sector k that can be produced with one unit of labor in country i. $z_i^k(\omega)$ is drawn independently across sectors and countries from a Fréchet distribution:

$$F_i^k(z) = \exp\{(z/z_i^k)^{-\vartheta}\} \tag{1}$$

for all $z \geq 0$, where $z_i^k > 0$ and $\vartheta > 1$. The shape parameter of the Fréchet distribution, ϑ, is the trade elasticity in this model. The location parameter, z_i^k, is country and sector-specific, and we will refer to it as the *fundamental productivity* of country i in sector k. The goal of the estimation procedure is to recover values for the parameters z_i^k, which drive inter-industry Ricardian comparative advantage. Lastly, international trade is subject to bilateral and sector-level iceberg costs $d_{ij}^k > 1$, for $i \neq j$.

Under this setup, bilateral exports from country i to country j in sector k, X_{ij}^k , are given by:

$$X_{ij}^k = \frac{\left(w_i d_{ij}^k / z_i^k\right)^{-\vartheta}}{\sum_{i'=1}^{I} \left(w_{i'} d_{i'j}^k / z_{i'}^k\right)^{-\vartheta}} \alpha_j^k w_j L_j. \tag{2}$$

Under the standard assumption that $d_{ij}^k = d_{ij} \cdot d_j^k$, Costinot et al. (2012) show that it is possible to recover revealed comparative advantage by regressing bilateral industry-level trade flows on a set of fixed effects:[8]

$$\ln X_{ij}^k = \delta_{ij} + \delta_j^k + \delta_i^k + \varepsilon_{ij}^k \tag{3}$$

where δ_{ij} denotes origin-destination fixed effects, δ_j^k are destination-industry fixed effects, δ_i^k are origin-industry fixed effects, and ε_{ij}^k is an orthogonal error term. Conditional on the value of the trade elasticity ϑ, the origin-industry fixed effects deliver estimates of the relative fundamental productivities: $\delta_i^k = \vartheta \ln z_i^k$.

4.2 Results

We compute revealed comparative advantage for each country-industry pair in our sample using equation (3). We use the trade elasticity estimated by Costinot et al. (2012), ϑ =6.53, and normalize the results with respect to i = ROW and k =20 (food and kindred products). Table 2 shows the estimates using the preliminary data described in Section 3, for the year 1912.[9]

A few observations are in order. First, Cuba displays a large RCA estimate in its key industries: raw cane sugar manufacturing (SIC 2061), refined cane sugar manufacturing (SIC 2062) and some tobacco industries (SIC 2121, cigars, and SIC 2141, tobacco stemming and redrying). The core of the Cuban sugar industry revolved around the first stages of the manufacturing process, which is why we see a higher RCA in the *raw* sugar manufacturing industry. In addition, there is no RCA estimate for the corresponding agricultural industry, sugarcane farming. This is explained by the

[8] It is reasonable to ask whether the separability assumption on the iceberg costs is appropriate in this setting. We argue that it is for US-Cuba trade flows. First, the US special treatment of Cuba's exports, via preferential tariffs under the US-Cuban Commercial Convention, applied to the majority of products imported from Cuba (hence entering the term δ_{ij} in the estimation). Second, the underlying US tariff schedule on sugar is industry-specific and applied to multiple trading partners.

[9] At the time of writing, data have been assembled for only 14 countries. The remaining trade flows are aggregated in a residual "rest of the world" (ROW) category. On the industry side, the classification is 2-digit SIC, with two exceptions: 1) given the extreme specialization of the Cuban economy in sugar and tobacco, the more detailed SIC4 classification is used for those two industries (0132, 2111, 2121, 2131, and 2141 for tobacco, and 0133, 2061, 2062, and 2063 for sugar, where sugar farming is further broken down into sugarcane and sugarbeet – the 0133 category).

	BEL	CAN	CUBA	FRA	GER	IND	IDN	JPN	NED	NOR	RUS	SPN	UK	US	UY	ROW
01	1.10	1.09	0.81	0.82	1.21	1.45	0.68		1.10		1.08	0.89	0.68	1.06	0.79	1.00
0132																1.00
0133	1.68				2.65											1.00
0133b																
02	1.05	0.85	0.50	0.96	0.90				0.86		1.15	0.58	0.84	0.57	0.77	1.00
08	0.95	1.59	2.16	1.14	1.67		1.36				1.97	0.66	1.13	1.36		1.00
09			1.61		0.60							0.80		0.88	1.21	1.00
10	0.86	1.13	1.02	1.10	1.26	1.03			1.23		1.15	0.94	0.82	0.63	1.27	1.00
12	1.12	0.82		0.89	1.61				1.00			0.42	1.35	0.76		1.00
13													0.96			1.00
14	0.88	1.23	1.11		1.47	0.96			1.30	0.99	0.71	1.38	1.06	0.68	1.12	1.00
20	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2061			2.74													1.00
2062			1.31		1.85	0.80	1.93					0.31		0.94		1.00
2063	1.93			1.73	1.83				1.93				1.41			1.00
2111		0.44		1.31									1.78	0.68		1.00
2121		0.37	1.23		1.01								0.34			1.00
2131																
2141		0.65	2.09											1.39		1.00
22	1.22	0.56		1.12	1.24	0.96		1.43	0.85	0.40	0.91	0.69	1.28	0.73	1.17	1.00
23	1.03	0.61		1.32	1.66				0.89		1.09	0.48	1.30	0.79		1.00
24	0.89	1.16	0.72	0.99	1.02				0.59	1.06	1.45	0.94	0.76	1.05		1.00
25	1.10	0.77	0.86	1.21	1.22							0.71	1.08	0.99		1.00
26	1.17	1.06		0.99	1.37				1.05	0.87		0.71	1.11	0.90		1.00
27	1.11	0.81		1.33	1.61				1.25		0.89	0.83	1.28	1.06		1.00
28	1.23	0.75	0.79	1.13	1.43	1.12			0.94		0.65	0.93	1.19	1.12		1.00
29	1.13	0.51		0.74	1.48						1.25		1.02	1.55		1.00
30	1.28	0.59		1.19	1.38	0.83			0.89		0.75	0.51	0.95	0.92		1.00
31	1.21	0.87	1.09	1.18	1.50	1.21		0.99	0.87		1.02	0.83	1.11	1.08	1.33	1.00
32	1.33	0.83		1.06	1.41			1.22	0.76	0.88		0.81	1.10	0.88		1.00
33	1.47	0.72		1.07	1.59				1.26	0.79	0.83	1.02	1.41	1.25		1.00
34	1.11	0.59		1.12	1.81			0.76	1.19		0.79	0.85	1.38	1.22		1.00
35	1.27	1.02		1.11	1.69			0.78				0.63	1.46	1.44		1.00
36		0.54			1.72							0.43	1.15	1.17		1.00
37	1.31	0.79		1.22	1.48			0.91	0.94	0.75		0.58	1.35	1.15		1.00
38	0.73			1.39	1.82							0.60	0.82	1.27		1.00
39	0.83	0.82	0.80	1.20	1.31			0.94			0.61	0.84	0.94	0.82	0.73	1.00
ROI	1.12	0.79	0.82	1.09	1.06	0.91		1.47	1.26	0.68	0.94	0.51	0.99	0.88	0.71	1.00

Table 2: Revealed comparative advantage estimates, 1912.

		Cuba, 1912	Cuba, 1947
01	Crops	0.81	0.39
02	Livestock	0.50	0.45
08	Forestry	2.16	0.54
09	Fishing/Hunting	1.61	0.53
10	Metal Mining	1.02	
20	Food and Kindred Products	1.00	1.00
2061	Raw Cane Sugar Manufacturing	2.74	2.81
2062	Refined Cane Sugar Manufacturing	1.31	
2121	Cigars	1.23	
2141	Tobacco Stemming and Redrying	2.09	0.99
24	Lumber and Wood Products, Except Furniture	0.72	0.42
25	Furniture and Fixtures	0.86	1.37
28	Chemicals and Allied Products	0.79	0.62
31	Leather and Leather Products	1.09	0.76
39	Miscellaneous Manufacturing Industries	0.80	0.54
ROI	Rest of Industries	0.82	0.43

Table 3: Comparison of Revealed comparative advantage estimates, Cuba, 1912-1947.

fact that sugarcane is a highly perishable product, and needs to be processed almost immediately after farming. For this reason, sugarcane cannot be traded in its raw state (Ballinger, 1975). Our estimates also serve to illustrate the extent of competition that the Cuban sugar industry experienced in the first half of the 20th century. Due to its warm climate and mostly flat orography, the island of Java in Indonesia appears to be Cuba's only strong competitor in the global cane sugar industry. Consistent with our finding, Dye (1998) documents that Java was the second largest cane sugar producer in the world after Cuba at this time. In addition, several European countries (Belgium, France, Germany, the Netherlands and the UK) display high estimated productivity in the highly substitutable beet sugar sector.

The fairly detailed industry classification we have chosen for the estimation implies that there are many country-industry pairs for which we do not have RCA estimates. The missing estimates will be reduced as the data collection proceeds.

In order to perform our counterfactual analysis, we repeat the RCA estimation in the year 1947. In the interest of space, we report in Table 3 only the comparison of the RCA estimates for Cuba.

Table 3 shows that, between 1912 and 1947, Cuba's relative productivity estimates decrease in all industries but SIC 2061, raw cane sugar manufacturing, which shows a small increase. [10]

[10]Unfortunately the 1947 data do not produce an identified estimate for the refined can sugar manufacturing anc cigars. As explained before, estimates are only identified normalizing the results with respect to one country and industry of reference, ROW and SIC 20 in our case. We recover ROW's exports as other countries' imports from the ROW. In the current dataset, no countries report imports in industry 2062 from the ROW. We expect this issue to

Consistently with the decreased concentration observed in the raw data, we interpret these results as evidence of reduced specialization in 1947 compared to 1912.

It is worth to notice that the decline in the RCA estimates for Cuba does not follow a trend of decreased RCA across countries. Appendix Figures B.9-B.10 show changes in the RCA estimates between 1912 and 1947 across countries and across sectors. No clear pattern of RCA decline can be inferred from the figures.[11]

5 The Road not Taken: Welfare Analysis, 1912-1947

The goal of our counterfactual analysis is to provide a quantitative assessment of the welfare changes that the Cuban economy experienced from the pre-WWI period to the end of WWII.

We use our newly collected trade data, the 1912 estimates reported in Table 2, together with analogous estimates for 1947, to perform counterfactual exercises. As explained in Section 2, we chose 1912 and 1947 as being characterized by low tariffs and no quotas restricting trade between Cuba and the United States. We aim to shed light on a long standing question in the Latin American studies literature: what would "the road not taken" (to cite Ward and Devereux, 2012) have been for Cuba? Or, more precisely, what is the welfare differential between the data economy and a counterfactual economy where Cuba had retained the comparative advantage it had in the pre-WWI years?

Using the data for 1912 and 1947, we perform two exercises. First, by using the multi-sector version of the ACR formula (Arkolakis et al., 2012), we compute the 'distance from autarky' of both the 1912 and 1947 economies, and the realized trade-induced welfare differential between these two years.

Our second counterfactual exercise exploits the RCA estimates presented in Section 4. We have shown that the RCA estimates in 1912 and 1947 are very different. We interpret these estimates as akin to a macro-style "productivity residual": not knowing what economic fundamentals to attribute changes to, we attribute them to productivity and interpret these differences in productivity as the result of trade policies that were implemented *between* these two years. Our hypothesis is that, if these policies had not occurred, Cuba should have retained the same level of involvement in international trade as in 1912, and its RCA should not be different in 1947 compared to 1912.

be resolved when the data collection will be completed. A similar observation applies to SIC 2121 (cigars).

[11] For robustness, we also computed revealed comparative advantage using the Balassa (1965) RCA index. Results for Cuba are shown in Appendix Table B.4, while Appendix Figure B.11 illustrates the correlation between the RCA ranking estimated following Costinot et al. (2012) and following Balassa (1965).

Hence, we quantify the welfare effects of this change in Cuba's comparative advantage by constructing a counterfactual economy where we impose that the 1947 RCA pattern between Cuba and its main trading partner (the United States) is unchanged relative to what is implied by the 1912 estimates. The welfare differences between the real and counterfactual 1947 economies should thus be interpreted as quantifying the cumulative effects that the policies enacted in the 1912-1947 period had on welfare via changes in comparative advantage.

5.1 Trade-induced Realized Welfare Changes

We start by examining differences in the welfare gains from trade in 1912 versus 1947. We use the standard welfare calculations that can be performed with an ACR formula. Let $\hat{X} = X'/X$ denote an arbitrary proportional change in a variable X. The welfare differential due to changes in trade flows for country i can be computed as:

$$\hat{W}_i = \prod_{k=1}^{K} (\hat{\pi}_{ii}^k)^{-\alpha_i^k/\vartheta} \tag{4}$$

where $\hat{\pi}_{ii}^k$ denotes changes in the domestic expenditure share in sector k between the two equilibria, $\pi_{ii}^k = X_{ii}^k / \sum_{i'=1}^{I} X_{i'j}^k$, and α_i^k is country i's expenditure share in sector k.

Our first counterfactual exercise consists in computing the welfare gain from trade for the Cuban economy compared to a situation of autarky, for both the year 1912 and the year 1947, using equation (4). To this end, we need additional data: Cuba's expenditure shares by sector, α_c^k, and domestic sectoral expenditure shares, π_{cc}^k, in addition to a value for the trade elasticity ϑ.

Given that our data do not allow us to construct an independent estimate of the trade elasticity ϑ, we rely on Costinot et al. (2012)'s estimates and present our result using their baseline value $\vartheta = 6.53$, together with other values that the literature has used, to provide a range for our results.

More importantly, construction of the expenditure shares α_c^k and of the domestic expenditure shares π_{cc}^k requires us to take a stand on measures of Cuba's GDP and expenditure for the period at hand. We present our results using data from the Maddison Project,[12] which uses the estimates in Ward and Devereux (2012).

We recover real GDP per capita estimates ($GDPpc_i$) and population (POP_i) from the Maddison Project. We compute real GDP as $GDP_i = GDPpc_i \times POP_i$. We convert the real GDP to nominal

[12] Maddison Project Database, version 2020, available at
`https://www.rug.nl/ggdc/historicaldevelopment/maddison/releases/maddison-project-database-2020?lang=en`

	$\vartheta = 8.28$ EK	$\vartheta = 6.53$ CDK (baseline)	$\vartheta = 3.6$ BEJK
Maddison Project			
1912 vs autarky	12.11	15.10	25.70
1947 vs autarky	5.35	6.74	11.89

Table 4: Welfare Gains from Trade for the Cuban economy, 1912 versus 1947. Gains expressed in percentages.

values using the US GDP deflator from FRED.[13] We then compute the local expenditure X_{ii} as GDP minus imports:

$$X_{ii} = GDP_i - \sum_{j \neq i} X_{ji}. \tag{5}$$

Cuban data lack information on domestic expenditure. Given that the majority of Cuban consumption was imported,[14] we approximate expenditure shares with import shares. Let μ_i^k denote the share of country i's imports in industry k:

$$\mu_i^k = \frac{\sum_{j \neq i} M_{ij}^k}{\sum_{k'} \sum_{j \neq i} M_{ij}^{k'}}. \tag{6}$$

We compute domestic expenditure in sector k as:

$$X_{ii}^k = \mu_i^k X_{ii} \tag{7}$$

and the sectoral expenditure shares as:

$$\alpha_i^k = \frac{\sum_j X_{ji}^k}{\sum_{k'} \sum_j X_{ji}^{k'}}. \tag{8}$$

Equipped with these numbers, we use equation (4) to compute a 'welfare distance from autarky' for the Cuban economy in 1912 and in 1947.

Table 4 shows the results. Consistent with our hypothesis, welfare gains from trade are higher in 1912 compared to 1947. Quantitatively, across sources and specifications, welfare gains from trade

[13] `https://fred.stlouisfed.org/series/A191RD3A086NBEA`. FRED GDP deflators are available starting in 1929. For earlier years, we use US inflation data from the Minneapolis FED: `https://www.minneapolisfed.org/about-us/monetary-policy/inflation-calculator/consumer-price-index-1800-`.

[14] Imports as a share of absorption were 89.2% in 1912 and 86.3% in 1947, using the GDP measure from the Maddison Project.

in 1912 are more than twice as large as those in 1947, reflecting changes in the structure of trade between these two years. Our preferred specification, using $\vartheta = 6.53$, implies that the welfare gains from trade where about 15% in 1912, compared to about 7% in 1947.

Together with our baseline result using the Costinot et al. (2012) estimate of ϑ, Table 5 shows the welfare calculations also using two alternate values of the trade elasticity: the original Eaton and Kortum (2002) estimate of $\vartheta = 8.28$ (from a single-sector model and price data), and the simulation-based estimate in Bernard et al. (2003) of $\vartheta = 3.6$. Naturally, a higher trade elasticity is associated with smaller welfare gains, with welfare gains differentials ranging from 7 to 14 percentage points.[15]

The results of the baseline specification imply that welfare in 1912 was 8.36 percentage points higher compared to 1947. In our next counterfactual, we aim to quantify the portion of this welfare differential that is due to changes in comparative advantage.

5.2 Freezing Cuba's Comparative Advantage

Following the analysis in Costinot et al. (2012), counterfactual welfare changes due to changes in fundamental productivity for country j satisfy:

$$\hat{W}_j = \prod_{k=1}^{K} \left[\sum_{i=1}^{I} \pi_{ij}^k (\hat{z}_i^k)^{\vartheta} \right]^{\alpha_j^k/\vartheta} \tag{9}$$

where $\pi_{ij}^k \equiv X_{ij}^k / \sum_{i'=1}^{I} X_{i'j}^k$ are the trade shares in the baseline equilibrium and α_j^k is country j's expenditure share in sector k.

The counterfactual exercise we design around equation (9) is constructed to answer the question: how different would the Cuban economy's living standards have been in 1947 if the country's comparative advantage with the US had remained the same as in 1912?

In order to answer this question, we "freeze" Cuba's comparative advantage with the US to its estimated 1912 level and compute the welfare differential arising from the comparison of two economies: the actual world economy in 1947, and a counterfactual economy where Cuba's RCA with the US is the same as in 1912, while all other countries have their actual 1947 estimated comparative advantage levels.

To this end, let $\delta_{cu}^l(1912)$ denote the relative productivity of Cuba compared to the US in sector l

[15] Appendix Table C.5 shows similar calculations to assess Cuba's 'distance from autarky' at the time of the embargo.

in 1912:

$$\delta_{cu}^{l}(1912) \equiv \frac{z_c^l(1912)}{z_u^l(1912)}. \tag{10}$$

Let $(z_c^k)'$ denote Cuba's RCA in sector k in the counterfactual equilibrium. We construct each element of the vector $\{(z_c^k)'\}_{k=1,...K}$ as:

$$(z_c^k)' = A_c \delta_{cu}^{k}(1912) z_u^k(1947) \tag{11}$$

where A_c is a country-specific productivity adjustment that ensures that wages are the same in the actual and counterfactual equilibria. This construction ensures that, for any sector pair (l, k):

$$\frac{(z_c^l)'}{(z_c^k)'} = \frac{A_c \delta_{cu}^{l}(1912) z_u^l(1947)}{A_c \delta_{cu}^{k}(1912) z_u^k(1947)} \tag{12}$$

so that –in the counterfactual equilibrium– the comparative advantage between Cuba and the US is the same as in 1912:

$$\frac{\frac{(z_c^l)'}{(z_c^k)'}}{\frac{z_u^l(1947)}{z_u^k(1947)}} = \frac{\frac{z_c^l(1912)}{z_c^k(1912)}}{\frac{z_u^l(1912)}{z_u^k(1912)}}. \tag{13}$$

As shown in Costinot et al. (2012), for any counterfactual equilibrium computed with productivities $(z_i^k)'$ where relative wages are the same as in the baseline equilibrium, the productivity adjustments A_i are the solution of:

$$\sum_{j=1}^{J} \sum_{k=1}^{K} \frac{\pi_{ij}^k [z_i^k/(z_i^k)']^{-\vartheta}}{\sum_{i'=1}^{I} \pi_{i'j}^k [z_{i'}^k/(z_{i'}^k)']^{-\vartheta}} \alpha_j^k \gamma_j = \gamma_i \tag{14}$$

where $\gamma_i = w_i L_i / \sum_{j=1}^{J} w_j L_j$. In our exercise, the counterfactual productivities are then given by:

$$(z_i^k)' = A_i z_i^k, \forall i \neq \text{Cuba} \tag{15}$$

$$(z_i^k)' = A_i \delta_{cu}^{k}(1912) z_u^k(1947), \text{for } i = \text{Cuba}. \tag{16}$$

Equipped with all the necessary information, we proceed to present the results of our calculation. The first row of Table 5 shows that, for the baseline value of ϑ, the counterfactual 1947 Cuban economy (with 1912 comparative advantage with the US) has about 3.5% higher welfare than the Cuban economy in the "real" 1947 equilibrium. We interpret this welfare loss as primarily driven by the large decline in RCA across industries that Cuba experienced between 1912 and 1947. While the first row of the table presents the results as purely driven by changes on comparative advantage, keeping wages across countries fixed through the A_c terms, the second row presents the results without fixing the wages, so including general equilibrium effects on the terms of trade (TOT). As

	$\vartheta = 8.28$ EK	$\vartheta = 6.53$ CDK (baseline)	$\vartheta = 3.6$ BEJK
no TOT effects	2.72	**3.44**	6.94
with TOT effects	4.52	5.76	11.3

Table 5: Welfare changes between the 1947 Cuba economy and a counterfactual economy where Cuba's RCA with the US is at its 1912 level.

productivity and wages are correlated in the model, the results including terms of trade effects are quantitatively larger, at 5.76% under the baseline value of ϑ.

Together with our baseline result, Table 5 shows the welfare differential also using the two alternate values of the trade elasticity from Eaton and Kortum (2002) and Bernard et al. (2003). Welfare changes range from 2.72% to 6.94% depending on the chosen value of ϑ in the scenario with no TOT effects, and from 4.52% to 11.3% in the scenario including TOT effects. In summary, our calculations suggest that about half of the gains from trade differential shown in Table 4 can be attributed purely to changes in comparative advantage.

It is important to stress that the numbers reported in Table 5 are preliminary, and based on a sample that is smaller than ideal (and smaller than the sample we will use when our data collection will be completed). Nonetheless, we believe that it is useful to compare our numbers with Ward and Devereux (2012)'s estimates. Ward and Devereux (2012) report that, if Cuba had held its pre-revolution growth trend, its GDP in 1947 could have been about 20% higher than what it was realized. Our results suggest that about one fifth of this GDP loss could be purely due to changes in the strength of Cuba's comparative advantage with the US.

6 Conclusions

This project starts from the Ricardian insight whereby trade-driven specialization generates welfare gains for all the countries involved. The examination of Cuba's historical experience, however, suggests that the same mechanism can push countries into a "specialization trap" and lead to welfare losses if sudden changes in trade policy are realized. Using newly digitized historical trade data and the insights of a standard Ricardian model of trade, we attempt to provide a quantitative answer to a long-standing question about the Cuban economy: the 'road not taken'. Our analysis quantifies the gains from trade in post WWII Cuba to be less than half compared to prior to WWI. In addition, the results of our counterfactual exercises suggest that post-WWII Cuba experienced

about 3.5% lower welfare than it would have had if its comparative advantage with the US had remained the same as at the beginning of the twentieth century.

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Appendix

A Data Collection and Assembly

A.1 List of Harmonized Industries

We start this appendix by listing the industries used to harmonize the data and for the estimation.

01 Agricultural Production – Crops
0132 Tobacco Farming
0133 Sugarbeet Farming
0133b Sugarcane Farming
02 Agricultural Production – Livestock
07 Agricultural Services
08 Forestry
09 Fishing, Hunting, & Trapping
10 Metal, Mining
12 Coal Mining
13 Oil and Gas Extraction
14 Nonmetallic Minerals, Except Fuels
20 Food and Kindred Products
2061 Raw Cane Sugar Manufacturing
2062 Refined Cane Sugar Manufacturing
2063 Beet Sugar Manufacturing
2111 Tobacco Products: Cigarettes
2121 Tobacco Products: Cigars
2131 Tobacco Products: Chewing Tobacco
2141 Tobacco Stemming and Redrying
22 Textile Mill Products
23 Apparel and Other Textile Products
24 Lumber and Wood Products
25 Furniture and Fixtures
26 Paper and Allied Products
27 Printing and Publishing
28 Chemical and Allied Products
29 Petroleum and Coal Products

30 Rubber and Miscellaneous Plastics Products
31 Leather and Leather Products
32 Stone, Clay, and Glass Products
33 Primary Metal Industries
34 Fabricated Metal Products
35 Industrial Machinery and Equipment
36 Electronic and Other Electric Equipment
37 Transportation Equipment
38 Instruments and Related Products
39 Miscellaneous Manufacturing Industries

A.2 Construction of Trade Flow Data

We gathered and processed country trade flows (exports and imports) from historic statistical yearbooks. The information found in the yearbooks is displayed in two types of structures.

Some countries in our dataset (Cuba, Germany, India, Norway) report detailed country-industry-level export flows X_{ij}^k and country-industry-level import flows M_{ij}^k. Table A.1 is an example of the structure of reported exports for these countries. X_{ij}^k denotes country i's exports to trade partner j of products in industry k.

Table A.1: Flows by Country-Industry

		Industries				
		1	$\cdots$	k	$\cdots$	K
Countries	1	X_{i1}^1	$\cdots$	X_{i1}^k	$\cdots$	X_{i1}^K
	$\vdots$	$\vdots$	$\ddots$	$\vdots$	$\ddots$	$\vdots$
	j	X_{ij}^1	$\cdots$	X_{ij}^k	$\cdots$	X_{ij}^K
	$\vdots$	$\vdots$	$\ddots$	$\vdots$	$\ddots$	$\vdots$
	J	X_{iJ}^1	$\cdots$	X_{iJ}^k	$\cdots$	X_{iJ}^K

The other countries only report export and import flows separately at the industry level (X_i^k and M_i^k, respectively) and at the country-level (X_{ij} and M_{ij}, respectively). Tables A.2 and A.3 are examples of the structure of export data for these countries. X_{ij} denotes the aggregate exports from country i to country j, and X_i^k denotes the aggregate exports from country i of products in

industry k.

2

Table A.2: Flows by Country

Countries	Value
1	X_{i1}
⋮	⋮
j	X_{ij}
⋮	⋮
J	X_{iJ}

Table A.3: Flows by Industry

Industries	Value
1	X_i^1
⋮	⋮
k	X_i^k
⋮	⋮
K	X_i^K

In order to privilege direct observations in the data, we construct the export flows used for the estimation, X_{ij}^k, as follows.

1. If country i reports country-industry-level data, use observed X_{ij}^k.

2. If country i does not report country-industry-level data, but country j does, we can use the observed M_{ji}^k to approximate X_{ij}^k.[1]

   We illustrate an example of this scenario using exports of Belgium to Germany. In the data, we do not observe X_{BG}^k in the Belgian data, but we observe M_{GB}^k in the German data. Hence, using the German import data, we compute the share of German imports from Belgium that is in sector k,

$$\mu_{GB}^k \equiv \frac{M_{GB}^k}{M_{GB}} \tag{A.1}$$

[1]We cannot use M_{ji}^k directly as a measure of X_{ij}^k because, due to differences in the reporting of export versus import flows, the aggregate exports of country i measured from import data, $\sum_{j \neq i} M_{ji}^k$, can be higher than the reported aggregate exports of country i, X_i^k, preventing the attribution of positive trade flows to other partner countries that don't report country-industry-level flows.

and we approximate Belgian exports to Germany in sector k as:

$$\hat{X}^k_{BG} = \mu^k_{GB} X_{BG}. \tag{A.2}$$

3. If neither country i nor j report country-industry-level data, we use a constant-share approximation.

   We illustrate an example of this scenario using exports of Belgium to the US. In the data, we do not observe $X^k_{B,US}$ in the Belgian data, nor $M^k_{US,B}$ in the US data. We construct the share of Belgian exports that are in industry k, ξ^k_b:

$$\xi^k_B \equiv \frac{X^k_B}{\sum_k X^k_B} \tag{A.3}$$

   and we approximate Belgium exports to the US in sector k as:

$$\hat{X}^k_{B,US} = \xi^k_B X_{B,US}. \tag{A.4}$$

With the currently collected data, 31.1% of country pair-industry observations derive directly from data at the country-industry level, while we resort to approximations for the rest of the dataset. Notice that the completion of the data collection will increase the share of direct observations.

B Other Figures

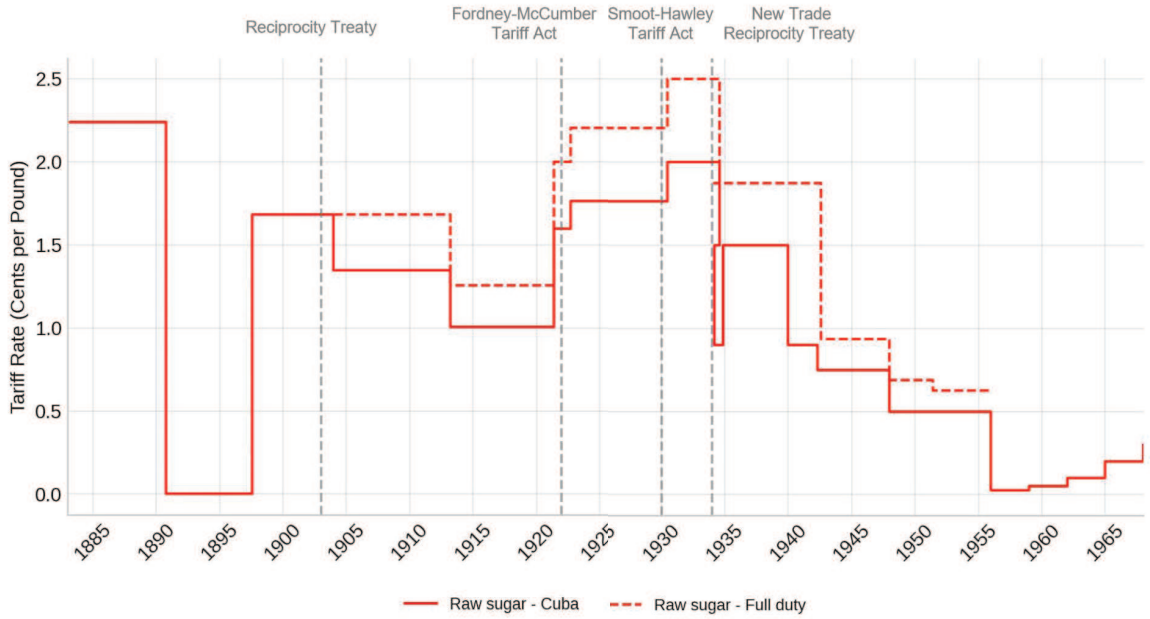

Figure B.1: US-imposed tariffs on raw sugar.
Source: Ballinger (1975).

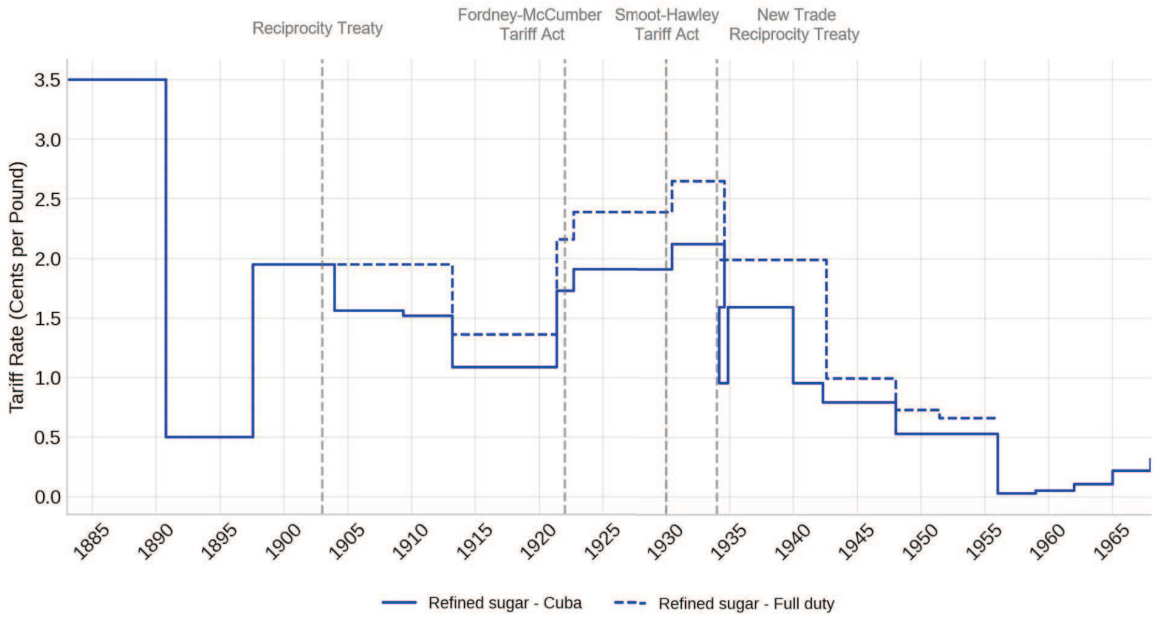

Figure B.2: US-imposed tariffs on refined sugar.
Source: Ballinger (1975).

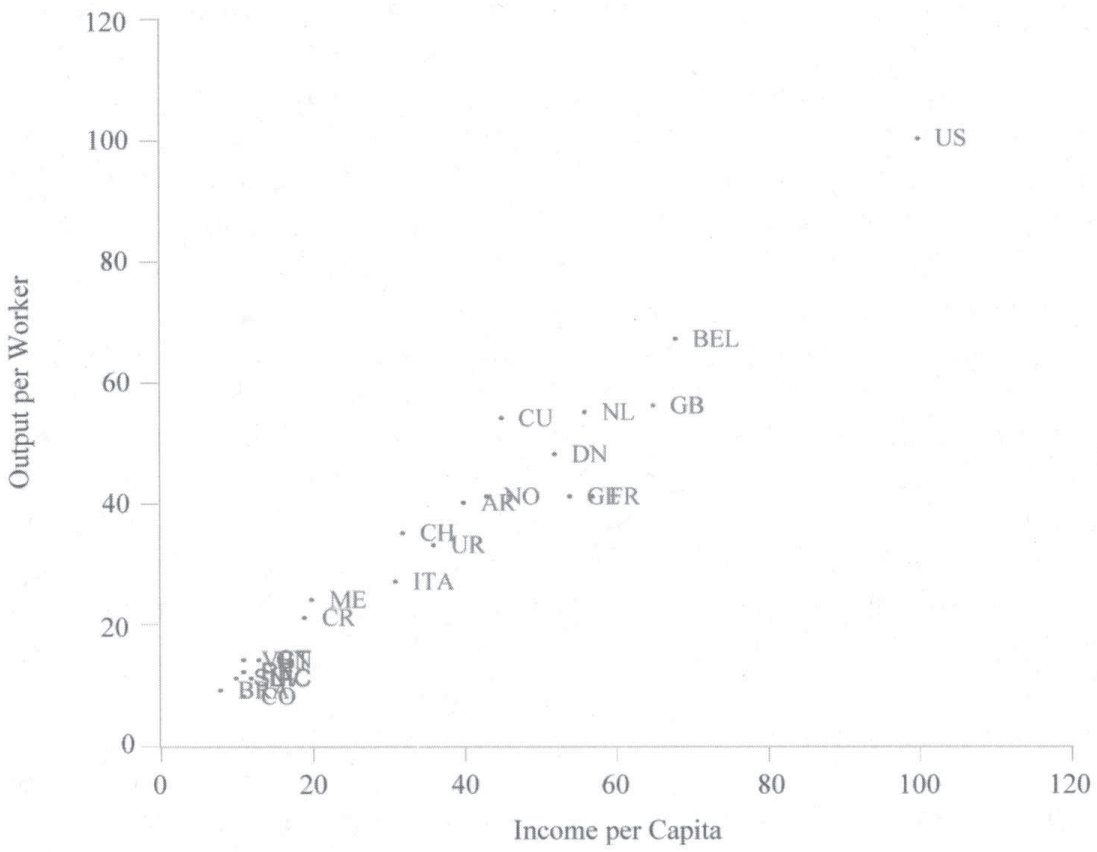

Figure B.3: Comparison of income per capita across countries, 1925. (US=100).
Source: Ward and Devereux (2012).

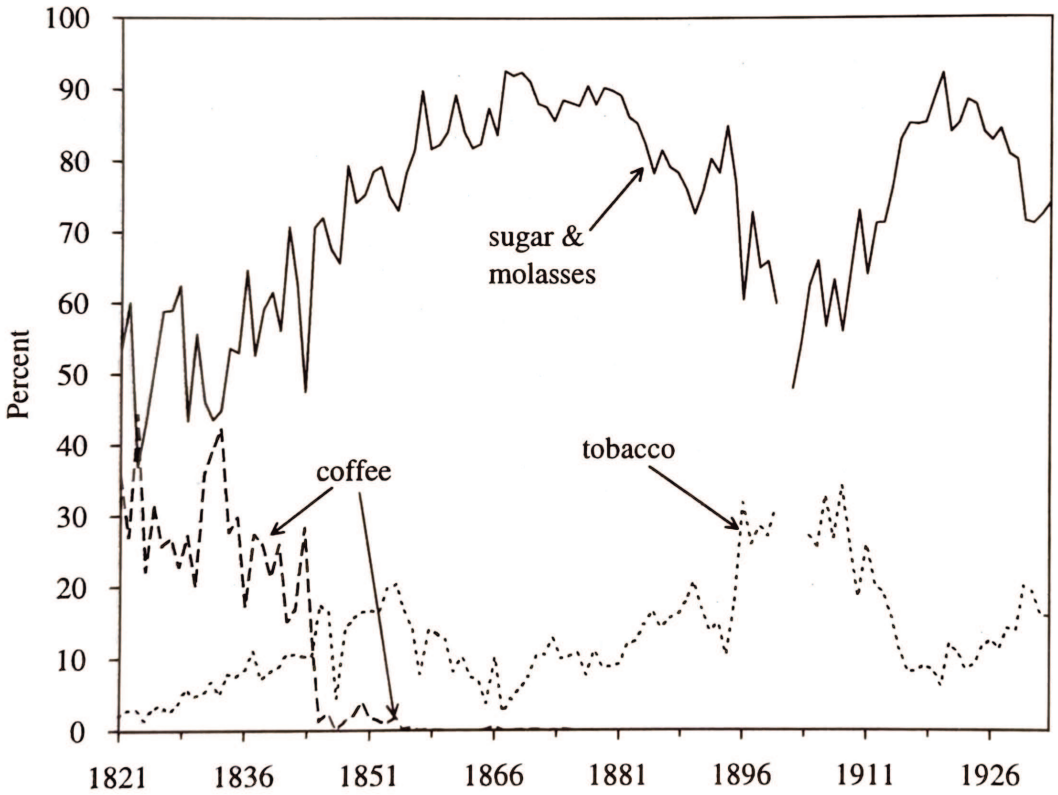

Fig. 2.3. Major Cuban exports as shares in total exports, 1821–1933. Source: Moreno Fraginals, *El ingenio*, 3: 88–89.

Figure B.4: Sectoral Composition of Cuba's exports, 1821-1933.
Source: Dye (1998), Fraginals (1978).

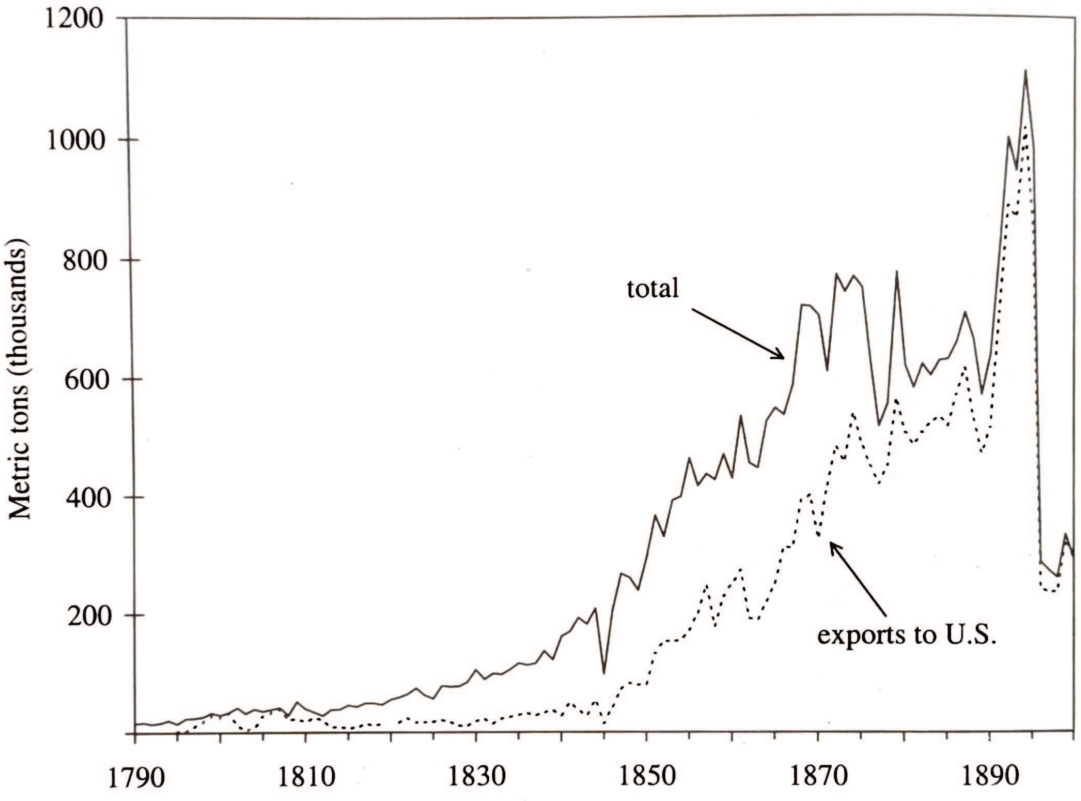

Fig. 2.1. Cuban sugar production, 1790–1900. Source: Moreno Fraginals, *El ingenio*, 3: 35–44.

Figure B.5: Cuba's exports, total and to the US, 1790-1900.
Source: Dye (1998), Fraginals (1978).

Figure B.6: The Production Technology of Sugar.
Source: `Sugar.org`.

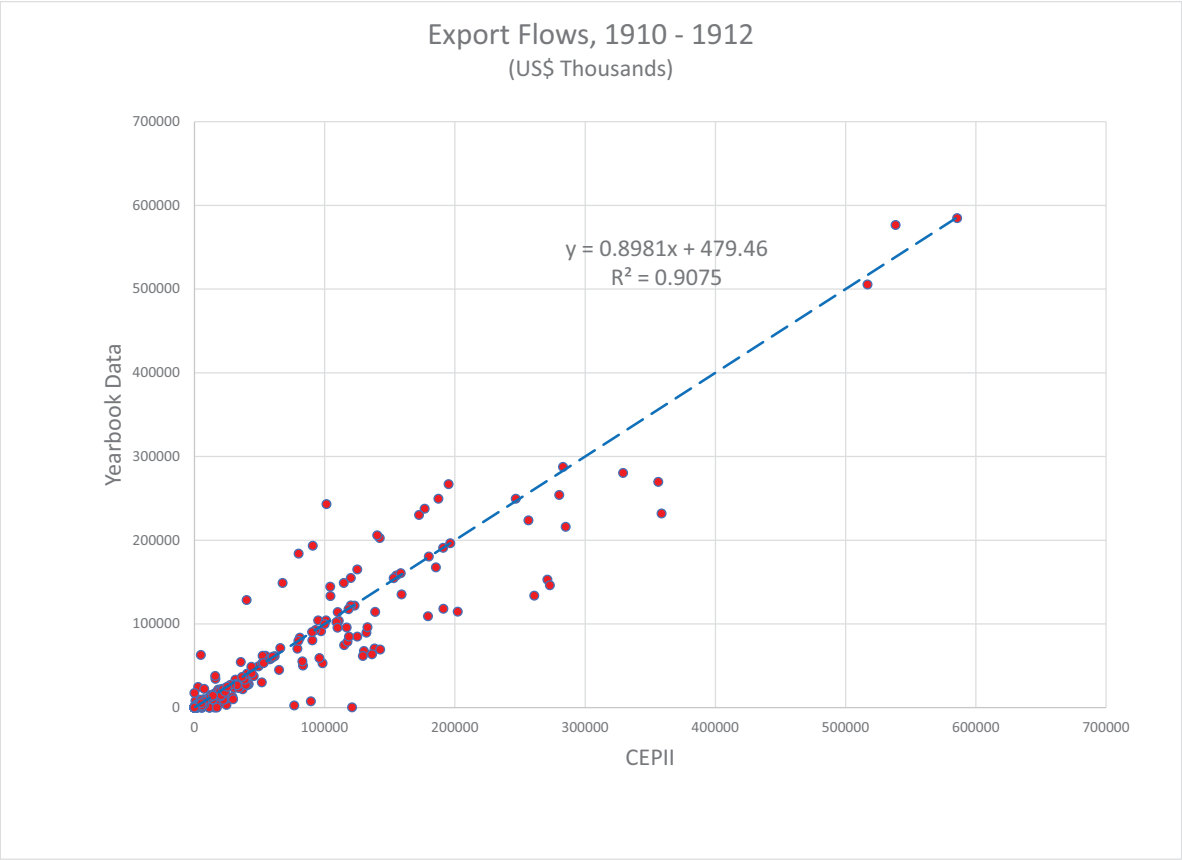

Figure B.7: Comparison with CEPII Data: Exports.

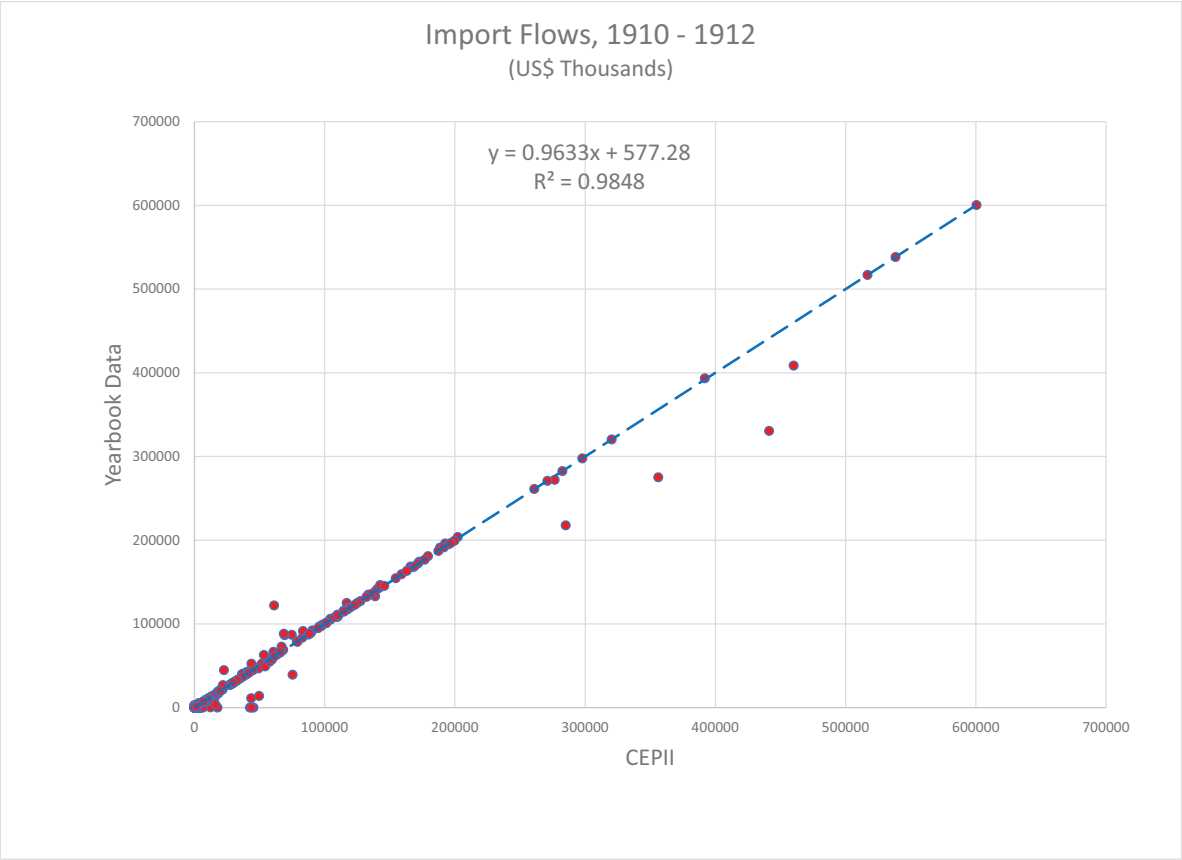

Figure B.8: Comparison with CEPII Data: Imports.

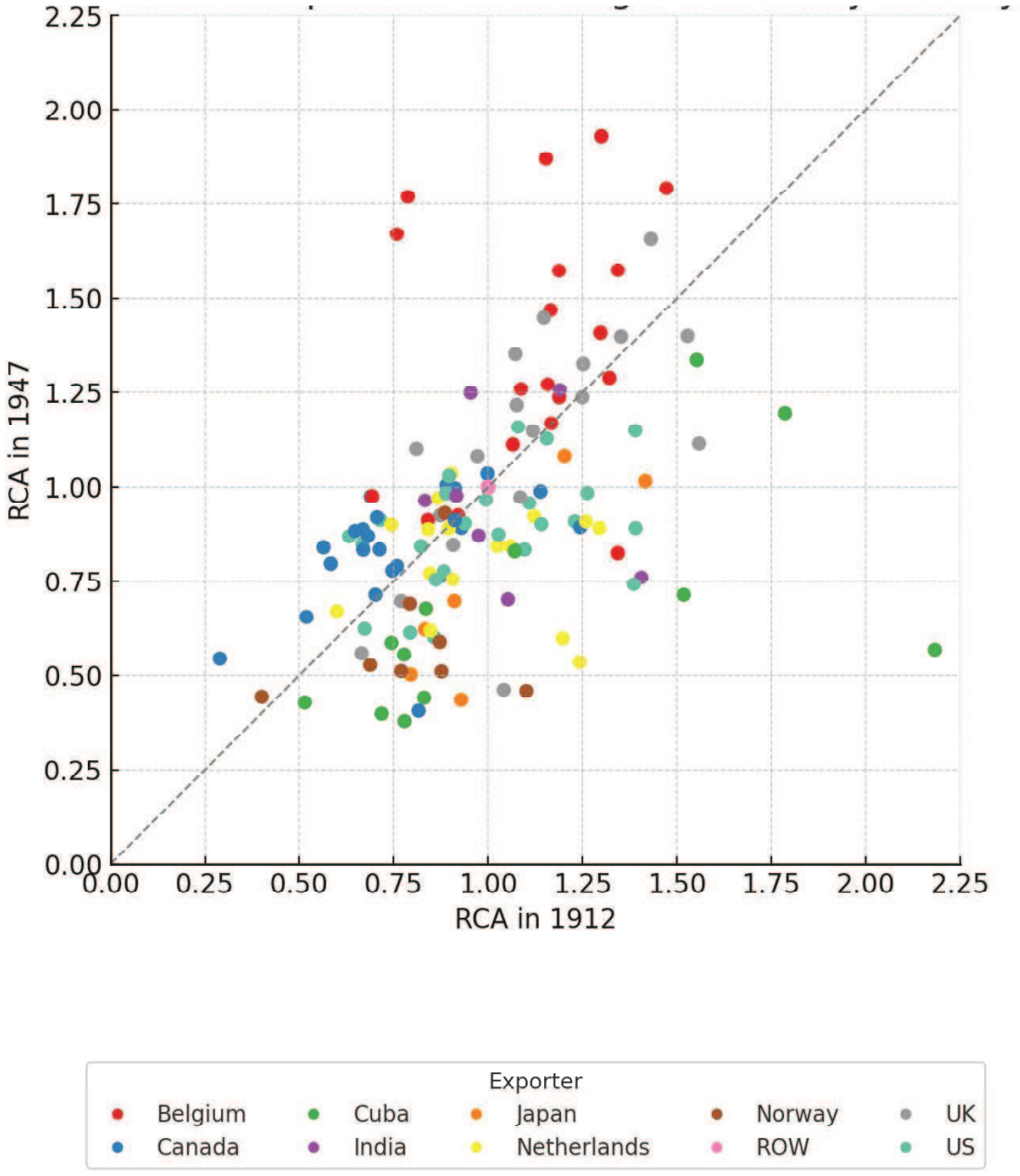

Figure B.9: Revealed Comparative Advantage across Countries, 1912 vs 1947.

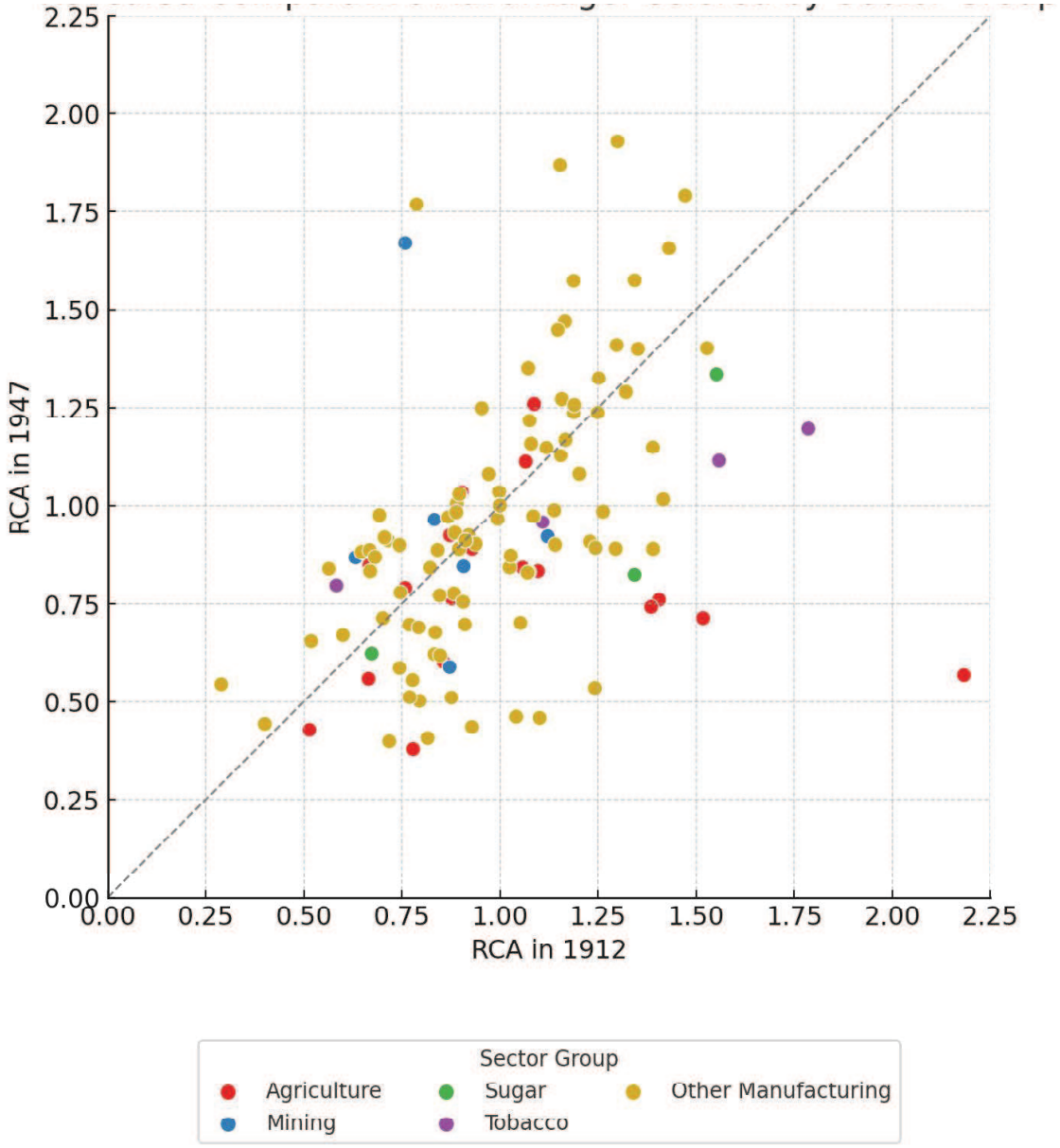

Figure B.10: Revealed Comparative Advantage across Industries, 1912 vs 1947.

	Balassa RCA Index		CDK RCA Estimate	
	1912	1947	1912	1947
1	0.11	0.17	0.81	0.39
2	0.00	0.01	0.50	0.45
8	1.74	0.22	2.16	0.54
9	2.62	0.15	1.61	0.53
10	1.30	2.74	1.02	
12		0.00		0.14
14	0.09	0.04	1.11	0.52
20	0.17	0.43	1.00	1.00
2061	67.56	43.48	2.74	2.81
2062	0.82	10.17	1.31	
2121	9.44	43.61	1.23	
2131	67.92	43.55		
2141	26.89	8.03	2.09	0.99
22		0.04		0.52
23	0.00	0.27		0.57
24	0.04	0.01	0.72	0.42
25	0.01	1.33	0.86	1.37
26		0.00		0.31
27		0.06		0.51
28	0.04	0.51	0.79	0.62
29		0.00		0.11
30		0.01		0.43
31	0.28	0.44	1.09	0.76
32		0.02		0.46
33		0.01		0.48
34		0.02		0.62
35		0.00		0.49
36		0.01		0.57
37		0.02		0.65
38		0.01		0.49
39	0.02	0.04	0.80	0.54
ROI	0.04	0.01	0.82	0.43

Table B.4: Revealed Comparative Advantage for the Cuban Economy Estimated following Balassa (1965)'s method versus Costinot et al. (2012)'s method.

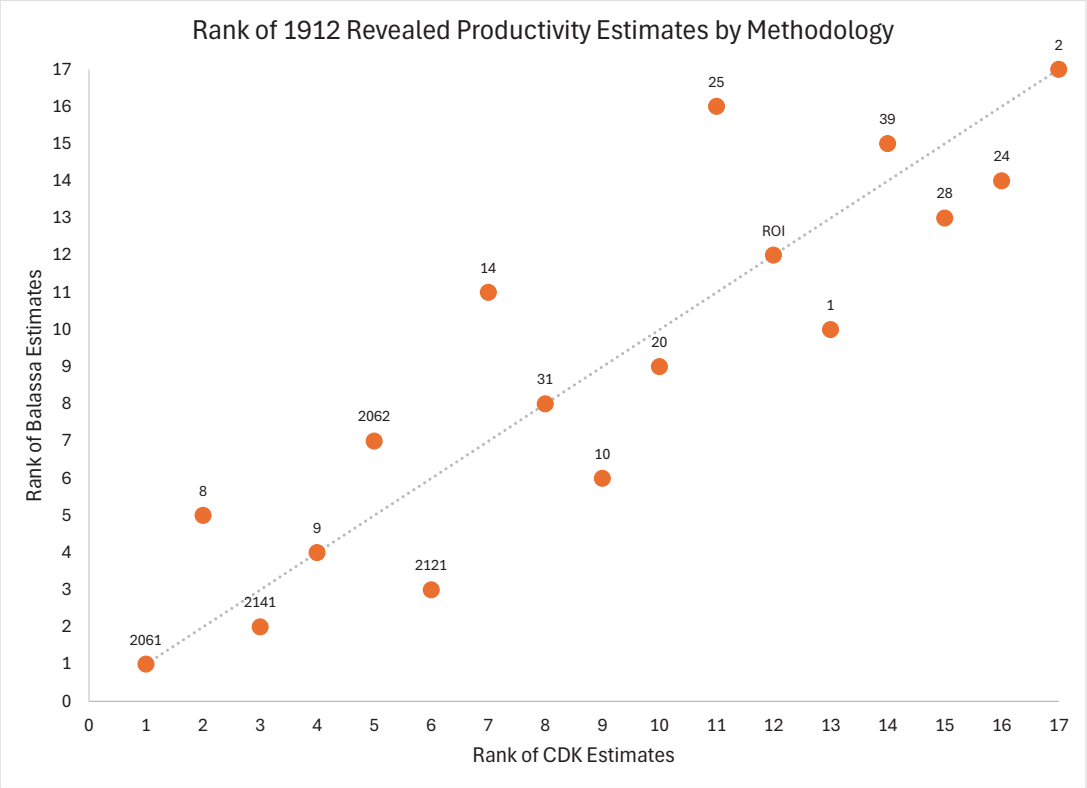

Figure B.11: Ranking of Revealed Comparative Advantage Estimates for the Cuban Economy. Balassa (1965)'s method versus Costinot et al. (2012)'s method.

C 1912-1962: Losses from "El Bloqueo"

In 1962, the United States took to the extremes the existing trade restrictions with Cuba, imposing a ban on all trade with the island, except for non-subsidized sale of foods and medicines, *de facto* beginning a fully-fledged embargo. To analyze the effects of the US trade embargo on Cuba, we analyze bilateral trade flows at the sector level from Comtrade.

The embargo changes radically the geography of Cuban exports. Figure C.12 shows Cuban exports by industry and by destination country for 1962, the year in which the United States interrupts all commercial relationships with Cuba. As the figure shows, in 1962, exports to the US account for only about 10% of total exports, while exports to Japan increase from a few percentage points to almost 25% of the total. Also industry-level specialization declines, with raw sugar manufacturing accounting for only 48% of total exports. The move away from the US to other export destinations is probably associated with the increase in the export share of refined sugar. While the US was refining the imported raw sugar domestically, other countries may have preferred to import the finished product.

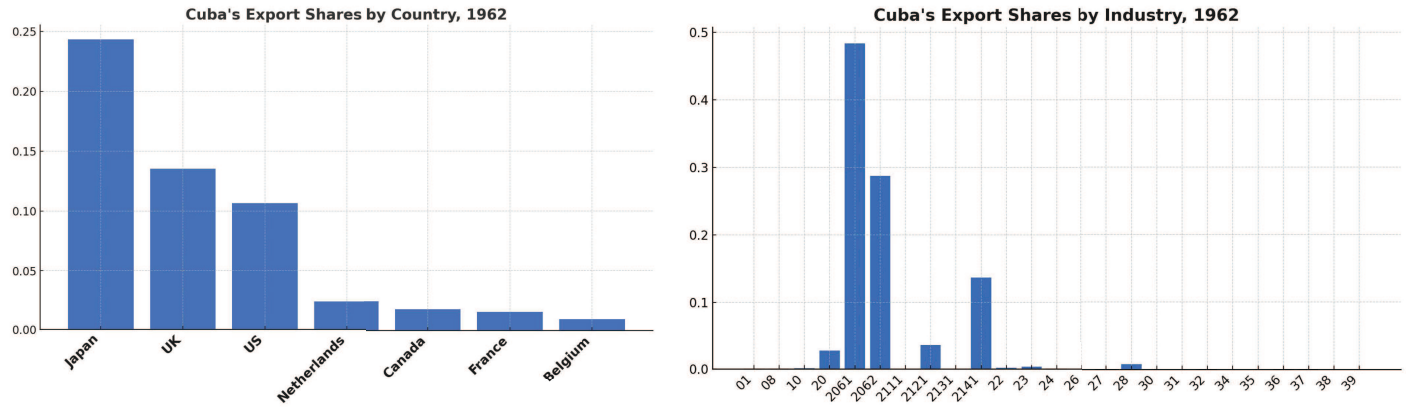

Figure C.12: Cuba's export shares, by country and industry. 1962.
Source: Comtrade.

With these data, similarly to the analysis in section5, we use the ACR formula to compute "realized" welfare losses. This exercise informs us on how far the consequences of the embargo were from a move to full autarky, and sheds light on the welfare effects of reallocations towards trading partners other than the US.

Table C.5 shows the results of a welfare calculation performed using equation (4). After the Embargo is implemented, realized welfare gains from trade are close to zero, indicating limited

	$\vartheta = 8.28$ EK	$\vartheta = 6.53$ CDK (baseline)	$\vartheta = 3.6$ BEJK
Devereux (2021)			
1912 vs autarky	12.11	15.10	25.70
1962 vs autarky	0.32	0.41	0.74

Table C.5: Welfare Gains from Trade for the Cuban economy, 1912 versus 1962. Gains expressed in percentages.

substitution of trade flows away from the US and towards other countries. De facto, the embargo is bringing Cuba to a situation of quasi-autarky.[2]

[2]The numbers in Table C.5 should be intepreted with caution, as the 1962 Comtrade data do not include the Soviet Union or China.