

The Tariff on Sugar

by

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Stillwater, Oklahoma

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AUTHOR'S ACKNOWLEDGMENTS

The object of this monograph is to determine the effectiveness of the tariff on sugar in increasing the price of sugar in the United States, and to measure the costs or benefits to the various groups of consumers and producers in this country. It seems necessary to precede the actual price analysis with a summary of the world sugar situation, together with an outline of the tariff policies pursued in this country with special reference to sugar. This is followed by a description of the sugar industry of continental United States and a brief explanation of the sugar markets.

It is the desire of the author to acknowledge his indebtedness to Dr. B. H. Hibbard, Head of the Department of Agricultural Economics, Dr. John R. Commons and Dr. Walter A. Morton, Department of Economics, University of Wisconsin, to Miss Jane Greverus and all other members of the staff of the Rawleigh Foundation for their constant counsel and many constructive suggestions while the book was being prepared; to Professor Clement E. Trout, Head of the Department of Publications, Oklahoma A. and M. College, and to Mr. Ben H. Thibodeaux, Assistant Agricultural Economist, United States Department of Agriculture, for reading the original manuscript and offering many constructive criticisms; to Dr. J. C. Muerman, School of Education, Oklahoma A. and M. College, for reading the section dealing with the Philippines and offering suggestions; to all those who have furnished statistical data used throughout the monograph; and to my wife, Mrs. Carleen E. Ellis, for assuming the task of proofreading the entire manuscript.

The author wishes especially to recognize the generosity and spirit of public service displayed by Mr. W. T. Rawleigh, Freeport, Illinois, who made this study possible.

Stillwater, Oklahoma
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Lippert S. Ellis

DIRECTOR'S PREFACE

The subject of the agricultural tariff schedule is one of unusual interest at the present time and is certain to continue to demand attention in the near future. During recent years an attempt has been made to ease the farmer's difficult position by providing "tariff equality for agriculture" through an increase in the duties levied on a number of agricultural products while instituting or maintaining relatively higher duties on most industrial products. The success of this policy as a means of farm relief is now a question concerning which there is a wide difference of opinion.

There has been an abundance of abstract theorizing about the effectiveness of this program of farm relief and a great deal of statistical and other evidence has been submitted by interested parties for the purpose of bolstering partisan claims or advancing private interests, but there has been too little dispassionate analysis of the concrete effects of particular agricultural duties. Because of the cloud of propaganda which befalls this issue, the public is left largely in the dark with respect to the actual effects of these duties.

Dr. Ellis has sought to disclose the facts and thus to clarify the situation with regard to sugar. In doing this he has attempted to treat the following topics: (1) The past, present, and probable future status of the sugar industry. (2) The relationship of the sugar duty to each of these three phases of the industry. (3) Is the sugar problem a domestic, regional or world problem? (4) Does the duty raise the price of sugar and, if so, how much? (5) Who is benefitted and who is burdened by this price increase? (6) How do the benefits secured compare with the burdens imposed? (7) What public policy is indicated by the effects of the sugar duty? His findings and conclusions are interesting and impressive. It is hoped that they may offer some practical aid to those interested in solving the current farm problem.

Mr. W. T. Rawleigh's interest in public service and his generosity in financing the research and publishing the results have made this study possible. Much credit is also due the Advisory Committee, Dr. John R. Commons, Dr. B. H. Hibbard, and Dr. Walter A. Morton, as well as the many friends and cooperating institutions that have given aid and advice, both to the author and to the Foundation.

Haldor R. Mohat,
Director

TABLE OF CONTENTS

	Page
The Rawleigh Foundation	3
Author's Acknowledgments	4
Director's Preface	5
Table of Contents	7-8
List of Tables	9-10-11-12
List of Charts	12
Editors' Introduction	13-22

CHAPTER I

The World Sugar Situation

	Page		Page
World Production and Consumption	23-27	Possible Expansion of Production	29
Growth in World Production	23	Influence of Protective Measures	32
Consumption Increasing Steadily	25	The World Movement of Sugar	34
Trend in Cane- and Beet-Sugar Production	27-34	The Trend of Prices and the Sugar Crisis	36
Brussels Convention, a Stimulus to Cane Industry	28	Possible Remedies	38-42
Effect of World War on Production	29	Cuban Efforts at Control	38
		Increasing Consumption	40
		Reduction of Tariffs	41
		Summary	42

CHAPTER II

Sugar and the United States Tariff Policy

The Tariff	44-48	Labor Situation	56
Direct Bounty on Sugar	46	Possibility of Increased Production	57
Duties from 1897 to 1930	47	Porto Rico	59-61
Our Insular Policies	48-73	Production and Exports to the United States	59
Hawaiian Islands	49	Expansion of Area Unlikely	60
Production and Exports to the United States	50	Virgin Islands	61-62
Conditions Affecting the Production of Sugar	51	Cuba	62-72
The Labor Problem	52	Tariff Concessions Granted Cuba	64
Integrated Nature of the Industry	52	Cuban Exports to the United States	64
Expansion of Area Unlikely	53	Cuban Producers	66
Philippine Islands	53-59	Cuba Benefits Little by Preferential Duty	68
Production and Exports to the United States	54	Production Conditions in Cuba	70
Conditions in the Islands	56	Summary	72

CHAPTER III

The Sugar Industry of Continental United States

Diverse Interests Represented in the Continental Sugar Industry	74	Conditions in Louisiana	77
The Sugar-Cane Industry	75-79	Possible Expansion in Texas and Florida	79

CHAPTER III, (Continued)

	Page		Page
The Sugar-Beet Industry	80-96	Organization of the Industry	92
Area of Production	81	Sugar-Beet Prices and the Tariff	
Climatic Advantages of Western States	81	Act of 1930	93
Freight Protection	84	More Than Higher Tariff Necessary	94
Size of Western Market Important	86	Seasonal Character of the Industry	94
Crop Competition	88	Outlook for Sugar-Beet Production	96
The Labor Situation	91	Summary	97

CHAPTER IV

The Sugar Market

Sugar Refining	98	The Cuban Market	108
New York City, the Dominant Sugar Market in the United States	99	The London Market	108
Price Quotations	99	Factors Influencing Prices	111
		Summary	114

CHAPTER V

The Effect of the Sugar Duty on Prices

Methods of Measuring the Effect of a Duty on Price	117-121	Cuban Exporters Ordinarily Sell for Same Price in New York and London Markets	127
Propaganda or the Before-and-After Method	117	Influence of the Single Seller	128
Equilibrium Method	118	The Cuban Price and the Tariff	128
Price Differential Method	119	Influence of Tariff on Domestic Prices	130-142
New York and London Prices	121-125	Refiners' Margin	134
New York and Cuban Prices	126-130	Refined Sugar for Export	139
Total World Supply Focused on London Market	126	Conclusions as to the Effect of the Sugar Duty on Prices	142-145
		Summary	145

CHAPTER VI

Costs and Benefits of the Sugar Duty

Sugar Consumption in the United States	146-148	Benefits to United States Producers	154
Total Cost of Sugar Duty	148-153	Net Benefits to Farmers of the United States	155
Distribution of Total Costs Between Urban and Rural Population	153	Revenue Aspects of the Sugar Duty	158-159
Beneficiaries of the Sugar Duty	153-157	Summary	160

APPENDICES

Appendix A. Methods of Tariff Investigation	161-173	Appendix C. The Chadbourne Plan	176-182
Appendix B. The Cooperative Sugar Export Agency, Inc., of Cuba	174-175	Appendix D. Distribution of Sugar Among Various Classes of Consumers	183-184
		Index	185

LIST OF TABLES

Table	Page
1. Sugar Crops of the World, 1904-1932	26
2. Sugar Crops of the Chief Producing Areas of the World, 1903-04 to 1931-32	30
3. Import Duties on Raw and Refined Sugar in Countries Pro- ducing Beet Sugar	31
4. Import Duties on Raw and Refined Sugar in Countries Pro- ducing Cane Sugar	33
5. Exports of Refined Sugar from the United States, 1910- 1930	36
6. Average Annual Price of Raw Cuban Sugar, c. & f., New York and c. i. f., London, 1921-1930	37
7. Per Capita Consumption of Sugar in Various Countries for the Year 1927-28	40
8. Average Annual Sugar Consumption and Imports of the United States, 1822-1900	45
9. Total Customs Duties and Sugar Duties Collected in the United States, 1893-1931	46
10. Payments Made from the Treasury of the United States to Sugar Producers under the Bounty Law of 1891	47
11. Rates of Duty on Sugar in Tariff Acts of the United States, 1897-1930	48
12. Production and Exports of Hawaiian Sugar to the United States, 1900-1931	50
13. Production and Exports of Philippine Sugar to the United States, 1900-1931	55
14. Production and Exports of Porto Rican Sugar to the United States, 1900-1931	60
15. Acreage, Production, and Exports of Virgin Island Sugar, 1912-1931	62

Table	Page
16. Sugar Consumption in the United States and Importations from Cuba, 1900-1931	63
17. Sugar Consumption in the United States and Importations from Countries Paying Full Duty, 1900-1931	63
18. Production and Exports of Raw Cuban Sugar, 1900-1931	65
19. United States Consumption of Continental Cane and Beet Sugar, 1900-1931	69
20. Acres of Cane for Sugar and Sugar Factories in Louisiana, 1911-1930	78
21. Progress of the Beet-Sugar Industry in the United States, 1888-89 to 1931-32	80
22. Sugar-Beet Acreage Harvested, by States, 1923-1930	82
23. Beet Factories, Acreage of Beets, and Production of Beet Sugar, by States, 1929-30	83
24. Weighted Average Costs of Production and Returns to Growers from the Sale of Sugar Beets, 1921-1923	83
25. Freight Rates on Sugar, January 1, 1932	85
26. Sugar Handled by the Federal Barge Line on the Mississippi River, 1918-1931	86
27. Distribution of Sugar Consumption, 1918, and Percentage Distribution of Population, 1920, by States	89
28. Harvesting Periods in Various Sugar-Producing Countries of the World	95
29. Monthly Price of Raw Sugar in Public Warehouses, (Cuba promedios) Cuba, 1912-1931	103
30. Monthly Price of Raw Cuban Sugar, c. & f., New York, 1912-1931	104
31. Monthly Price of 96° Centrifugal Sugar, Duty Paid, New York, 1905-1930	105
32. Monthly Wholesale Price of Granulated Sugar, New York, 1905-1930	106
33. Monthly Retail Price of Granulated Sugar, New York, 1910-1930	107

Table	Page
34. Differential Between the Prices of Raw Cuban Sugar, c. i. f., London, and c. & f., New York, 1922-1931	109
35. Imports of Raw Sugar into the United Kingdom	110
36. Differential Between the Prices of Raw Cuban Sugar, Duty Paid, New York, and c. i. f., London, 1922-1931	122
37. Freight Rates on Sugar from the North Coast of Cuba to New York or Philadelphia, 1921-1931	123
38. Freight Rates on Sugar from the North Coast of Cuba to the United Kingdom, 1921-1931	124
39. Differential Between the Prices of Raw Cuban Sugar, Duty Paid, and c. & f., New York, 1912-1931	131
40. Differential Between the Prices of Raw Sugar, Duty Paid, and Refined Sugar, New York, 1922	136
41. Differential Between the Prices of Granulated Sugar, Wholesale, and Raw Sugar, Duty Paid, New York, 1921-1930	138
42. Differential Between the Yearly Average Prices of Raw and Refined Sugar, New York, 1915 to 1931	139
43. Comparison of Domestic and Export Prices for Refined Sugar, New York, 1922	141
44. Differential Between the Wholesale Prices of Granulated Sugar for Domestic Use and for Export, New York, 1927-1930	143
45. Sugar Consumption in the United States, 1910-1931	147
46. Source of the Sugar Supply of the United States, Average 1922-1929, and 1929	148
47. Relative Importance of the Sources of Supply of Sugar Consumed in the United States, 1917-1930	149
48. Distribution of the Average Annual Benefits of the Sugar Duty, 1922-1929	151
49. Distribution of the Benefits of the Sugar Duty, 1929	151
50. Distribution of the Benefits of the Sugar Duty, 1930	152

Table	Page
51. Total Population and Farm Population of the United States, 1922-1930	154
52. Number of Farms in the United States Reporting Specified Crops and Classes of Livestock, 1925	156
53. Estimated Annual Average Cash Income from Farm Production in the United States, 1926-1928	157
A. Average Annual Sugar Crop of the World, 1925-26 to 1929-30	178
B. Exports of Sugar Allowed Under the Chadbourne Agreement	179
C. Exports of Sugar from the Countries Participating in the Chadbourne Agreement, 1925-1930	181

LIST OF FIGURES

Figure	Page
1. The Sugar-Producing Areas of the World	24
2. Sugar Crops of the World, 1904-1930	27
3. Chief Sugar-Producing Countries of the World, 1926-1930	28
4. The Movement of Sugar in International Trade	35
5. Distribution of Sugar Crops in the United States	76
6. Sugar Production in Continental United States, 1823-1930	76
7. Upbound Movement of Sugar on the Mississippi River	87
8. Sugar Prices in New York and Cuba, 1921-1930	102
9. Price of 96° Centrifugal Cuban Sugar, Duty Paid at New York City, and c. i. f., London, 1922-1930	120
10. Price of 96° Centrifugal Cuban Sugar in Cuba and at New York City, 1912-1930	129
11. Price of Raw and Refined Sugar at New York City, 1921-1930	137
12. Source of Sugar Consumed in Continental United States, Average 1922-1929	150

EDITORS' INTRODUCTION

At no time in its history has sugar been subject to greater tariff protection than now, yet the industry has never been in greater distress. While governments throughout the world have levied higher and higher duties, the price of sugar has gone lower and lower, until today virtually the entire industry is operating either without profit or at an actual loss. It has not always been so. Sugar has been called the prince-and-pauper industry, because the sugar cycle gives producers tremendous profits on the upswing and almost demolishes them on the downswing. This cycle does not coincide with the general economic cycle. In 1927, 1928, and 1929, when other industries were making large profits, sugar was already in trouble. Since then it has gone from bad to worse. Concerns operating in Cuba which at first passed common and preferred dividends have since defaulted on their bonds. These bonds are now selling as low as 2 or 3 cents on the dollar. Thanks to the American tariff, the Philippine, Porto Rican, and Hawaiian companies have been able to sell their sugar in the United States at about 2 cents per pound above the world price, and are consequently in better financial condition than the Cubans. It was recently estimated that an original investment of about \$800,000,000 in Cuban sugar securities is currently valued in the market at less than \$30,000,000, or about 4 per cent. The manufacturers of beet sugar within the United States are showing huge deficits, and plants are being abandoned.

The Sugar Crisis. The sugar crisis is neither local nor Cuban, but world-wide. It is due primarily to world overproduction. The consumption of sugar has expanded at a steady rate, and, unlike the consumption of other commodities the demand for which is dependent upon changes in style or the development of substitutes, is not subject to great fluctuations. In the United States normal consumption appears to be about 100 pounds per capita; in China it is only about 4 pounds per capita. This wide range does not indicate instability; consumption in each country is relatively stable at its own norm. While the depression has to some extent decreased consumption, the crisis is due primarily to no sudden change in the habit of the public, but to a rapid increase in production. This increase is due largely to increased efficiency, over-development, war, tariffs, and other institutional factors.

The cultivation of sugar cane has made notable advances. Experiment stations are maintained by governments, and by private industry, to conduct research in entomology, pathology, agriculture, forestry, technology, and chemistry, as they relate to sugar. Experiments are constantly being made to adapt the cane to soil, climate, or other factors affecting its development. In Java, for example, production of head sugar per acre had been increased about 50 per cent from 1919 to 1930, due chiefly to the introduction and use of a variety, P. O. J. 2878, better adapted to the needs of the region. Disease-resistant types have also been discovered. The technology of soil preparations has been improved, largely through the competition of the American and English manufacturers of sugar machinery. Nearly all the harvesting is still done in the old way, but the centrals have greatly increased their efficiency. New and better mills, crushers, centrifugals, and other machinery have been perfected by the manufacturers. All these things have tended to reduce costs and increase output throughout the world.

During the last decade all raw material industries have shown a tendency to overdevelopment. The enormous profits accruing from temporary high prices of sugar induced the cultivation of new land areas and the use of additional capital. A further cause was the inability to diversify, which has resulted in production unresponsive to changes in price.

The World War brought a slump in the production of beet sugar in continental Europe. In 1913 Europe produced a total of about 8 million long tons (7,967,969 in 1913-14). By 1919 it had dropped to 2½ million long tons (2,604,341 for 1919-20), and then gradually crept up again to 8 million in 1929. During the same period Cuba and other regions increased production, although not enough to make up for the decline in Europe. The return of peace brought European beet production back to normal and accelerated Asian and American production, thereby precipitating overproduction and the world sugar crisis.

The Futility of Tariff Relief. The sugar industry is one in which the *laissez-faire* philosophy of the nineteenth century has not been taken seriously even by those governments which profess to pursue it in other respects. A recent report estimates that about three-fourths of the world's sugar total is sold in markets where it enjoys preference by tariff or other governmental action. More than 100 countries have set up systems of taxes, duties, excises, and bounties, all calculated to help producers within and penalize those without the national boundaries.

And to what avail? Our high tariff, now equivalent to about 200 per cent ad valorem, was designed to aid the domestic industry, and it has done so. But how? It has maintained the domestic price above the world price, but it has not kept the world price from declining to ever lower levels. Hence the total duty-paid domestic price is not enough to prevent heavy losses to a considerable portion of the domestic industry.

The sugar tariff is an excellent example of the manner in which tariffs can thwart and obstruct international commerce, divert industry from its natural course, twist the channels of trade into tortuous and unwholesome paths, and introduce confusion and uncertainty into international trade to the benefit of no one—not even those for whose protection they are levied. It has stimulated overproduction, encouraged high-cost producers behind its protective wall, made possible long hauls to unnatural markets, and penalized efficient producers on our own shores; but it has brought neither stability nor profit to the sugar industry.

Instead of permitting a natural readjustment to demand after the war, local interests have demanded special protection and encouraged additional expansion. A considerable proportion of Philippine production, for instance, can be attributed to the American tariff. Politicians have been censured for providing tariff incentive to this expansion, but the blame must rest directly upon the business man. He has demanded protection for local interests regardless of its effects upon consumers, international trade, or the health of industry as a whole. He has castigated his competitors, and by legislation has sought to destroy them. But by these efforts he has destroyed himself, a victim of his own myopia, which he mistook for statesmanship.

Producers and Consumers. The United States sugar tariff gives rise to a conflict of interests between consumers and protected producers, and between the protected American and the Cuban producers. The three groups of producers immediately concerned with the American tariff are the continental producers of cane and beet sugar, the American island producers, and the Cubans. Those who may possibly bear the tariff are the sugar refiners, the processors, and the ultimate consumers.

Since each of these groups regards only its own immediate interests, it generally fails to see that the price of sugar is not a purely local, but a world problem. The movement of prices and profits during the last decade ought to prove beyond reasonable doubt that

tariffs alone are not enough to maintain either one. If the producers in the industry were willing to face the fact that their immediate problem is world overproduction, they would cease attempting to injure one another for what is at best a specious benefit.

The continental United States and island producers who seek tariff protection generally argue that the tariff does not burden the consumer, but that they themselves are being injured by Cuban competition. The Cubans, on the other hand, contend that they are being discriminated against in American markets, and that the low prices they are receiving for sugar are due to the American tariff. Each group believes that it will be benefitted by limiting Philippine imports. As will be seen below, the island cane and continental beet producers receive a differential above the world price of sugar, which is determined not alone by Cuban, but by world production. On the other hand, the Cubans would not receive any substantial advantage merely from the repeal of the American tariff, since they would still be obliged to sell their sugar in competition with Java and others in the world market at world market prices. Should the United States duty be repealed, the domestic and island producers would also be paid the world market price, and the consumers would benefit.

The United States and the World Price. Professor Lippert S. Ellis in this monograph has set forth in considerable detail the mechanism of the sugar market and the interrelationship existing between New York, Cuban, and London markets. He has shown how the New York price is contingent not upon local production and consumption, but upon international supply and demand factors. Unfortunately the problem of the sugar industry has ordinarily been looked at in too narrow a setting. It has generally been believed that the American tariff presents a conflict of interests between United States and Cuban producers. But when viewed in the frame of world production and consumption it is seen that a change in American tariff policy can be of only minor benefit to Cuba, and that so long as the world price of sugar remains low the American industry must remain unprofitable, unless the tariff is raised to heights now undreamed-of.

Only about one-half our consumption comes from areas within the United States tariff wall. The remainder comes from Cuba. Through this Cuban portion the price in the New York market and in every city, town, village, and hamlet in the United States is made dependent upon world conditions. The price received by producers within our tariff wall, even though it has the advantage of the tariff

differential, therefore, fluctuates with world conditions. For the price at which raw Cubans sell in New York determines the price paid the island and continental American producers. In turn, this price determines within narrow limits the price at which Cuba will sell in the London market, which fixes the price London will pay for Javanese sugar, and hence limits the price received by Brazil, Peru, and all other shippers to the London market. Due to competition among Javanese producers the net price received by Java in the London market determines the price received in the Indian and Chinese markets. International competition, therefore, makes conditions in Java and the interior of China or India directly influential on the price of sugar in the United States.¹

Professor Ellis has demonstrated what Thomas Chadbourne and others have recognized: that the American tariff cannot raise the world price of sugar, but rather tends to lower it by stimulating production behind tariff walls. He takes the position that under the conditions existing during the past decade, the American consumer has paid the full amount of the duty, and that practically none of it has been absorbed by Cuba. This view is not generally accepted by the sugar trade, which reasons somewhat as follows: "Cuba has lowered her price progressively until it is now below the cost of production. Consequently she is absorbing the duty." But did the Cuban price fall because of the American tariff, or of world overproduction? And what price would Cuba get for her sugar if the United States tariff were entirely removed? The answer is apparent. Cuba now receives the world price, which is low because of overproduction. If the American tariff were removed the New York price would be approximately on the world level. Cuba would have the alternatives of the London or New York markets at the world price. The United States and island producers would lose the 2-cent per pound tariff differential; the sources of supply in the various markets would be shifted; and only if the readjustment caused a decrease in world production or an increase in consumption would the price be raised. The American consumer, not the producers, would be the direct beneficiary of tariff reduction.²

¹ In this analysis it has been assumed that Cuban production and American demand are the "determining" factors. This is by no means true, but it is used merely for convenience in presenting the relation between markets. It is just as true to reverse the process of determination and to say that Java's sugar and Chinese consumption determine the Cuban selling price and the price paid by American consumers. Perhaps the proper, although complex and abstract, method of presenting the above argument is to construct an equation which shows all production and consumption as functionally related to each other in the price-making process.

² When the duty on sugar was repealed in 1890, Cuba continued to receive the world price in the American market just as she had while the American duty was in effect. But the Hawaiian planters "had now to accept for their sugar the price of the open market, like the planters of Cuba and Java and Brazil. The price of sugar went down sharply in the islands, it is said to have fallen in a single day after the passage of the tariff act from \$100 to \$60 a ton." Taussig, F. W., *Some Aspects of the Tariff Question*, Cambridge, Mass., 1915, p. 61.

The Protected Markets. The present tariff insures continental cane and beet, and Hawaiian, Philippine, and Porto Rican producers a price 2 cents per pound above the world level. When raw sugar sells as low as one cent per pound, this is an ad valorem duty of 200 per cent. Not all of these interests are prosperous. The production costs of the island producers vary with extensive and intensive cultivation, labor costs, size of plant, and other factors. Domestic sugar beet production costs are generally higher than those of the island producers. In recent years the latter have made profits when the continental United States producers were operating at a loss, but both continental and island producers have developed a high-cost production which could not survive except for the tariff.

While it is the legislative theory that the tariff should equalize costs of production, it is apparent that the demands of producers for protection have little to do with relative costs. In recent years the price of sugar has been below the cost of production. The domestic beet interests, nevertheless, argued in 1930 that Tariff Commission estimates of costs were unreliable, and that the market price was the best measure of Cuban, although not of their own costs. This sophistry was seriously advanced at the Congressional hearings, despite the obvious and well-known fact that world competition was forcing the Cuban industry to sell below cost, and that the Cubans were being forced into bankruptcy, because of these low prices. Only a few small producers were frank enough to admit that they wanted the government to guarantee them a higher price for sugar. The tariff demands of local interests are a function of price, and the adduction of data regarding costs of production is merely a conventional gesture to theory. When prices are below cost of production the domestic interests realize that the tariff does not insure a profitable price, and some of them have consequently asked for a tariff that would guarantee them a price of 6 cents a pound regardless of the world price. Hence a world price of one cent would require a duty of 5 cents, a world price of 2 cents a duty of 4 cents, a world price of 3 cents a duty of 3 cents, etc. Attempts were made to work out a sliding scale on this principle, but were abandoned as impractical. They were also criticised as "price-fixing." These efforts to maintain a definite domestic price, regardless of world fluctuations, show that the domestic producers now realize that the duty merely raises the domestic above the world price, and that if the world price is abnormally low the domestic industry may suffer even with a high tariff. On the other hand, no rate has the same effect on all pro-

ducers, since one which is high enough to protect high-cost firms will give an immense profit to those producing at low cost. A tariff high enough to enable the Michigan beet industry, for instance, to operate at a profit would give Hawaiian, Porto Rican, and Philippine producers enormous returns.

The effect of differing costs of production is best illustrated by the operating statements of domestic beet and island cane sugar producers. In the years when the beet producers lose money the island cane producers make substantial profits. Both receive approximately the same price for their sugar, so that the difference in net profits is wholly due to differences in costs.

The difference in profits and values which has been created almost wholly by the tariff can be noted by comparing the operating statements of Cuban companies with those of Porto Rico, Hawaii, and the Philippines. These will show that while the Cubans were going into bankruptcy, the island producers (with the aid of the 2-cent advantage given them by the tariff) even during the periods of low prices were making substantial profits, or at least breaking even. The higher profits received by island producers have brought more land into cultivation and raised the intensive margin of existing acreage. Prices paid for the better grades of land have increased. In Porto Rico, prior to the present depression, good cane land sold as high as \$500 per acre, a price greatly in excess of prime land in the best agricultural sections of the United States. But the result of the tariff is more striking when Porto Rican prices are compared with those prevailing in Cuba. There land of the same fertility and natural advantages, producing the same products for the same markets, sold at about 10 per cent of the Porto Rican price. The difference between \$50 and \$500 per acre can be explained only by the American tariff, the advantage of which has accrued primarily to landowners. Since, however, land values are now capitalized, the landlord may be a corporation, and the increment in land values can be found only in net profits. Recent history has illustrated the correctness of the original judgment of Professor Frank W. Taussig regarding the incidence of the American tariff. "So long as some fraction of the supply continues to be steadily taxed—so long as dutiable imports persist,—the whole is raised in price by the full amount of the tax or duty. The producer, domestic or foreign as the case may be, gets the benefit of the remission, not the consumer."³

The benefits accruing to the domestic beet and cane industry by virtue of the present duty are estimated by Professor Ellis as \$53,-

³ Taussig, F. W., *Some Aspects of the Tariff Question*, Cambridge, Mass., 1915, p. 60.

525,394 in 1930. Those accruing to the islands, in 1930, \$95,860,345, are divided as follows: Hawaii, \$32,236,918; Porto Rico \$31,199,160; the Philippines, \$32,181,930; and the Virgin Islands, \$242,337.

Cuba. Cuban producers are being ruined not by our tariff but by world competition. If the American tariff were removed, the American price would fall to the world level, and Cuban as well as all other producers would receive not the present elevated price, but the world price. Nevertheless, Cuba has a just grievance against world-wide tariff barriers which have been put up against her. These have tended to increase supply, and especially in the poorer countries to decrease consumer demand. This in turn has tended to depress the world price, a tendency which could not be overcome simply by a change in the American tariff. It is easy to create excess productive capacity by legislation, but not so easy to destroy that capacity in the same way. The American tariff contributes to but is responsible for only a small portion of world overproduction. The tariff and bounty-protected sugar, which 100 countries throw upon the world market, is helping to ruin it. But even if there had been no increase attributable to tariffs and bounties, the new supplies from Java and Cuba itself would still tend to depress world prices. Cuba's advantage in the American market consists of low freight charges, due to her proximity to our refineries. While, therefore, the remission of the American duty to all the world would not materially benefit Cuba, it would deal a telling blow to our continental beet and cane industry and to at least a portion of the industry in Hawaii, Porto Rico, and the Philippines. The Philippines probably could not compete in the American market at all, but would be obliged to sell their sugar in the Orient in direct competition with Java and India. Hawaii would have the choice of competing in the Orient or shipping to the United States. Porto Rico could probably continue to compete in the American market, but would be obliged to cultivate less intensively, or to cease using inferior lands. It cannot be said with any certainty just what changes would occur in the absolute price paid by the consumer, because the world price is abnormally low at the present time, and fails to cover the cost of production in even the most efficient mills. This situation cannot continue permanently, and over a period of years the world price of sugar will probably rise.

In view of these facts, the contention of the domestic industry that the tariff is being absorbed by Cuba is without foundation. To

say that the Cubans themselves "admit" that they are absorbing the duty does not prove that it is so. It must be shown that if the American tariff did not exist Cuba would be getting the present American duty-paid price rather than the world price. The Chadbourne Plan is a recognition of the fact that tariffs, while they have contributed to Cuba's injury, are not the sole cause of her distressed condition.

The Philippines. Such has been the misunderstanding of price relations between the various groups of producers that both the Cubans and the continental American interests have argued, fallaciously, that their condition would be considerably improved were Philippine sales in the American market restricted, or were those islands made independent and their sugar subjected to the duty. They do not seem to realize that in such a case Cuban sugar which now competes in London and, therefore, indirectly with Java and India in the Oriental markets, would be diverted to the closer American market. But the Philippine sugar now coming to the American market would then go to the Orient to take the place of the Cuban sugar. Our continental beet producers can derive little benefit from a restriction of Philippine production, so long as Cuba is still producing sugar for sale in the world market. Of course, if the diversion of Philippine sugar to the world market should compel a curtailment of Philippine production, it would to that extent tend to raise the world price. But even a 50 per cent decrease in Philippine production would decrease world production by only about one per cent, assuming that no other country increased its production to take the Philippine markets. It is, therefore, manifestly absurd for the domestic beet industry to contend that a mere decrease of Philippine production would appreciably affect the domestic price. The American tariff gives the American industry a 2-cent differential above the world price. That differential can neither be increased nor decreased by regulation of Philippine production. If that production is restricted and Cuban imports consequently increase, the price to the consumer will remain approximately the same; but the contribution of the consumer will be paid to the Treasury of the United States instead of to the Philippine producers. This would, of course, be of no benefit to the domestic industry. The desire for restriction of Philippine production has arisen from an entirely false conception of the competitive problem. Nothing short of a correction of world overproduction can remedy the low price now received by both interests. A mere curtailment of Philippine imports would be futile. It would help the United States Treasury to the extent that it injures

the Philippines, but would benefit neither Cuba nor the domestic industry except by the resulting curtailment of world supplies.

The Consumer. The American purchaser of sugar must pay the world price plus the duty. If the duty were abolished the consumer would pay the world price. Would this price be higher or lower than the present world price? The answer to this question is not simple; it requires a prediction of future production and demand. A removal of the American duty would probably decrease the domestic price by a like amount, and both immediately and in the long run give the consumer cheaper sugar. Present world prices are so low that they will probably rise eventually regardless of tariff action. A remission of the duty would probably force into bankruptcy those domestic and island producers who are surviving only by virtue of the tariff. This would decrease world supplies, and tend to raise the price slightly above present levels. The long run effect of the duty is to encourage high-cost production, which tends to maintain the price at a level higher than it would otherwise be, although during the past 10 years this production has also contributed to weakness in sugar prices. The actual cost of the tariff to consumers is, probably, slightly less than the full amount of the duty.

This cost may not be paid wholly by the ultimate consumer. It may be partially absorbed by the manufacturer and processor. The annual burden of the present tariff to the nation is estimated by Professor Ellis as \$268,434,133, which is a maximum figure. About 50 per cent of this goes to the domestic sugar beet and the island cane interests, as explained above, and the balance goes into the United States Treasury. Farmers as a class are losers by the sugar duty, and the gain of beet farmers is probably small in view of their alternative opportunities to produce other crops at substantially the same profit. Since, however, the industry has been built around the tariff, it is doubtful that the duty will be removed, no matter how greatly it burdens the nation. It has often been shown that a bounty to domestic beet raisers would be a cheaper and more efficacious aid to them, but it is opposed because of its high visibility, and its cost to the Treasury, which makes it dependent upon public opinion. A tariff, on the other hand, is collected from the consumer, who does not know that he is paying a tax.⁴

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January 1, 1933

⁴ Mr. Morton's description of the methods of investigation, primarily of interest to economists and statisticians, is in the Appendix A, page 161.

Appendix A

METHODS OF TARIFF INVESTIGATION

THE conclusions of Professor Ellis regarding the effect of the sugar tariff are substantially in accord with those of such other students of the subject as Professor F. W. Taussig,¹ Dr. Philip G. Wright,² and Professor Henry Schultz.³ The approach and emphasis of each author is different, but it is significant that all of them agree in substance with the conclusions reached by Professor Taussig more than 15 years ago. Although their individual estimates of benefits and burdens cannot be established with mathematical precision, the differences are of no moment for matters of policy.

Effects of the Duty on Normal Costs. Professor Taussig's work combines economic theory with observation. His chief conclusions are derived from an analysis of the effect of the duty upon production, the extensive and intensive margins of cultivation, and the cost of production. They are premised upon the theory that the duty tends to increase normal cost and price. It is shown that the tariff has increased the normal cost of production above what it would otherwise be, and has consequently burdened the consumer by approximately the full amount of the duty, with benefits to domestic and island producers and the Treasury of the United States. Professor Taussig's analysis is the only type which can deal with long run effects.

The first study of Dr. Philip G. Wright⁴ was made in an attempt to answer the question, "What would be a fair rate of duty to be levied on sugar?" The analysis was made on the basis of the current doctrine that a fair duty would enable present industry to survive on the basis of comparative costs of production.⁵ This necessitated a study of the effects of the duty on costs of production and price. After the original work of Taussig the United States Tariff Commission studied the cost of producing sugar in the United States, Cuba, and the islands. Dr. Wright utilized this material in estimating a rate which would "equalize costs of production."

Like Taussig, Wright worked on the theory that (1) the normal tendency of the tariff was to increase the normal marginal cost of production, (2) that normal cost of production equalled normal

¹ Taussig, F. W., *Some Aspects of the Tariff Question*, Cambridge, Mass., 1931.

² Wright, Philip G., *Sugar in Relation to the Tariff*, New York, 1924, and *Protection Benefits and Burdens*, Freeport, Illinois., 1930.

³ Schultz, Henry, *Statistical Laws of Demand and Supply*, Chicago, 1928, and *The Meaning of Statistical Demand Curves*, Chicago.

⁴ The second study, *Protection, Its Benefits and Burdens*, is based upon Schultz's method, discussed below.

⁵ In making this study Dr. Wright, of course, did not necessarily personally subscribe to this theory of tariff-making. For a statement of his attitude, see *Tariff Making by Commission*, Freeport, Illinois, 1930.

price, and (3) hence the duty normally increased the price. He attempted to prove this as far as possible by concrete statistical data regarding prices and costs of production.

Statistical proof of these assumptions requires: (1) an independent series to measure normal cost; (2) an independent series to measure normal price; (3) a comparison of these two series to ascertain whether normal costs equal normal price; (4) a measurement of other factors, such as efficiency, affecting costs of production; and (5) conclusions regarding the net effect of the duty.

For the first series Dr. Wright used cost of production figures. For the second he used the trend of wholesale prices of sugar, inflated or deflated by the general price level. He had no precise measure of efficiency or other factors affecting costs. The costs available were, however, accounting and not truly marginal costs. Consequently, he was obliged to use the series of sugar prices as his best estimate of both costs and prices, and, with modifications allowing for efficiency, concluded that the tariff normally raised marginal costs and, therefore, prices.⁶ Since, however, higher prices curtailed demand, marginal costs were raised slightly less than the duty, and the added cost to the consumer was a little less than the tariff rate.

The Neo-Classical and Equilibrium Theories. The studies of Taussig and Wright follow in large measure the reasoning of the classical school of economics, which stresses the relation between cost of production and price. More recent works follow the equilibrium theory, the mathematics of which was developed by Cournot, Walras, and others, though the reasoning follows that of the Austrian and neo-classical schools. The Austrian school stressed demand, or marginal utility, as a price-making factor. The neo-classicists by the use of marginal analysis applied both to supply and demand have developed the equilibrium theory, which holds that price will balance at a point where the supply and demand are equal. This point is dependent upon the nature of the supply and demand schedules.

Mathematics or statistics can be used in connection with almost any method of tariff analysis, but the mathematical economists have relied almost wholly on neo-classical reasoning. Sometimes their assumptions cannot be reduced to language, but insofar as they deal with economic issues they are neo-classical and are subject to the same limitations. Some of the assumptions of the neo-classicists are: that the price system is a perfect regulator of production and consumption; that business cycles, unemployment, etc., are not deter-

⁶ In the words of Dr. Wright, "The point of this reasoning is that while in a dynamic system marginal cost and price may differ, there are, nevertheless, long run economic forces tending to draw them together, and hence the average price for a series of normal years may be taken as perhaps the best measure of the average marginal cost for those years." *Sugar in Relation to the Tariff*, p. 118. There is occasion for doubt as to the value of this method since it has the appearance of begging the question. However, Wright's conclusions are not wholly dependent upon it.

mining but merely "disturbing" factors; that there is perfect mobility of capital and labor; free competition; perfect knowledge of present and future markets; and a rational coordination of economic activity, so as to permit perfect adjustment at the margin.

The mathematical equilibrium method has been used by Schultz and others to measure the effects of the sugar duty. It seeks to measure quantitatively the effect of a duty on supply, demand, and price.⁷ After ascertaining the elasticities of supply and demand a formula is used to ascertain their effect on the exchange price. The mathematical school in effect really attempts to furnish concrete data to fill in the purely subjective supply and demand schedules of neo-classical theory. Those who use it claim that the mathematical law of supply and demand is broader than that of the neo-classical school, but for all essential purposes the use made of the statistical method in the study of sugar shows the mathematical equilibrium method to be practically analogous to the reasoning of the neo-classicists.

Evaluating Disturbing Factors. Neo-classical economists generally assume that the long run supply curve is the normal cost curve, and the demand curve is the utility curve. Only the supply curve is determinable empirically, and then only in such cases as marginal costs are known. Two independent time series would be necessary to derive these data. Since such series would reflect conditions other than changes in quantity due to changes in price, it would be necessary to value or weigh those "other" factors to ascertain the changes in quantity due to (not merely coincident with) changes in price. Consequently, even if two good independent series of data were available showing quantity and cost and demand and price, it would still be imperative to ascertain to what extent each series was affected by "disturbing" factors. To derive supply and demand curves it would be necessary to eliminate the influence on supply and demand of all factors other than price, such as the price level, changes in population and consumption habits, the use of substitutes, patriotic self-denial, changes in national income, employment, efficiency, as well as all of the other phenomena usually embodied in the business cycle. The method of eliminating these by the use of trends or trend ratios is adequate only on the assumption that they are not the determining, but merely "disturbing" factors. But recent studies of the business cycle, the effect of inflation, war, and other disturbing factors show that in some cases these may be the major determinants of subsequent prices, since they create conditions such that supply and demand are for some time not at all responsive to price

⁷ The assumptions and mathematics of this method were first elaborated by Pigou, A. C., in *Protective and Preferential Import Duties*, London, 1906, and subsequently by Schultz, Wright, and others.

changes. To "eliminate" them by the use of "trends" and to hold that the residuals express a response to price alone is an act of faith which can be justified only if the results are so obviously reasonable that they permit of no other likely interpretation.

The Cost and Supply Curves. The difficulty of weighting the disturbing factors is exceedingly great, but the derivation of supply and demand curves becomes well-nigh impossible when independent series of data are not available at all. The independent series for supply must consist of a cost curve derived from cost data. But, as Wright found, these data were unsatisfactory. Subsequently Schultz attempted to derive both supply and demand curves from the same set of data. In *Statistical Laws of Demand and Supply*, pp. 209-210, Dr. Schultz objects to the accounting cost curve, not because it does not coincide with the facts, but that it is contrary to the "assumption of free competition." The most cogent objection to it, however, is that it does not coincide with the facts, since recently, at least, supply has not been a function of cost. Certainly no one can believe that the sugar supply in the past decade has followed the neo-classical law of free competition. These practical objections, however, cannot be raised against the equilibrium theory, since it eliminates them by hypothesis. It seems to be the aim of these theorists simply to reduce neo-classical logic to mathematical terms.

There are three objections to the cost curve: (1) accounting costs represent average costs at the existing scale of production and not the marginal costs of economic theory; (2) the cost curve so conceived is not the same as the supply curve. (3) Hence the cost and demand curves would not meet at the proper point. But if actual supply does not follow actual costs, the marginal productivity theory must be abandoned, and it is doubtful whether the whole equilibrium theory has any foundation whatever.⁸ If, however, the cost curve is not used, there is only one series of prices for both supply and demand, which may be called the exchange curve, since at any given time in any given market the price prevailing is the result of both supply and demand. Hence, the schedules were properly called subjective by the Austrian school of economists. They are subjective because they deal not with prices actually paid or received, but with the prices that buyers and sellers are willing to pay or receive at any given time. Since, however, at any one time only one price prevails in a competitive market, there is no objective measure of the prices which people would be willing to pay, and these prices,

⁸ This seems to be the contention of Mr. Schultz in "Marginal Productivity and the Pricing Process," *Journal of Political Economy*, Chicago, October, 1929. But there is no contradiction between his two positions. Mr. Schultz holds that according to the hypotheses of conventional theory the cost curve is the supply curve, which meets the demand curve to form the exchange curve. His theories are consequently consistent with his hypotheses, although they may not always jibe with reality.

if they exist at all, are known only to the consciousness of the individual in whom they exist. It is obvious that they can only be ascertained by asking that individual to state his subjective price⁹ Such information is, of course, not available. So long, therefore, as the demand curve remains subjective, it is useless for empirical analysis. Since the Austrian economists used subjective rational psychology to explain price phenomena, they were not troubled about problems arising from an attempt to translate these subjective schedules into objective statements of the elasticities of demand—based upon market statistics as contrasted with assumptions about the psychology of individuals, or about mass behavior.

The Exchange Curve. The mathematical school attempts to perform a task which on strictly logical grounds is impossible. It seeks to infer two unknowns from one known—to derive from an effect (without a third system of reference) two independent causes, without knowing the value of either cause. The known effect is the quantity of sugar exchanged at certain prices. The causes sought are the supply and demand curves which brought about this exchange curve. So long as the cost curve is used to derive the supply curve, the exchange curve can be used to derive the demand curve. If, however, the cost curve is rejected as the basis for the supply curve, both curves must be derived from the exchange curve.

Some attempts to derive two unknowns from one known assume that economic theory is the third system of reference, but economic theory is merely an hypothesis which statistics may prove, and not a proof of the validity either of statistical method or its result. To reject this or that result because it gives a curve which does not agree with economic theory, or to accept another because it does, is fallacious. It illustrates the well-known tendency to use statistics to prove preconceptions rather than to find the actual content of human behavior. Curves thus ascertained prove not how human beings behave, but merely that curves consistent with economic theory may be derived.

Available price series indicate at what price given quantities of sugar are exchanged. They cannot give us supply and demand curves, but merely exchange curves. To derive supply and demand curves from the exchange curve requires a system of reference outside these data by which it can be shown whether price changes are due to changes in the supply curve or the demand curve. Without such a system an independent series must be used to derive the supply curve, which ultimately come from the cost curve.¹⁰

⁹ Since, however, people react only to situations which have some reality for them, it is doubtful whether these schedules actually exist within the organism.

¹⁰ For a contrary view see Schultz, Henry, *Statistical Laws of Demand and Supply*, pp. 205-10.

With a proper marginal cost curve and an exchange curve, it might be possible to derive a demand curve.¹¹ All attempts to derive both supply and demand curves from a given exchange curve are, therefore, fallacious. At the present time the terms "true demand curve" and "true supply curve" are used by the equilibrium school to designate curves which coincide with the presuppositions of theory, and the data are manipulated in such a way as to make it doubtful whether the results are a reflection of the data or of the author's original preconceptions.

Demand and supply curves and coefficients of elasticity of demand and supply for sugar have been derived by Professor Schultz in his **Statistical Laws of Demand and Supply and The Meaning of Statistical Demand Curves**. After deriving these coefficients, Mr. Schultz uses his own version of the Pigou formula to measure the effects of the sugar duty. The methods of deriving the demand and supply curves will be explained very briefly. A complete understanding of the assumptions and statistical technique can be gained only by a study of the author's own works. This study is based upon price and quantity data for the period 1890-1914.

The Law of Demand. Professor Schultz recognizes the limitation of the neo-classical law of demand for purposes of investigation. He points out, however, that the neo-classical and the statistical laws of demand are both static laws because they each relate to a definite point in time. He finds it necessary to elaborate a technique which will show how the demand curve changes from year to year. This distinction is, therefore, made between the static law of demand, and the dynamic concrete statistical law of demand, which latter is based upon observations over a considerable period of time. The distinction is probably invalid. Insofar as his results are valid at all, they give a series of curves showing demand at various times, and a comparison of these curves shows the shift in demand over a period of years. By the method adopted, Mr. Schultz attempts to ascertain not only the demand curve for 1890 or 1914, or any intervening year, but how the curve changed through the entire period.¹²

When the raw data for price and consumption are plotted for the period 1890-1914, they fail to show a demand curve such as one might expect. Consumption seems to increase almost without regard to price. This increase is so significant that it is evident that there are "disturbing" factors which prevent the original data from revealing a good demand curve. Two questions, therefore, present them-

¹¹ Even so, it is questionable whether cost curves so constituted can ever be projected into the future. Costs are subject to such revolutionary changes as to be virtually unpredictable. These changes may be due to improvements in efficiency or technology, or to alterations in wages, the standard of living, and other economic factors. This makes projection into the future extremely hazardous, though without such projection it is difficult to evaluate the statistical methods used or their results.

¹² *Ibid.*, p. 27.

selves: (1) what are the disturbing factors, and (2) how can they be eliminated from the data?

Empirical analysis indicates that the disturbing factors are: (1) changes in the price of substitutes, such as glucose, corn sugar, etc.; (2) changing habits of consumption¹³; (3) changes in population; (4) changes in the price level.

The ideal method of eliminating all disturbing factors in order to reveal those changes in consumption which are due to changes in price would be multiple correlation.¹⁴ This method, however, assumes that the significance of each of the disturbing factors is known or can be computed statistically, so that it can be allocated a definite statistical value in the equation. This is, of course, impossible. At any rate, the author rejects this method of analysis for the other explained below. In his opinion, the important disturbing factors are not changes in the price of substitutes, but changing habits of consumption, increasing population, and the price level. The subsequent procedure is, therefore, based upon the hypothesis that if these disturbing factors are eliminated from the raw data, the data will show a "true" demand relationship—that is, will reveal a typical demand curve. It is well to bear this assumption in mind, for much of the subsequent analysis is based upon the presupposition that the data really do contain a demand curve, and that the curve, if not apparent, is concealed by other factors which must be eliminated by proper statistical procedure. In general, the hypothesis seems to be a reasonable one.

The author uses two general methods for deriving the demand curve. After he has done so he computes the coefficient of elasticity. These two methods are (1) the method of relative changes (link relatives), and (2) the method of trend ratios. These are applied first to the unadjusted data and then to the adjusted figures. The adjusted figures are derived by dividing the money price by the Bureau of Labor Statistics index number of wholesale prices, all commodities, average 1900-1909 as 100, and by reducing the total consumption to per capita figures. Thus, the adjusted data make direct allowance for changes in population and in the price level. The method of analysis applied to both the adjusted and unadjusted data is in all essential respects the same. The discussion immediately following, however, refers directly to the method of link relatives applied to the unadjusted data.

The Method of Link Relatives. This method is intended to take out the disturbing factors. The procedure is as follows: first, the

¹³ Per capita consumption increased from 52.8 pounds in 1890 to 84.3 in 1914. *Ibid.*, p. 216.

¹⁴ *Ibid.*, p. 31.

link relatives of price and quantities of sugar are calculated; second, the link relatives are plotted in a scatter diagram. When the scatter diagram is completed, it is evident that there is a wide dispersion of the data. The problem, then, is to fit a demand curve to these data. Two curves are fitted by the method of least squares. Which of these curves should be selected as the best fit? The line selected is one which is assumed to eliminate the inaccuracies of either the regression of X on Y or the regression of Y on X, and one in which the sum of the squares of the perpendicular distances of the points from the curve are a minimum.¹⁵ The equation of the line N is then derived. This equation (Y equals -8.840 x plus 2.910) represents the average relationship between the link relatives of prices and the link relatives of consumption.¹⁶

The equation of the line derived with the adjusted data is Y equals -2.0817 x + 3.113.¹⁷

A discussion of the limitations and assumptions underlying the method of link relatives will follow the explanation of the method of trend ratios.

The Method of Trend Ratios. This method derives the demand curve from the ratios of prices and quantities consumed to their respective trends or normal values.¹⁸ It postulates a knowledge of the "normal" consumption and the "normal" price for each year, the assumption being that the "normal" values are slowly and smoothly changing quantities about which the observed quantities fluctuate.

The major problem in this analysis consists of fitting to each series the proper trend line. The nature of the line fitted determines all subsequent figures and gives us the demand curve. The author fits a number of trend lines. He then computes the ratios of the actual data to the ordinate of the trend. By correlating the trend ratios of prices to the trend ratios of quantities, the equation of demand is chosen. The data are widely dispersed, and the trend which should be fitted is not apparent. Four curves were fitted to consumption and six to price. The problem then was to select one curve for consumption and one for price. These curves yielded a wide variety of results. By inspection five were eliminated from consideration. The other five, when correlated, showed a wide range of results. The author then selected those lines for both prices and consumption which yielded the highest correlation between changes in price and changes in consumption, and rejected those lines which did not yield results in accordance with economic theory.

¹⁵ *Ibid.*, p. 39.

¹⁶ *Ibid.*

¹⁷ *Ibid.*, pp. 72-74.

¹⁸ *Ibid.*, p. 47.

The equation of the demand curve which he selected is: Y equals $-1.9782x + 2.9786$.¹⁹ The equation derived from the adjusted data is Y equals $-2.1356x + 3.136$.²⁰

The value of the results derived by analysis depends entirely upon the adequacy of the methods used. Where the data are such as to permit the fitting of only one curve, we may say that the figures themselves establish our result. When, however, they are as widely dispersed as in the case aforementioned, it appears that they permit the selection of a wide variety of curves, and the one finally chosen is that which agrees with the author's preconceptions and represents his best judgment. As Professor Wesley C. Mitchell has pointed out (*Business Cycles, the Problem and Its Setting*, pp. 214-15): "There is, indeed, no single criterion for determining 'goodness of fit.' A mathematical test can be applied only in certain cases. . . . A test of wider application is to consider the 'reasonableness' of the value shown by projecting trend lines into the future, and to choose lines which indicate results judged to be probable. . . . But published expressions of opinion show that a fit which seems good to one man would be called poor by another. Personal equations play a large role in such judgments."

The author computes the coefficient of elasticity of demand from the demand curves which he derived by the methods explained above. This coefficient may be described as the ratio of the relative changes in quantity demanded to the relative changes in price, when the relative changes are infinitesimal.²¹ The coefficient of elasticity, under normal conditions, for each of the four different methods gives approximately the same value, -0.5 . That is, an increase of one per cent in price will bring about a decrease of .5 per cent in consumption.²² The author points out that this coefficient is an average figure of the curve for the entire period 1890-1914 and for the entire range of prices. He shows, however, that the consumption of sugar has become less elastic through the period; the elasticity was greater in 1890 than in 1914. Also the demand is more elastic at high prices (and low consumption) than at low prices (and high consumption.)²³

The Law of Supply. By lagging the price data behind the quantity data, the author attempts to derive the elasticity of supply along the same general lines as demand. He believes that he has derived a supply curve which shows the relation between supply and price. In view of the behavior of production and price during the last decade, it is doubtful that the curve has any validity for this period. It is also subject to many of the same criticisms which applied to the demand curve.

¹⁹ *Ibid.*, p. 60.

²⁰ *Ibid.*, pp. 84-85.

²¹ "In mathematical symbols the coefficient of the elasticity of demand $= -\frac{dx}{dy} \frac{y}{x}$," See *The Meaning of Statistical Demand Curves*, p. 61.

²² *Statistical Laws of Demand and Supply*, p. 92.

²³ See *The Meaning of Statistical Demand Curves*, pp. 61, 62-64.

Qualifications and Criticisms. Professor Schultz is very careful throughout the entire volume to point out the limitations and qualifications of his method of deriving the laws of supply and demand. It is well, therefore, to point out some of the specific qualifications needed.

(1) The fundamental criticism of this method is that it embodies an attempt to derive from one known series (the exchange curve) two unknown series. This is logically impossible. If the exchange and demand curves were known it would still be difficult to derive the supply curve, or if the supply and demand curves were known, the exchange curve could be derived. But to derive two new unknown curves from one known curve, of which they are held to be its two independent causes, is logically impossible, except by reference to a third system of data. The author has recourse to economic theory, but this theory is not a proof of facts, but itself a mere hypothesis in many cases unrealized. Extreme care should, therefore, be exercised in drawing inferences on the basis of the data. The realm of judgment based on "outside" facts should be limited to those facts commonly agreed to. Certainly few would admit that the supply or demand of sugar is a function of price to such an extent that the existence of normal supply and demand curves should be taken for granted. The curves selected do not, therefore, show how people react so much as how the investigator assumes that they act within his presuppositions. This makes the results, though consistent with the assumptions, of doubtful practical value.

(2) The coefficients of elasticity derived from these data apply only to the period 1890-1914. They cannot, therefore, be blindly used for any subsequent period. If the method employed is satisfactory possibly coefficients might be derived for the period 1914-1930. But the difficulties inherent in this problem are very great. The period 1914-1920 involves the abnormal conditions caused by the War, in which the rationing of sugar was undoubtedly a more significant factor in consumption than price. The period 1920-1932 is rather a short one, accompanied by post-war readjustments of price levels and business in the United States and throughout the world, and by overproduction of sugar, all of which increase the difficulty of using such a short period of time as the basis for new curves.

(3) The coefficients of elasticity have both the merits and the limitations of the methods by which they were derived. The supply and demand curves from which they proceed were selected by the

author to yield the results he thought most reasonable.²⁴ They were not forced upon him by the nature of the data—rather their form was assumed and data inconsistent with the assumption were, to some extent, disregarded. This is not a criticism of the method, nor the judgment of the author. It is merely a conclusion drawn from the fact that the data were so widely dispersed as to permit the fitting of a number of curves. The curve finally fitted is, therefore, a result of the author's own judgment in selecting curves from a rather wide range.²⁵ This is, of course, clearly stated by the author himself in the preface to his book.²⁶

The difficulties involved in correlating time series make it necessary to be very careful in the acceptance of statistical transformations and the results. In the words of Wesley C. Mitchell, (*Business Cycles, the Problem and Its Setting*, p. 266): "The proposition may be ventured that a competent statistician, with sufficient clerical assistance and time at his command, can take almost any pair of time series for a given period and work them into forms which will yield coefficients of correlation exceeding ± 9 . It has long been known that a mathematician can fit a curve to any time series which will pass through every point of the data. Performances of the latter sort, have no significance, however, unless the mathematically computed curve continues to agree with the data when projected beyond the period for which it is fitted." The forecasting test, however, cannot be applied to Professor Schultz's coefficients because the period 1914-1920 was quite abnormal, and furthermore because the coefficients were not derived with a view to making long range forecasts.²⁷

(4) The author contends that "the existence of the law of demand is an objective fact, quite independent of one's psychological

²⁴ "The demand curves which were finally selected in this study are those which were fitted on the assumption that the reason why any point fails to fall on the curve is that it is subject to a horizontal as well as a vertical "error." The "errors" with which we have to deal are not only, or even mainly, the accidental errors due to no known cause of systematic or constant error which play such an important role in the theory of least squares. But they are treated as though they were true accidental errors. That is to say, we first eliminate such constant or systematic "errors" as may be eliminated through the use of index numbers, trend ratios, or link relatives. (Such constant "errors are due as a rule, to population growth and to changes in the general price level.) We are quite certain that there are others still, but we cannot measure them. We therefore assume that they are eliminated by the graduation process involved in fitting the demand curve." See *Statistical Laws of Demand and Supply*, p. 94.

²⁵ For example, see p. 53, *Statistical Laws of Demand and Supply*.

²⁶ "As he examines the conclusions reached in this book the reader will do well to keep in mind the fact that the results of a method cannot be separated from the method itself. The fine differences between the various methods—differences which are not always apparent and which cannot always be conveniently explained—produce differences in the results obtained with their aid. Thus the values of the elasticities of demand and supply derived in this book depend to a large degree upon the particular method of curve-fitting employed. Had the common method of curve-fitting been adopted, the results would have been quite different."

²⁷ See *The Meaning of Statistical Demand Curves*, p. 87.

preconceptions."²⁸ This is a statement which must be challenged in view of the author's own methods of analysis. While it is, no doubt, true that the notion of elasticity of demand need not necessarily be based upon rationalistic psychology and hedonistic calculus, it is nevertheless apparent that the coefficients of elasticity derived by Professor Schultz are not objective facts independent of his own preconceptions. The notion of elasticity may, of course, be based upon the common observation that as the income of individuals or the nation is limited, the quantities of goods which can be purchased is limited. It is merely a problem of arithmetic to show that fewer goods can be bought at high prices than at low prices with the same purchasing power. This is a matter of common observation. It is precisely because the author had confidence in this notion and a belief in a certain type of demand curve, which for the purpose of statistical analysis must be classed as preconceptions, that he rejected those curves which could be reasonably fitted to his data, but which did not show a high correlation between changes in price and changes in quantity. The data upon which these curves are based are merely the limits within which the preconceptions may be "verified" by statistical ingenuity. Sometimes the data permit a small range of selection, sometimes a wide one, and sometimes none at all. As has been pointed out above, the data involved in the present case permitted a wide variety of selection. Consequently the results obtained so far as the data permits are largely a result not of the facts themselves but of the author's preconceptions of supply and demand curves for sugar.

Conclusion. Schultz attempts to answer the significant question, "To what extent does the tariff raise the domestic and depress the foreign price?" For the reasons indicated, his method, even if it were satisfactory, could not be used to ascertain the effect of the sugar duty during the past decade.²⁹

²⁸ This quotation is extracted from the following paragraph: "Finally, we should like to point out the real nature of the statistical law of demand. Some economists, among whom are to be included not a few members of the institutional school, have, unfortunately, gotten the impression that any attempt to derive a law of demand must needs be based upon no better psychology than that of James Mill. A few of them even go so far as to deny the very existence of a law of demand. What these economists overlook, however, is that the existence of a law of demand is an objective fact, quite independent of one's psychological preconceptions. And when economists, in the words of Professor Mitchell, 'grasp the idea that their business is with behavior, and that behavior is objective, they will see that their psychological footing can be made secure.' For the law of demand is not a fiction of the hedonistic school. It is nothing less than a summary presentation, in quantitative terms, of an important aspect of human behavior." **Statistical Laws of Demand and Supply**, p. 95.

²⁹ It would not be applicable to sugar during the last ten years because it assumes free competition. The Cuban Single Seller and governmental control over production and exports were significant factors affecting supply. This formula is misleading in the case of most agricultural tariffs since a full differential between two market areas does not follow wherever imports persist. This assumption, which is fundamental to the formula method, is often contrary to fact. In the case of other products, notably butter, cheese, and lamb, to mention only a few, the equilibrium

The method used by Professor Ellis is to present not only the differential created by the duty but the alternative opportunities of producers and consumers in the sugar market. He puts the emphasis on markets rather than on supply and demand or costs. The incidence of the tariff has been judged largely by its effect on the alternative opportunities of those affected. If in its absence it appears that consumers would have access to the world market the measure of their burden is the difference between the world market and the protected market. If Cuban producers had no other opportunity but the world market they could not be said to be absorbing the duty. This type of opportunity cost theory is of course inadequate to deal with the long run effects. But it is impossible by any statistical method now known to measure the long run effects on production in direct quantitative terms. This must be done by inferences from known effects and causes, by the type of observation, induction, and deduction used by Professor Taussig. Little attention has been paid to costs of production in this monograph partly because this aspect of the problem has been adequately dealt with by others and partly because the spread between cost of production and supply has been so great in recent years. Instead an attempt has been made to set forth clearly the interrelationship of the world sugar markets and the interdependence of world prices.

Walter A. Morton

Madison, Wisconsin
January 1, 1933

method could not be used at all. Imports persist in all of these cases, but to measure the effect of the duty by the Pigou formula even were the data available to construct supply and demand curves would lead to erroneous conclusions. It has never been shown that this formula can explain a partial differential, or the benefit of a duty when it does not exclude imports, but for practical purposes creates two independent markets.

Appendix B

THE COOPERATIVE SUGAR EXPORT AGENCY, INC., OF CUBA

THE Cooperative Sugar Export Agency, Inc., of Cuba was organized in accordance with a decree signed by President Machado, July 26, 1929. The Agency or "Single Seller," as it was known to the trade, started operations September 1, 1929, and continued until April 14, 1930, when it was voted out by the sugar producers of Cuba. It was a real factor in the New York market during this time.

The Cubans proposed, by a system of control over exports, to secure a portion of the 20 per cent preferential, amounting to .4412 cent per pound on 96° centrifugal sugar, granted by the United States on sugar imported from Cuba. This was accomplished by selling in the United States markets only when a price of some .25 cent per pound above the London or world price, transportation charges considered, could be secured. When such a price differential could not be secured, no sales were made in the United States.

During the entire period of its operation, the organization was able to secure a very substantial portion of the 20 per cent preferential, as is clearly shown in Table 34, which gives the differential between the prices of 96° centrifugal Cuban sugar, c. i. f. London and c. & f. New York. A freight differential only existed prior to August, 1929, and the differential dropped again to that basis the week following dissolution, April 14, 1930.

During the week of December 19, 1929, "sales to the U. S. market by the Cuban Cooperative Export Agency totalled only 11,000 tons for late December and January shipment for which 2.10 cents c. & f. was accepted."¹ During that same week Cuba's and Domingo's, 96° basis, sold in London at 8s 7½d, c. i. f., which was equivalent to 1.88 cents per pound. After making allowance for freight, .13 cent to New York and .20 cent to London, there was a difference of .29 cent per pound.

The following quotation from C. Czarnikow, Ltd., is quite typical of market reports during the last few months of 1929 and the early months of 1930:

"The Cuban Cooperative Export Agency has made no sales this week, their idea of price for the United States being 2 1/16

¹ C. Czarnikow, Ltd., *Weekly Price Current*, London, December 19, 1929.

cents c. & f., and it is reported that bids of 2 cents have been submitted and refused."²

This shows the influence of the Single Seller in the market, but it also suggests that when Cuba was not selling her sugar, surplus stocks were accumulating at home, and, since no provision had been made for making advances to the producers, dissatisfaction grew and the whole plan was finally abandoned.

The Agency handled a total of 1,118,317 long tons of sugar during the seven and one-half months of its operation, 421,650 long tons of old crop (1928-29) sugar and 696,667 long tons of new crop (1929-30) sugar. By early January, 1930, stocks of sugar in Cuba had accumulated so that there were some 200,000 long tons more on hand than on the same date the previous year. At the time the Single Seller was voted out, there were nearly 500,000 long tons more on hand than on the same date of the preceding year. This explains in part the demand for dissolution on the part of the producers. It further illustrates the futility of control by only one country in reducing production and raising prices.

² *Ibid.*, January 16, 1930.

Appendix C

THE CHADBOURNE PLAN

AT the time of the dissolution of the Cuban Single Seller, April 14, 1930, it was generally understood that Cuba would never again resort to a restriction of either production or sales. However, prices steadily declined, due to heavy stocks of Cuban sugar and increased crops of duty-free sugars, until a price of 1.04 cents c. & f. New York City was reached on September 29, 1930. This was a new all-time low price for sugar, and sentiment in Cuba was again turned to crop or export restriction.

Mr. Thomas L. Chadbourne, a New York attorney, submitted a plan to the Cuban planters and Cuban government which had as its purpose the stabilization of the sugar industry and the raising of sugar prices. In brief the plan called for the segregation of 1,500,000 tons of Cuban stocks of sugar to be paid for by Cuban government bonds, a limitation of the amount of exports to the United States, and the sending of a delegation to Europe to confer with European and Javanese producers in an attempt to settle upon some world plan of sugar crop or export restriction. The essential points of this plan were embodied in the Sugar Stabilization Law of Cuba enacted November 15, 1930, and in two special decrees issued by President Gerardo Machado, November 17, 1930.

The Chadbourne Agreement and the International Sugar Council

Soon after the passage of the Sugar Stabilization Law a committee, including Mr. Chadbourne, which had been appointed by President Machado, sailed for Europe to carry on negotiations with representatives of Cuban, Javanese, and European sugar producers. These conferences led to nothing of a definite nature since Germany withdrew on December 15. Negotiations were resumed again about the middle of January, 1931, and the Chadbourne Agreement was signed in Brussels, May 9, 1931, by representatives of Cuba, Java, Czechoslovakia, Germany, Poland, Belgium, and Hungary.¹

These seven countries, which include the two largest cane-sugar exporting countries of the world and the most important beet-sugar exporting countries of Europe, accounted for 43.8 per cent of the world's crop of sugar during the period of 1926-1930. The same

¹ At the regular meeting of the International Sugar Council, the governing body under the Chadbourne Plan, held at Paris, France, December 14, 1931, Peru was admitted to full membership in the Council with five votes and an export quota of 360,000 tons for the year 1931-32 and 373,750 tons for each of the succeeding years. The Council also decided to admit Jugo-Slavia as a member of the Council provided she fulfill the terms and conditions accepted by all the other members of the Agreement.

seven countries accounted for about 70 per cent of the annual sugar crop entering international trade channels during the same period. It is apparent, therefore, that the parties to this Agreement control a very substantial part of the sugar crop of the world. (See Table A.)

Briefly, this new scheme for stabilizing the sugar industry of the world calls for: (1) the segregation of sugar out of present surpluses to be marketed during the next five years, (2) limitation of production to an amount which, together with the segregated sugar will just meet current needs, and (3) a provision which will allow for greater exports of sugar from the countries signing the Agreement when the price goes above a certain minimum. This latter provision is intended to prevent the expansion of production in those countries not parties to the plan.

The Agreement, which is to remain in force until September 1, 1935, calls for the establishment of a permanent council, known as the International Sugar Council, to be located at The Hague. Four regular meetings are to be held annually and special meetings may be called at the request of two or more nations or by the chairman. The votes allotted in the Council are distributed among the delegates as follows:

Cuba.....	35
Java.....	30
Europe.....	25

The 25 European votes are distributed as follows:

Czechoslovakia.....	8
Germany.....	6
Poland.....	6
Hungary.....	3
Belgium.....	2

Table B shows the exports that are allowed each of the seven countries during the period covered by the Agreement. It is hoped that the annual production plus the segregated sugar, in the case of Cuba and Java, will just about balance the export quotas and domestic consumption, so that no new surpluses will be accumulated during the period of the Agreement. Any such surplus would be held back in the individual country; nevertheless such a surplus would have a depressing effect upon the market in general.

The production figures for Cuba and the export quotas shown for each country are, of course, the quantities forming the basis of the Agreement and, so far as the first year is concerned, constitute the maximum figures allowed. After the first year the Cuban exports to the United States each year will be regulated by the extent

TABLE A

**Average Annual Sugar Crop of the World
1925-26 to 1929-30**

Country	Average crop long tons	Per cent of total	Country	Average crop long tons	Per cent of total
Cane Sugar			Cane Sugar		
United States			Egypt	88,767	.35
Louisiana	105,179	.41	Mauritius	227,029	.89
Porto Rico	615,684	2.41	Reunion	50,857	.20
Hawaiian Islands	787,523	3.08	Natal	236,204	.92
Virgin Islands	6,820	.03	Mozambique	74,968	.29
Cuba	4,645,733	18.16	Total in Africa	677,826	2.65
British West Indies			Europe—Spain	10,229	.04
Trinidad	75,372	.29	TOTAL		
Barbados	56,720	.22	CANE SUGAR	16,858,260	65.89
Jamaica	61,235	.24			
Antigua	17,121	.07	Beet Sugar		
St. Kitts	17,263	.07	Europe		
Other	6,531	.03	Germany	1,747,226	6.83
French West Indies			Czechoslovakia ..	1,174,222	4.59
Martinique	42,025	.16	Austria	99,072	.39
Guadeloupe	26,148	.10	Hungary	200,038	.78
San Domingo	348,157	1.36	France	832,789	3.26
Hayti	14,076	.06	Belgium	274,008	1.07
Mexico	187,242	.73	Holland	287,657	1.12
Central America			Russia & Ukraine..	1,162,182	4.54
Guatemala	28,486	.11	Poland	676,067	2.64
Other	63,818	.25	Sweden	130,594	.51
South America			Denmark	153,542	.60
Demerara	110,689	.43	Italy	318,289	1.24
Surinam	14,064	.05	Spain	265,698	1.04
Venezuela	20,622	.08	Switzerland	6,799	.03
Ecuador	19,797	.08	Bulgaria	36,608	.14
Peru	361,258	1.41	Roumania	126,451	.49
Argentina	401,767	1.57	Great Britain and		
Brazil	702,914	2.75	Ireland	190,029	.74
Total in America	8,736,244	34.15	Yugoslavia	95,728	.38
British India	2,989,800	11.69	Other	37,272	.15
Java	2,492,882	9.74	Total in Europe	7,814,270	30.54
Formosa and Japan	732,491	2.86	United States	882,256	3.45
Philippine Islands	629,342	2.46	Canada	29,567	.12
Total in Asia	6,844,515	26.75	TOTAL		
Australia	499,174	1.95	BEEET SUGAR	8,726,093	34.11
Fiji Islands	90,272	.35	GRAND TOTAL		
Total in Australia			CANE & BEEET		
and Polynesia....	589,446	2.30	SUGAR	25,584,353	100.00

Source: Compiled from yearly figures in Willett and Gray's **Weekly Statistical Sugar Trade Journal**, New York. The crop year varies in different countries. See Table 28, p. 95, for the harvesting periods in the chief sugar-producing countries of the world.

TABLE B
Exports of Sugar Allowed Under the Chadbourne Agreement
 (Long tons, raw basis)

Country	First year	Second year	Third year	Fourth year	Fifth year
Cuba	1931	1932 ^d	1933	1934	1935
Production, January-December	3,122,000	3,495,000	3,545,000	3,545,000	3,545,000
Drawn from quantity segregated	260,000	260,000	260,000	260,000	260,000
Total amount available	3,382,000	3,755,000	3,805,000	3,805,000	3,805,000
Cuban consumption	150,000	150,000	150,000	150,000	150,000
Available for export	3,232,000	3,605,000	3,655,000	3,655,000	3,655,000
Distribution					
Exports to United States	2,577,000 ^a	2,800,000	2,800,000	2,800,000	2,800,000
Exports to other countries	655,000	805,000	855,000	855,000	855,000
Java	1931-32	1932-33	1933-34	1934-35	1935-36
Exports, April-March	2,200,000	2,200,000	2,200,000	2,200,000	2,200,000
Cumulative increase of exports after first year	—	100,000	200,000	300,000	400,000
Drawn from quantity segregated	100,000	100,000	100,000	100,000	100,000
Total exports	2,300,000	2,400,000	2,500,000	2,600,000	2,700,000
European exports, September-August	1930-31	1931-32	1932-33	1933-34	1934-35
Czechoslovakia	570,815	570,815	570,815	570,815	570,815
Germany	500,000	350,000	300,000	300,000	300,000
Poland	308,810	308,810	308,810	308,810	308,810
Hungary	84,100	84,100	84,100	84,100	84,100
Belgium	30,275	30,275	30,275	30,275	30,275
Total European exports	1,494,000	1,346,000	1,294,000	1,294,000	1,294,000
Total exports, seven countries	7,026,000	7,349,000	7,449,000	7,549,000	7,649,000
Distribution					
Cuban exports to United States	2,577,000	2,800,000	2,800,000	2,800,000	2,800,000
Exports to "free" markets	4,449,000	4,549,000	4,649,000	4,749,000	4,849,000
Total exports to "free" markets under increase of quotas^b					
5% obligatory increase in event price reaches 2 cents	4,671,450	4,776,450	4,881,450	4,986,450	5,091,450
2½% increase (not obligatory) in event price reaches 2¼ cents	4,782,675	4,890,175	4,997,675	5,105,175	5,212,675
2½% obligatory increase in event price reaches 2½ cents ^c	4,893,900	5,003,900	5,113,900	5,223,900	5,333,900

TABLE B, continued

Exports of Sugar Allowed Under the Chadbourne Agreement
(Long tons, raw basis)

-
- ^a To this amount should be added 60,000 tons afloat January 1, 1931, and 53,000 tons, for which export permits had been granted. The balance of 110,000 tons, to bring this figure to a total of 2,800,000 tons as available to the United States during the current year, was assumed to have already been supplied to the United States, and was arrived at by the deduction of the normal stocks carried in the United States on January 1, 1931, viz., 300,000 tons from the stocks of 410,000 tons actually held on that date.
 - ^b The quota increases will be based on the respective annual export quotas of each country as stipulated in the upper part of the table. The price refers to the quotation on raw sugar, 96 degrees polarization, f. o. b. Cuba, and "the respective prices referred to shall be considered reached whenever the average price over a period of thirty consecutive market working days shall not be less than the equivalent named."
 - ^c In the event that no increase in the quota is allowed at a price of 2½ cents, the obligatory increase in the quotas at a price of 2½ cents would be 5 per cent.
 - ^d The quotas for 1932 were altered somewhat by the negotiations during the spring of 1932. The Cuban crop was limited to about 2,700,000 long tons and the export quotas of the European countries, Peru and Java, were reduced to 3,217,754 tons. Cuban exports to the United States in 1932 are not to exceed 1,956,420 tons.

Source: C. Czarnikow, Ltd., *Weekly Price Current*, London, April 16, 1931.

of the increase in consumption in that country. Cuban exports to "free" markets after the first year will be regulated by the basic price ruling in the Cuban market. Cuban exports to the United States were fixed at 2,577,000 long tons the first year instead of 2,800,000 long tons because of amounts afloat, ready for shipment, or already shipped to the United States as explained in a footnote to Table B. The 100,000 long tons accumulative increase in Javanese exports is apparently intended to take care of an expected increase in consumption in the Far East. It should be noted that the shipments of sugar to the United States by Cuba is the only instance where restrictive measures have been applied in regard to the amount of sugar to be sold in any country by the parties to the agreement. Table C shows the exports from the nine countries concerned during the past six years.

The chief aim of the Agreement is to restore economic stability to the world sugar industry by bringing about a more equal balance between world production and world consumption. The immediate aim is not the attainment of artificially high prices, but rather an improvement in the statistical situation of the sugar industry of the world. If for any reason, such as a crop failure, a country is unable to export her full quota in any one year, the deficit cannot be made up the following year. Each year is considered by itself. In this connection it is well to point out that any surplus Cuban sugar not required by the United States in any one year cannot be carried into the next year or become a depressing influence on other markets. Any surplus stocks which Cuba finds on her hands at the end of a contract year will merely be deducted from the production for the following year.

TABLE C

**Exports of Sugar from the Countries Participating in the
Chadbourne Agreement, 1925-1930**

(Thousands of long tons, raw basis)

Cuba, January-December	1930	1929	1928	1927	1926	1925
Total exports	3,387	4,799	3,983	4,126	4,708	5,051
Exports to United States ..	2,355	3,685	2,874	3,207	3,748	3,636
Java, April-March	1930-31	1929-30	1928-29	1927-28	1926-27	1925-26
Total exports	2,107	2,316	2,631	2,080	1,713	2,070
Europe,* September-August	1929-30	1928-29	1927-28	1926-27	1925-26	1924-25
Czechoslovakia	600	674	813	708	1,080	1,015
Germany	234	143	83	64	47	226
Poland	452	305	163	226	272	200
Hungary	133	100	70	72	84	103
Belgium	25	44	40	46	146	181
Jugo-Slavia	18	7	0	^b	^b	^b
Peru, January-December	335	362	311	298	329	205
Total exports, nine countries	7,291	8,750	8,094	7,620	8,379	9,051
Exports to "free" markets ..	4,936	5,065	5,220	4,413	4,631	5,415

* Net exports in case of European countries.

^b Not available.

Source: All data from C. Czarnikow, Ltd., *Weekly Price Current*, London, April 23, 1931, except figures for Jugo-Slavia which are from the issue of December 30, 1931, and those for Peru which are from the issue of April 9, 1931. The Peruvian exports for 1925 are from the United States Sugar Association, N. Y.

A provision which allows for the release of sugar supplies in excess of the basic amounts stipulated provides a safeguard against the development of any statistical situation which might force prices to abnormally high levels and so stimulate output in those countries which remain outside the Agreement. This part of the plan provides that, if the world price of raw sugar, 96° basis, remains at an average of 2.00 cents per pound, f. o. b. Cuba for prompt shipment, for a period of 30 consecutive working days, the quotas allotted to each country for export to "free" markets shall be increased to the extent of 5 per cent of the original quantities allowed by the scheme. In case the price reaches a level of 2.25 cents per pound for a like period, the export quotas may be increased by 2.5 per cent, but this provision is not obligatory. If, however, the price reaches an average of 2.50 cents per pound for the prescribed period, the Council is required to increase the export quotas by a further 2.5 per cent in case the quotas were increased at the 2.25 cent price level or 5 per cent in case no such increase had been allowed. In the event of further increases in price, any additional increases in the export quotas

would, presumably, be entirely in the hands of the permanent council. Increases in the original quotas are based only on exports to "free" markets; so any increase in Cuban exports will be based on her quota of exports to countries outside the United States. A provision is included in the Agreement which allows Cuba to participate in any increase in consumption in the United States. The figures in the lower part of Table B indicate the additional amounts which may be exported as the price increases.

Appendix D

DISTRIBUTION OF SUGAR AMONG VARIOUS CLASSES OF CONSUMERS ¹

EARLY in the history of the Food Administration it was found imperative to restrict the non-essential uses of sugar, and as a basis for intelligent action some statistics relating to the matter were very much desired. Scant data were then available on this subject ² and figures had to be compiled showing the quantities used by various classes of consumers. Early in 1918, as a result of a more or less empirical survey, based on information received from manufacturers, the following table was drawn up, showing the quantities of sugar normally used in various manufactured products:

Quantities of Sugar Used in Various Manufactured Products

(Quantities in short tons, refined)

Product	Quantity tons	Product	Quantity tons
Confectionery	350,000	Tobacco	26,000
Bread	45,000	Soap	900
Crackers	55,000	Canned Vegetables	4,000
Sweet Doughs	45,000	Canned Fruits—	
Pies	47,500	California, Oregon,	
Cakes	37,500	Washington	17,000
Sundry Bakery Goods	9,000	Rest of United States	9,000
Chewing Gum	15,000	Condensed Milk	100,000
Soft Drinks	135,000	Proprietary Medicines	6,100
Ice Cream	64,000	Total	966,000

Much more accurate data were obtained, bearing on these matters under the operations of the "certificate plan" of distribution, in operation from July 1 to December 1, 1918. A representative of the United States Sugar Equalization Board traveled all over the United States in the latter part of 1918, in order to standardize the

¹ Source: A Statistical Survey of the Sugar Industry and Trade of the United States, by Joshua Berhardt, in charge Sugar Section, Statistical Division, United States Food Administration, and Chief, Statistical Department, United States Sugar Equalization Board, Inc., Washington, D. C., 1920, p. 93. The Food Administration, though obliged to continue certain controls such as wheat and sugar, lifted most of its regulations soon after the Armistice and the administration of the United States Sugar Equalization Board, Inc., was officially closed by executive order July 10, 1926.

² In 1901 the United States Bureau of Labor determined the actual direct household consumption of sugar in 2,567 families of workingmen for the whole year in various parts of the country. The average for the United States was 50.56 pounds per capita, and since the total usage of sugar in that year, as reported by Willett and Gray, was 69.7 pounds, the per capita quantity used outside the household must have been 19.14 pounds. In percentages then, 72.5 per cent of the per capita consumption in 1901 was household consumption, while 27.5 per cent went into other channels. Since 1901, however, there has been a tremendous expansion in the sugar-using industries, so that the impression in sugar trade circles was that in 1916 about one-third of the entire consumption was outside the household.

operations of the "certificate plan" in the different states. Incidentally, he obtained the following figures from the Federal Food Administrators, showing the number of manufacturers in the United States using sugar, the number of hotels and public eating places, the bakers and the retail grocers:

Manufacturers of soft drinks and non-essentials.....	56,130
Manufacturers of essential food products using sugar.....	34,388
Hotels and public eating places.....	121,393
Bakers	34,662
Retail grocers	375,361

INDEX

<p>Acreage</p> <ul style="list-style-type: none"> Hawaii51, 53 United States beet.....81-83 United States cane78-79 Virgin Islands62 <p>Alternative crops.....88, 90</p> <p>American capital in Cuba.....71</p> <p>Area for expansion</p> <ul style="list-style-type: none"> Cuba34, 70 Hawaii53 Philippine Islands57, 58 Porto Rico.....60, 61 United States beet.....96 United States cane.....78-79 Virgin Islands62 World29, 31, 32, 34 <p>Area of sugar production</p> <ul style="list-style-type: none"> Hawaii51, 53 United States beet.....76 United States cane76 Virgin Islands62 World24 <p>Baker, O. E.....23</p> <p>Beet sugar (See World, and under chief countries)</p> <p>Before-and-after method of price analysis117</p> <p>Belgium176-181</p> <p>Berhardt, Joshua183</p> <p>Bounty on sugar.22, 44, 46, 47, 80, 159</p> <ul style="list-style-type: none"> Bounty payments, U. S., 1891-189447 Constitutionality of47, 50 Tariff Act of 1890.....44, 46, 80 Tariff Act of 1930.....47 <p>Brazil28</p> <p>British India.....28</p> <p>Brokerage100</p> <p>Brussels Convention.....</p> <ul style="list-style-type: none">27, 28, 32, 37, 38, 42, 43 <p>Campaign periods.....95</p> <p>Cane sugar (See World, and under chief countries)</p> <p>Chadbourne Committee.....39</p>	<p>Chadbourne Plan...21, 39, 42, 176-182</p> <p>Chadbourne, Thomas L.....39, 176</p> <p>Colono71, 72, 128</p> <p>Constitutionality of protective tariff46</p> <p>Consumer22</p> <p>Consumption</p> <ul style="list-style-type: none"> By industries183-184 Farm148 Per capita consumption <ul style="list-style-type: none"> By countries13, 40 United States13, 40, 146-148 United States <ul style="list-style-type: none"> By sugar-using industries.....147-148, 183-184 Per capita13, 146-148 Per cent increase or decrease147 Total45, 69, 146-149 World23, 25, 40, 43 <p>Contracts, sugar beet.....92-94</p> <p>Cooperative Sugar Export Agency, Inc.39, 68, 174-175</p> <p>Cost curve164-165</p> <p>Cost of production.....18</p> <ul style="list-style-type: none"> Cuba19, 37 Equalization of18 Hawaii19, 37 Java37 Louisiana37 Philippine Islands19, 37 Porto Rico19, 37 United States beet19, 37, 83 <p>Cost of sugar tariff to consumers15, 146-160</p> <p>Crisis in sugar industry..13, 14, 25, 36</p> <p>Crockett Refinery53</p> <p>Crop restriction, Cuba.....38-40, 67</p> <p>Cuba</p> <ul style="list-style-type: none"> American investments71 Area for expansion34, 70 Benefits from U. S. preference68 Climate71 Colonel Tarafa67 Colono71, 72, 128
--	---

Cuba (Continued)	
Cost of production	19, 37
Cooperative Sugar Export Agency, Inc. 39, 68, 95, 113, 125, 128, 174-175	
Exports	
To Europe	108
To United Kingdom.....	34, 63, 65, 108
To United States	63, 65, 108
Total	65, 108
Labor situation	71
National Commission for the Defense of Sugar in Cuba.....	67
One-crop country	70
Organization of sugar industry	71, 72
Preferential duty	62-64
Prices	
London	66, 67, 109, 120-125
New York City	66, 67, 100, 102, 104, 105, 120-145
Promedios, public warehouses	103
Relationship to Hamburg price	64-66
Relationship to London price	66, 67
Production	28, 30, 32, 65
Promedios	103
Ratoon crops	70
Reciprocity Treaty of 1903	64
Restriction of production	38-40, 67
Single Seller	39, 68, 95, 113, 125, 128, 174-175
Sugar crops, 1904-1931	30, 65
Sugar Defense Law	67
Cuban Cooperative Sugar Export Agency, Inc.	
.....	39, 68, 95, 113, 125, 128, 174-175
Customs duties, U. S., 1893-1929.....	46
Czechoslovakia	28, 176-181
Demand curve	166
Demand, law of.....	166-167
Differential method of price analysis	119-121
Distribution of Sugar by State.....	89
Domestic sugar industry.....	
Beet	80-96
Branches of	74-75
Cane	75-79
Drawback of import duties.....	101, 139
Duties on sugar (See under Tariff)	
Equilibrium method of price analysis	118-119, 161-173

Europe	
Production	28, 30
Recovery of beet production.....	14, 29
Everglades	79
Exchange curve	165-166
Exports	
Chief exporting countries	34-36
Cuba	34, 179
Hawaiian Islands	50
Java	28, 30, 34, 179
Philippine Islands	34, 41
Porto Rico	59, 60
Refined sugar for export, U. S.	36, 139, 140, 142
United States	36, 139, 140, 142
Virgin Islands	62
Farm consumption	147-148
Farm income	157
Farms, number reporting specified crops and classes of livestock.....	156
Farm population	153-154
Farm relief	1, 14-15
Federal Barge Line.....	86-88
Foreign investments	13
Finch, V. C.	23
Florida	75, 79
Free trade, survival of domestic industry under	155
Freight rates	
United States beet and cane.....	85
Cuba to New York City	121, 123
Ocean, Cuba, New York City, London	124
Ocean, North Coast of Cuba to New York or Philadelphia	123
Ocean, North Coast of Cuba to United Kingdom, 1921-1931	124
Gardner, John C.....	111
Geerligs, H. C. Prinsen.....	25, 29, 34, 49
Germany	28, 176-181
Granulated sugar prices.....	106, 107, 134-145
Hawaii	
Area of production	51, 53
Climate	52
Cost of production	19, 37
Early history	49
Expansion of sugar area	53
Exports	50

Hawaii (Continued)	
Irrigation	51
Labor problem	52
Legal status of	49
Organization of sugar industry	52
Production	50
Reciprocity Treaty of 1876	45
Treaty of 1897.....	49
Yield of sugar per hectare	51
Hungary	176-181
Imports	
United Kingdom	110
United States	
From Cuba	63, 65
From Hawaii	50, 51
From Philippines	41, 55
From Porto Rico	59, 60
From Virgin Islands	62
Full-duty sugar	45, 63
Per cent of consumption	
imported, 1822-1900	45
Refined	45
Total	45, 99
Income, cash farm.....	157
Insular policies	48-73
Cuba	62-72
Hawaiian Islands	49-53
Philippine Islands	53-59
Porto Rico	59-61
Virgin Islands	61, 62
Insular Territories	
Hawaii	49-53
Philippine Islands	53-59
Porto Rico	59-61
Virgin Islands	61-62
International Sugar Council.....	176
International trade in sugar.....	34-36
Investments in Cuba.....	13
Java	
Cost of production	37
Exports	
British India	33-34
Total	179, 181
Production	28, 30, 32, 34
Jesuits	75
Labor situation	
Cuba	71
Hawaii	52
Philippine Islands	56, 57
United States	91, 92
Lake Okeechobee	79
League of Nations.....	37
Lee, Frederick P.....	50
Licht, O. F.....	31
Link relatives method.....	167-168
London market	108-111
Louisiana (See United States, Cane)	
Margin, refiners'	134, 139
Method of price analysis.....	
.....	101, 117, 121, 161-173
Mikusch, Gustav.....	25, 36
Mitchell, Wesley C.....	169, 171
Mountain States Beet Growers	
Marketing Association	155
Markets	
Mechanism of, in U. S.	98-108
New Orleans	78, 154
Protected	18-19, 32, 33
London	108-111
New York City	
Dominant sugar market in U. S.	99
Relationship to London market	
.....	109, 120-125
Relationship to other U. S.	
markets	100
World market	34-35
Relationship to New York City	
market	16-17
National Refinery	133
New Orleans market.....	78, 154
New York Coffee and Sugar Ex-	
change.....	99, 111, 113
New York market, 99-101, 109, 120-125	
Okeechobee, Lake	79
P. O. J., varieties of cane...14, 32, 78	
Population, U. S. total and farm..	
.....	153-154
Promedio	103
Protective tariff, constitutionality	
of	46
Philippine Islands.....	21-22
Area for expansion	57, 58
Climate	56
Cost of production	19, 37
Description of Islands	56
Early history	54
Exports to U. S.	34, 41, 55
Labor situation	56, 57
Legal status of	54

Philippine Islands (Continued)

Muscovado sugar	55
Production of sugar	15, 54, 55
Treaty of 1898	53
United States tariff policy	54
Yield	57, 58
Pigou, A. C.	163, 173
Poland	176-181
Population, United States.....	154
Porto Rico	
Area for expansion	60, 61
Climate	60
Cost of production	19, 37
Experiment station	61
Exports	59, 60, 62
Irrigation	60, 61
Legal status	54
Production	59, 60
Treaty of 1898	59

Prices

Beet sugar	92-94, 100-101
Cane sugar, raw	
Average annual, 1921-1930	37
Basis of quotations	100
Cuba	103, 120-145
Factors influencing	111-114
Hamburg	66
London	37, 109, 120-145
New York	
.....37, 100-102, 104, 105, 109, 120-145	
Cane sugar, refined	
Basis for quotations	100
Cash discount	101
New York City	106, 107, 134-145
United States for export	139-143
Cuban price and the tariff	128-130
Effect of tariff on	116-145
Factors influencing	111, 114
Sugar beets	92-94
Sugar cane	78
Sugar crisis and	13, 14, 25, 36
World price and the United States	
sugar duty	16-17, 126-127

Production

Beet sugar	26, 27
Beginnings in the U. S.	44, 80
Czechoslovakia	28
Europe	14
Germany	28

Production (Continued)

United States	76, 80-84
By states	82-83
Russia and Ukraine	28
Cane sugar	26, 27
Beginnings in the U. S.	75, 77
Brazil	28
British India	28
Cuba	28
Expansion of world production	
.....36, 37	
Hawaii	28
Java	28
Louisiana	77-78
Philippine Islands	15, 54, 55
Porto Rico	59, 60, 69, 76
United States	28
Virgin Islands	62
Chief countries	28
Cost of production (see under Cost)	
World (see also under specific	
countries)	
Area of	24
Beet sugar	14, 26-28
Cane sugar	-14, 26-28, 33
Expansion of	23-25, 29, 34
Restriction of	38-40
Total	26, 27, 28, 30
War, effect of	14, 29
Rao, K. K.	52
Ratio of raw to refined sugar.....	98-99
Reciprocity Treaty	
Cuba	64
Hawaii	45
Refined sugar for export, U. S.	36
Refiners' margin	134-139
Refining process	98-99
Restriction of production.....	38-40, 67
Revere Refinery	134
Russia	28
Schultz, Henry	
.....145, 161, 164, 166, 171, 172	
Single Seller of Cuba.....	
.....39, 68, 95, 113, 125, 128, 174-175	
Sugar beets (See under United	
States)	
Sugar cane (See under United	
States)	
Sugar crisis.....	13, 14, 25, 36

Sugar cycle	13	United Kingdom (Continued)	
Sugar Institute, Inc.....	41	Prices	37, 109, 120-145
Sugar refining	98	United States	
Sugar Stabilization Law, Cuba.....	176	Area of production	76
Sugar-using industries.....	183, 184	Beet-sugar industry	
Supply curve	164, 165	Acreage	82
Supply, law of.....	169	Area of production	76, 81
Surplus	25, 37	Climatic advantages of	
Survival of domestic industry under conditions of free trade.....	155	western states	81
Tarafa, Colonel	67	Contracts	92
Tariff on sugar		Cost of production	83
As farm relief	14-15	Crop competition	88
Beet-producing countries	31	History	80
Benefits to producers	146-160	Factories operated	80, 83
Cane-producing countries	33	Freight protection	84-88
Concessions to Cuba	64	Harvest period	95
Constitutionality of protective tariff	46	Labor situation	91-92
Cost of, to consumers	146-160	Organization of industry	92
Cuban preferential	32, 62, 64	Potential area of production	96
Drawback	101, 139	Prices (See under Prices, beet sugar)	93, 94
Effect on prices	18, 74, 116-145	Production	28, 69, 76, 80, 83
Futility of	14-15	Seasonable character of	94
Influence on price.....	18, 74	Western market	86, 88
Influence on production	32, 36	Cane-sugar industry	
Purpose of	116, 117	Acreage	78
Revenue aspects of	158-159	Area of production	75, 76
United States		Factories operated	78
Duties collected	46	Florida	75, 79
Policy previous to 1890	44, 45	Harvest period	95
Summary of duties, Acts of 1897-1930	48	History	75, 77
Tariff Act of 1789	44	Louisiana	75, 77, 78
Tariff Act of 1890	46, 80	Mosaic disease	77, 78
Tariff Act of 1897	47, 48	New Orleans market	78, 154
Tariff Act of 1914	48	Payment for cane	78
Tariff Act of 1921	48, 130, 140	Potential area	79
Tariff Act of 1922	48, 129, 130, 133, 140	Production	28, 69, 76
Tariff Act of 1930	48, 94, 108, 126	Factors influencing	77-78
Taussig, F. W.....	9, 49, 161	Texas	75, 77, 79
Taylor, Paul S.....	92	Varieties of cane	78
Texas	75, 77, 79	Yield	78
Trend ratios method.....	168-169	Consumption	45, 63
Typhoon, Philippine Islands.....	56	By sugar-using industries	147-148, 183-184
United Kingdom		Per capita	13, 40, 146-148
Consumption	40	Per cent increase or decrease	147
Imports	110	Total	45, 69, 146-149
		Continental industry	74, 97
		Beet	80, 96
		Branches of	74, 75

United States (Continued)

Continental industry (Continued)	
Cane	75, 79
Cost of production	
Beet	19, 37, 83
Cane (Louisiana)	37
Distribution of sugar by states	89
Exports of refined sugar	36
Imports	
Cuba	63, 65, 148, 150
Full-duty sugar	45, 63, 148-150
Hawaii	50, 51, 148-150
Philippine Islands	41, 55, 148-150
Porto Rico	59, 60, 148-150
Refined	45
Total	45, 99, 148-150
Virgin Islands	62, 148-150
Insular Territories	
Hawaii	49-53
Philippine Islands	53-59
Porto Rico	59-61
Virgin Islands	61, 62
Population, total and farm	153-154
Production	76, 80
Source of sugar supply	148-150
Tariff (see under Tariff)	
Varieties, cane.....	14, 32, 78
Virgin Islands	
Acreage	62

Virgin Islands (Continued)

Area for expansion	62
Decline in production	61, 62
Exports	62
Production	62
Purchase by the U. S.	6
Waterhouse, John	52
World consumption.....	23, 25, 40, 43
World production (see under Pro- duction)	
World sugar industry	
Area of production	24
Area for expansion	29, 31, 32
Beet sugar	
Trend in production	26, 27
Yield per acre	83
Cane sugar	
Expansion of production	29, 32
Trend in production	26, 27
Yield per acre	31, 32
Harvest periods in chief countries	95
Movement of sugar	34, 35
World War and sugar produc- tion	14, 29
Wright, P. G.....	155, 161, 162
Yield of sugar per unit of area	
Hawaii	51
Java	32
Louisiana	78
United States beet	83