

CONFIDENTIAL

AMERICAN PROSPERITY AND THE BRITISH
BALANCE-OF-PAYMENTS PROBLEM

by

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F O R E W O R D

It is widely recognized that Britain, at the end of the war, will in all likelihood be confronted with a serious balance-of-payments problem. Loss of foreign-investment income and the emergence of an immense external debt have resulted in a situation in which, at the pre-war volume of exports and imports, Britain would be faced with an annual balance-of-payments deficit that might easily amount to 400 million pounds. Unless Britain is able to meet this deficit by borrowing from abroad, or unless the external sterling debt is drastically scaled down, Britain will be forced either to undergo a marked reduction in imports or to achieve a very substantial increase in exports. The latter alternative will for Britain be much the less painful, particularly if there is a thriving demand for British wares. In the absence of such a demand, Britons may feel compelled to resort to bilateral trading arrangements and to demand from British sources of supply preferential treatment for British exports.

To what extent can the United States assist in the solution of this British problem by maintaining a high level of domestic prosperity (and thus of imports)? The ensuing report is an attempt to answer this question. Estimates are based on somewhat elaborate statistical analysis, and are made on the assumptions (1) that the United States does not raise tariffs above present levels and (2) that international trade is conducted on a multilateral basis. On these assumptions, it is estimated that at a peace-time national income of \$140,000,000,000 per year (somewhat below the present level), and at a price level for American imports 30 per cent greater than the 1937 level, American imports from Britain would amount to \$493,000,000 per year, and imports from Britain attributable to American imports from third countries would amount annually to \$916,000,000. Adding these two figures, we obtain a sum of \$1,409,000,000, representing the total estimated imports from Britain directly and indirectly attributable to the American economy at this level of national income (and of import prices). Since the corresponding estimate for 1937 (at 1937 import prices) is \$567,000,000, the estimated increase in British exports resulting from the increase in American national income (and import prices) over the 1937 level amounts to \$842,000,000 (\$209,000,000)--a very substantial contribution to the narrowing of the British balance-of-payments deficit. Estimates for other levels of national income and of import prices are available in Tables I-V.

AMERICAN PROSPERITY AND THE BRITISH
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It is generally agreed that by maintaining a high level of national income (and thus a high level of imports), the United States can diminish the grave balance-of-payments difficulties that are expected to confront Britain at the end of the war.² No attempt, however, appears to have been made to estimate the extent to which the United States can aid Britain in such fashion. This is hardly surprising, since even the most careful guess would have to rest, in some degree, on dubious assumptions and precarious extrapolations. Nevertheless, the problem is both important and intriguing, and in the ensuing discussion an effort will be made to estimate the extent to which the level of British exports would be affected by a level of American income after the war well above the level during any pre-war year.

To make such a guess, it will not, of course, be sufficient to estimate merely the increase in United States imports from Great Britain. This is only part of the problem. Of possibly equal (or even greater) importance, so far as the level of British exports is concerned, are the reverberations of an increase in American national income via third countries. The total effect on British exports of an increase in American income would comprise (1) the increase in American imports from Britain plus (2) any increase in imports from Britain by the rest of the world that was attributable to the increase in total American imports.

Effect of Changes in National Income on American Imports

The starting point of this study will be an investigation of the manner in which, in the past, American imports have fluctuated with national income. The period covered comprises the years 1922 through 1937. Chart I is a scatter-diagram in which annual figures for the two variables are correlated. The national-income figures used are the annual estimates prepared by the Department of Commerce; the import figures are from the official series referred to as United States

¹The writer is indebted to Messrs. J. H. Adler, Howard S. Ellis, Walter Gardner, Alexander Gerschenkron, and Lloyd Metzler for cooperation and advice.

²The British balance-of-payments problem is briefly analyzed in an appendix to this report.

"imports entered for consumption." In order to adjust the value of imports to reflect more accurately the cost of imports to American consumers, customs duties (which during this period varied from between 13.2 and 19.8 per cent of total imports) were added to the import figures.¹

As would be expected, there is a positive correlation between imports and national income. Moreover, the correlation is high, the linear correlation coefficient being +.95. Indeed, the correlation is so high that one is tempted to conclude that national income is the only important variable affecting the level of imports and to assume that the level of imports at high levels of income can be reliably estimated by extrapolating the regression line.² This, however, would imply that changes in the level of import prices have little effect on the level of imports, and can be disregarded in making predictions.³ Actually, certain irregularities in Chart I suggest that national income is not the only important variable affecting the value of imports. By connecting, in chronological order, the points on the diagram, it becomes clear that the value of imports was high in relation to national income during the period 1922-27 and low in relation to national income during the period 1934-37. Is it possible that this pattern was in some way related to the level of import prices? To answer this question, an index of import prices was correlated with national income, and the points in the scatter-diagram were connected in chronological order.⁴ The result, shown in Chart II, is most striking. Import prices, it will be seen, were high in relation to national income during those years (1922-27) when the value of imports was high in relation to national income, and were low relative to national income when the reverse was true (1934-37). This at once suggests that the price elasticity of the American demand for imports is less than unity, since, at a given level of income, the value of imports is high when import prices are high and is low when import prices are low.

In Chart III, the "quantity" of imports (i.e., the value of imports at 1937 prices) is correlated with national income.⁵ As would be expected,

¹Figures for both imports and customs duties were taken from the Statistical Abstract of the United States, 1941, p. 527.

²The regression line in Charts I, II, III, and V was fitted to the data by the method of least squares.

³Only if the price elasticity of demand for imports were unity would the value of imports be unaffected by changes in the level of import prices.

⁴The import price index here used is that found in the Statistical Abstract of the United States, 1941, p. 532 (figures for the years preceding 1930 are taken from the Department of Commerce publication, Foreign Trade of the United States, 1934, p. 38). For our purpose, an adjustment in the index was made to allow for changes in customs duties. This was accomplished by multiplying the index by the quotient of value of imports plus customs duties, divided by value of imports. The base of the index was then changed to the year 1937.

⁵Figures for quantity of imports were derived by multiplying, for each year, an index of quantity (the base of which had been changed to 1937) by the value of imports for 1937. The import quantity index was obtained from the same sources (same pages) as the import price index.

the pattern is the reverse of that in Chart II; when import prices are high in relation to national income (as during most of the twenties), the quantity of imports is low relative to national income, and the reverse is true when import prices are low relative to income (as during the middle thirties).

Effect of Changes in Import Prices on American Imports

In order to obtain a clearer idea of the influence of price on imports, it will be helpful to abstract, statistically, from the influence of national income. One way of accomplishing this is the method of multiple correlation. We shall employ this method shortly, but before doing so will resort to another method that may have already suggested itself to the reader.

If quantity of imports and import prices are plotted on the same diagram, it will be found that a positive, rather than a negative, correlation between the two variables results. This is due to the preponderant influence of changes in national income. Both quantity of imports and import prices tend to be high in periods when national income is high and low when national income is low. If, however, national income were to remain unchanged, one would expect a negative correlation between quantity of imports and the level of import prices. One way of testing this presumption is to correlate the deviations from the regression line in Chart II with the deviations from the regression line in Chart III. This is done in Chart IV. The result, it will be noted, is a striking negative correlation, revealing unmistakably that, besides being sensitive to changes in national income, the quantity of imports is also sensitive to changes in price.

Is it possible, from the deviation figures in Chart IV, to construct a demand curve for American imports? Such an attempt is made in Chart V, in which absolute figures are substituted for the deviation values. The major problem in constructing this curve was to derive two figures--one for quantity and one for price--to which to add (algebraically) the deviations plotted in Chart IV. These figures were obtained as follows: In the original data, the year 1937 was used as a base for both quantity and price; the quantity of imports was defined as the value of imports at 1937 prices, and the price index number for 1937 was set at 100. Thus in Chart V, the price and quantity figures for 1937 are simply the original figures (3.01 billion dollars for volume and 100 for price). By subtracting (algebraically) the 1937 volume deviation from the 1937 volume figure and the 1937 price deviation from the 1937 price figure, we obtain two figures (2.55 billion dollars and the index number 137.6), to the first of which can be added the quantity deviations and to the second the price deviations. Plotting the resulting sums, we obtain the curve found in Chart V.

This curve may be interpreted as a demand curve for American imports on the assumption that national income is at the 1937 level. The negative correlation between price and quantity is high ($-.92$), and the mean elasticity of the curve within the range of observations is well under unity ($-.57$).

A more elegant, and in some respects more reliable, method of ascertaining the manner in which the quantity of imports reacts to changes in national income and in the import price level is the method of multiple correlation. By this method can also be determined the degree to which changes in the volume of imports are explained by changes in national income and in import prices. That changes in the latter two variables account very largely for changes in the quantity of imports is revealed by the high "coefficient of multiple correlation" obtained for the three series over the period covered. Variations in the volume of imports would be completely accounted for by changes in national income and in import prices if this coefficient were 1.0; actually, the coefficient is .97.

The degree to which changes in the quantity of imports are explained (1) by changes in the import price level when national income remains unchanged or (2) by changes in national income when import prices remain unchanged can be expressed statistically by "coefficients of partial correlation." These coefficients, for the period covered in this study, are both very high. The partial coefficient showing the correlation between quantity of imports and national income when the import price level is held constant is +.97, and the coefficient showing the correlation between quantity of imports and import prices when national income is held constant is -.92. As would be expected, the latter correlation is negative, indicating that, at a given national income, the quantity of imports varies inversely with price.

Estimate of American Imports at High Levels of National Income

In multiple correlation, an equation is obtained in which, by inserting any given values for the independent variables (in this case national income and the import price level), the value of the dependent variable (in this case quantity of imports) can be estimated.¹ If the coefficients of multiple and partial correlation are high, as they are in this case, one can be confident that the actual value of the dependent variable will not be far from the estimated value, provided the values for the independent variables are within the range of the original data. When the values of the independent variables are outside the range of observed cases, one cannot, of course, rest assured that the estimated value of the dependent variable will approximate the actual value, but even in this situation the estimating equation may provide the basis for a good guess.

The ensuing estimates rest on this presumption. It is assumed that the war has not substantially altered the relationship of national income and import prices to the quantity of imports, and it is also assumed that the same relationship holds true for levels of national income well above the level of any pre-war year.

¹The equation obtained in this case may be expressed as follows:
 $X_1 = .8759 + .0408X_2 - .0090X_3$, where X_1 represents volume of imports, X_2 national income, and X_3 the level of import prices.

Employing the estimating equation obtained from multiple correlation, we can construct a table showing the value of imports to be expected at various levels of national income and at various levels of import prices. This is done in Table I.

TABLE I
ESTIMATED UNITED STATES IMPORTS
(Billions of Dollars)

National Income	Level of Import Prices (1937 = 100)					
	100	110	120	130	140	150
70	2.8	3.0	3.2	3.3	3.5	3.6
80	3.2	3.5	3.7	3.9	4.0	4.2
90	3.6	3.9	4.2	4.4	4.6	4.8
100	4.1	4.4	4.6	4.9	5.2	5.4
110	4.5	4.8	5.1	5.4	5.7	6.0
120	4.9	5.3	5.6	6.0	6.3	6.6
130	5.3	5.7	6.1	6.5	6.9	7.2
140	5.7	6.2	6.6	7.0	7.5	7.9
150	6.1	6.6	7.1	7.6	8.0	8.5

Since the price elasticity of the American demand for imports is less than unity, the value of imports rises, not only with national income, but with the level of import prices. As the above table shows, the extent of the increase in value of imports as the other two variables rise is rather spectacular. At a national income of 70 billion dollars (slightly below the 1937 level of 71.5 billions), and at the 1937 level of import prices, annual imports amount to 2.8 billion dollars. At a national income of 120 billions, and at a level of import prices 30 per cent higher than that of 1937, the estimated level of imports is exactly double the 1937 level of 3.0 billion dollars.

Effect of High American National Income on British Exports

How shall we estimate the post-war level of American imports from Britain? The simplest and perhaps the best procedure is to apply to the estimates in Table I the pre-war ratio of American imports from Britain to total American imports. Actually, this ratio varied considerably during the inter-war period. During the years 1923-29, imports from Britain amounted to 9.1 per cent of total American imports; during the years 1933-38, to 7.1 per cent. Annual figures for the period 1923-38 ranged from as high as 10.8 per cent (1923) to as low as 5.6 per cent (1932). The average for the sixteen years was 8.2 per cent, which coincides with the figure for 1936. Table II contains estimates, at various levels of

income and of import prices, of American imports from Britain on the conservative assumption that such imports amount to 7 per cent of total American imports as estimated in Table I.

TABLE II
ESTIMATED UNITED STATES IMPORTS FROM BRITAIN

(Millions of Dollars)

National Income ^a	Level of Import Prices (1937 = 100)					
	100	110	120	130	140	150
70	198	211	223	233	242	250
80	227	242	257	270	282	293
90	255	274	291	307	322	336
100	284	305	325	344	362	378
110	312	336	360	381	402	421
120	341	368	394	418	442	464
130	369	399	428	456	482	507
140	398	431	462	493	522	549
150	426	462	497	530	562	592

^aBillions of Dollars

The figures in Table II represent an estimate of what we may call the direct effect of an increase in American national income on British exports. As already pointed out, there is also an indirect effect--i.e., the effect of an increase in American imports on British exports via third countries. An increase in American imports provides the rest of the world with exchange resources, a part of which may be expected to be converted into sterling and used to purchase British exports. While the extent of this indirect effect is a matter of conjecture, it would appear reasonable to assume that the fraction of an addition to the rest of the world's exchange resources that would be spent on British exports would approximate the pre-existing fraction of the rest of the world's imports that come from Britain.¹ The latter fraction can be readily estimated from figures provided by the League of Nations in its publication, The Network of World Trade. Figures are available for the years 1928, 1935, and 1938. The numerator of the fraction is simply British exports minus exports to the United States, and the denominator is world imports minus total American and British imports. The fraction appears to be rather stable; expressed as a percentage, it is 14 per cent for each of the three years.

¹By "rest of the world" is here meant the world minus the United States and Britain.

Table III contains estimates, for various levels of American income and of import prices, of the amount of imports purchased from Britain by countries other than the United States as a result of American purchases from these countries. The estimates are obtained by taking 14 per cent of estimated total American imports other than from Britain (i.e., 14 per cent of the difference between the figures in Table I and the figures in Table II).

TABLE III

ESTIMATED IMPORTS FROM BRITAIN ATTRIBUTABLE TO
UNITED STATES IMPORTS FROM THIRD COUNTRIES

National Income ^a	(Millions of Dollars)					
	Level of Import Prices (1937 = 100)					
	<u>100</u>	<u>110</u>	<u>120</u>	<u>130</u>	<u>140</u>	<u>150</u>
70	368	393	414	433	450	465
80	421	451	478	502	525	545
90	475	509	542	571	599	624
100	528	568	605	640	673	704
110	581	626	669	709	747	783
120	634	684	732	778	822	863
130	687	743	796	847	896	943
140	740	801	860	916	970	1,022
150	793	859	923	985	1,045	1,102

^aBillions of dollars.

In comparing Table III with Table II, it is interesting to observe that the estimated indirect effect on British exports of an increase in American national income is much greater than the estimated direct effect. By adding the two together, we secure an estimate of the total amount of imports from Britain that can be traced, directly or indirectly, to the American economy. Sums of the two sets of figures (the figures of Table II plus the figures of Table III) are shown in Table IV.

Table V shows the estimated total increase in imports from Britain resulting from an increase in American national income above the level of 70 billion dollars (approximately the level of 1937). In order to present the matter from the British point of view, the figures are converted into pounds sterling at the current official exchange rate of 4.035 dollars per pound.

The figures in Table V strongly support the British contention that the United States can contribute greatly to the solution of the

TABLE IV

ESTIMATED IMPORTS FROM BRITAIN DIRECTLY AND INDIRECTLY
ATTRIBUTABLE TO THE AMERICAN ECONOMY

(Millions of Dollars)

National Income ^a	Level of Import Prices (1937 = 100)					
	100	110	120	130	140	150
70	567	604	637	666	692	715
80	648	693	735	772	807	837
90	730	783	833	878	921	960
100	811	873	930	985	1,035	1,082
110	893	962	1,028	1,091	1,149	1,204
120	975	1,052	1,126	1,197	1,264	1,327
130	1,056	1,142	1,224	1,303	1,378	1,449
140	1,138	1,232	1,322	1,409	1,492	1,572
150	1,219	1,321	1,420	1,515	1,606	1,694

^aBillions of dollars.

TABLE V

ESTIMATED INCREASE IN IMPORTS FROM BRITAIN RESULTING FROM
INCREASE IN AMERICAN NATIONAL INCOME ABOVE 1937 LEVEL

(Millions of Pounds)

National Income ^a	Level of Import Prices (1937 = 100)					
	100	110	120	130	140	150
70	0	9	17	25	31	37
80	20	31	42	51	60	67
90	40	54	66	77	88	97
100	61	76	90	104	116	128
110	81	98	114	130	144	158
120	101	120	139	156	173	188
130	121	143	163	182	201	219
140	142	165	187	209	229	249
150	162	187	212	235	258	279

^aBillions of dollars.

British balance-of-payments problem simply by maintaining domestic prosperity. At a national income of 140 billion dollars (about 12 per cent below the current level), and at an import price level 30 per cent greater than in 1937, the increase in imports from Britain would probably be sufficient to cover well over half the annual British deficit.

These estimates, however, rest on two assumptions. It is assumed that the United States does not raise tariffs above present levels, and it is assumed that international trade is conducted on a multilateral basis. The indirect effect (the effect via third countries) of an increase in American imports depends, of course, on the second assumption, and it should be remembered that, quantitatively, the indirect effect appears to be considerably more important than the direct effect (i.e., the increase in American imports from Britain). But both indirect and direct effects depend on the first assumption that the United States does not raise tariff barriers.

APPENDIX

THE BRITISH BALANCE-OF-PAYMENTS PROBLEM

The average annual British balance of payments for the three-year period 1936-38 was as follows:

BRITISH BALANCE, 1936-38

(Millions of Pounds)

<u>Debits</u>		<u>Credits</u>	
Imports ^a	950	Exports ^a	563
Government payments	7	Investment income	203
		Shipping income	105
		Other income	43
		Deficit	43
	<u>957</u>		<u>957</u>

^aIncludes silver bullion and specie. Exports include re-exports.

How has the war changed this picture? It is estimated that income from foreign investments has fallen by about half. The post-war shipping situation is decidedly obscure, but there are reasons to hope that British shipping income will remain about the same as before the war. Let us assume that this is the case, and let us make the same assumption in regard to "other income."

To estimate the deficit which, in the absence of borrowing, will have to be met either by a reduction in imports or by an increase in exports, let us assume that the post-war volume of exports and of imports remains at the 1936-38 level. Even though volume remains unchanged, the value of exports and imports will, for a period at least, be higher as a result of higher prices. At the present time, British wholesale food prices are more than 60 per cent higher than in 1938, and the same is true of British wholesale prices as a whole. Let us make the conservative assumption that both import and export prices in the immediate post-war period are 30 per cent higher than in 1936-38. (This assumption is favorable in that it implies no deterioration in British terms of trade.)

One further adjustment remains to be made. Britain during the course of the war has incurred a huge external debt in the form of blocked sterling balances. The exact amount of this debt is a matter of conjecture, but estimates (as of the end of 1944) run as high as 3 billion pounds.¹ Let

¹Lord Keynes, in the New York Times for July 7, 1944, was quoted as saying that blocked sterling balances will amount to \$12,000,000,000 (£3,000,000,000) by the end of this year.

us assume that, as a result of agreement, the sterling debt is retired at the rate of £100,000,000 a year.

Our balance now appears as follows:

ESTIMATED POST-WAR BRITISH BALANCE OF PAYMENTS

(Millions of Pounds)

<u>Debits</u>		<u>Credits</u>	
Imports	1,235	Exports	732
Government payments	113	Investment income	100
		Shipping income	105
		Other income	43
		Deficit	368
	<u>1,348</u>		<u>1,348</u>

On the above assumptions, we derive an annual balance-of-payments deficit of over ~~three and a half~~^{3.5} million pounds. In principle, this deficit could be met by a reduction in imports, and it is possible that substantial curtailment of imports may occur. It should be pointed out, however, that the British demand for imports appears to be highly inelastic, both with respect to price and with respect to national income, as the following table shows:

INDEX OF PER CAPITA VOLUME OF BRITISH IMPORTS

(1929 = 100)

1924	89	1929	100	1934	93
1925	92	1930	97	1935	94
1926	96	1931	100	1936	100
1927	98	1932	87	1937	105
1928	95	1933	88	1938	100

It will be seen that, despite wide variations in prices and in national income during the above years, the per capita volume of British imports varied but little. It is interesting to observe that per capita real imports were the same in such widely divergent years as 1929, 1931, 1936, and 1938. Thus it would seem that, in the absence of borrowing, the British deficit will have to be met, in the main, by a marked expansion of exports.

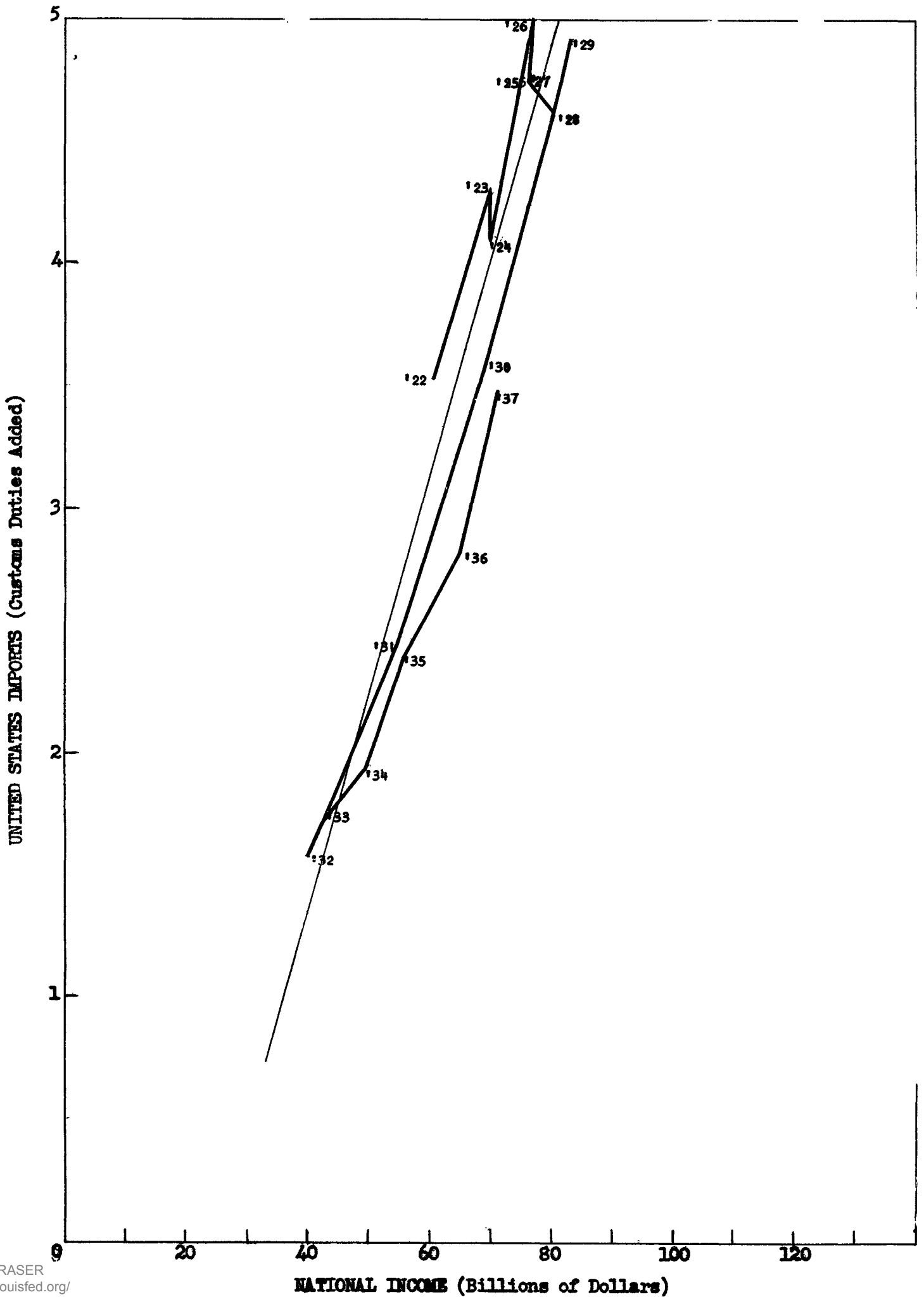
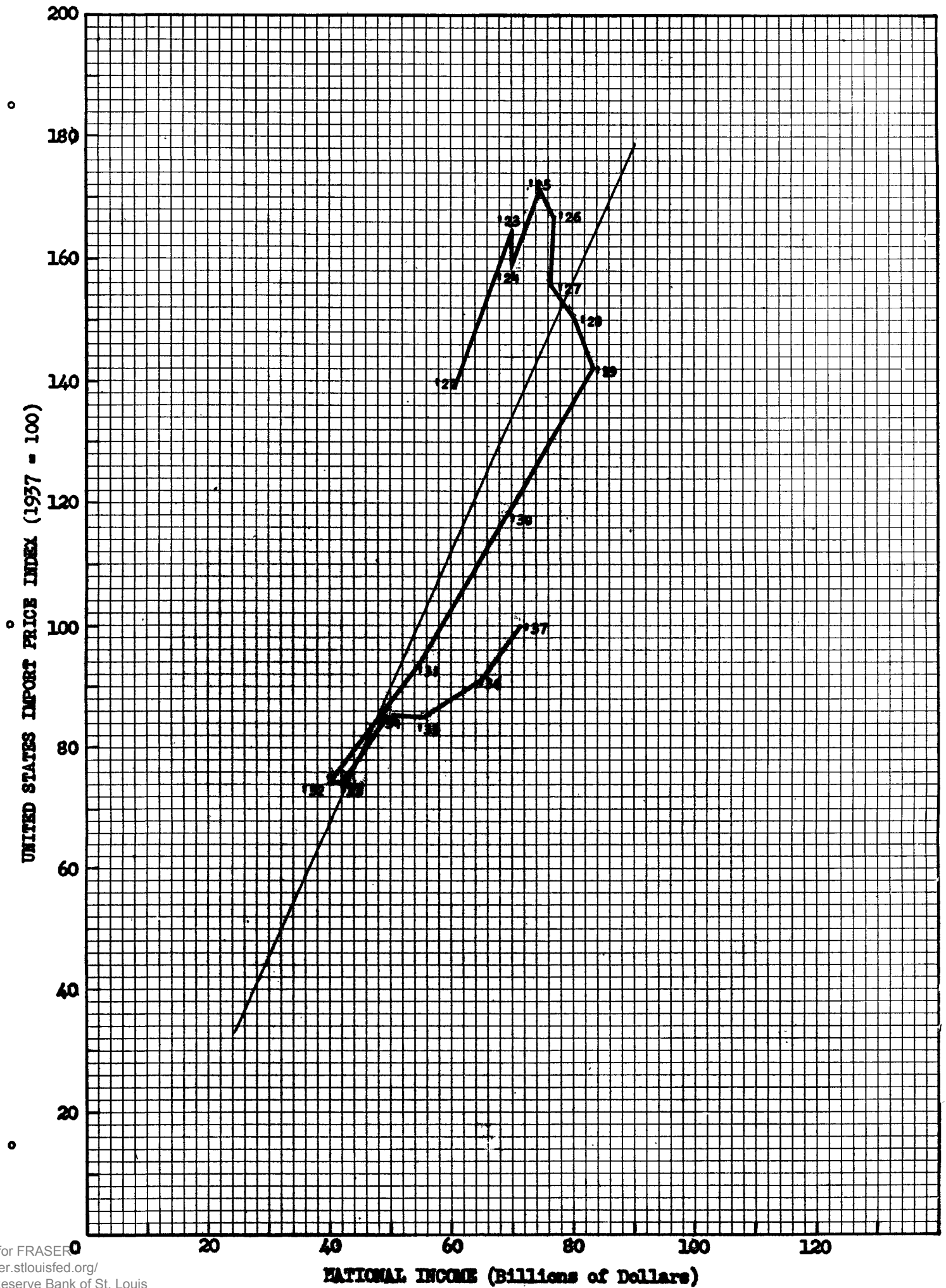
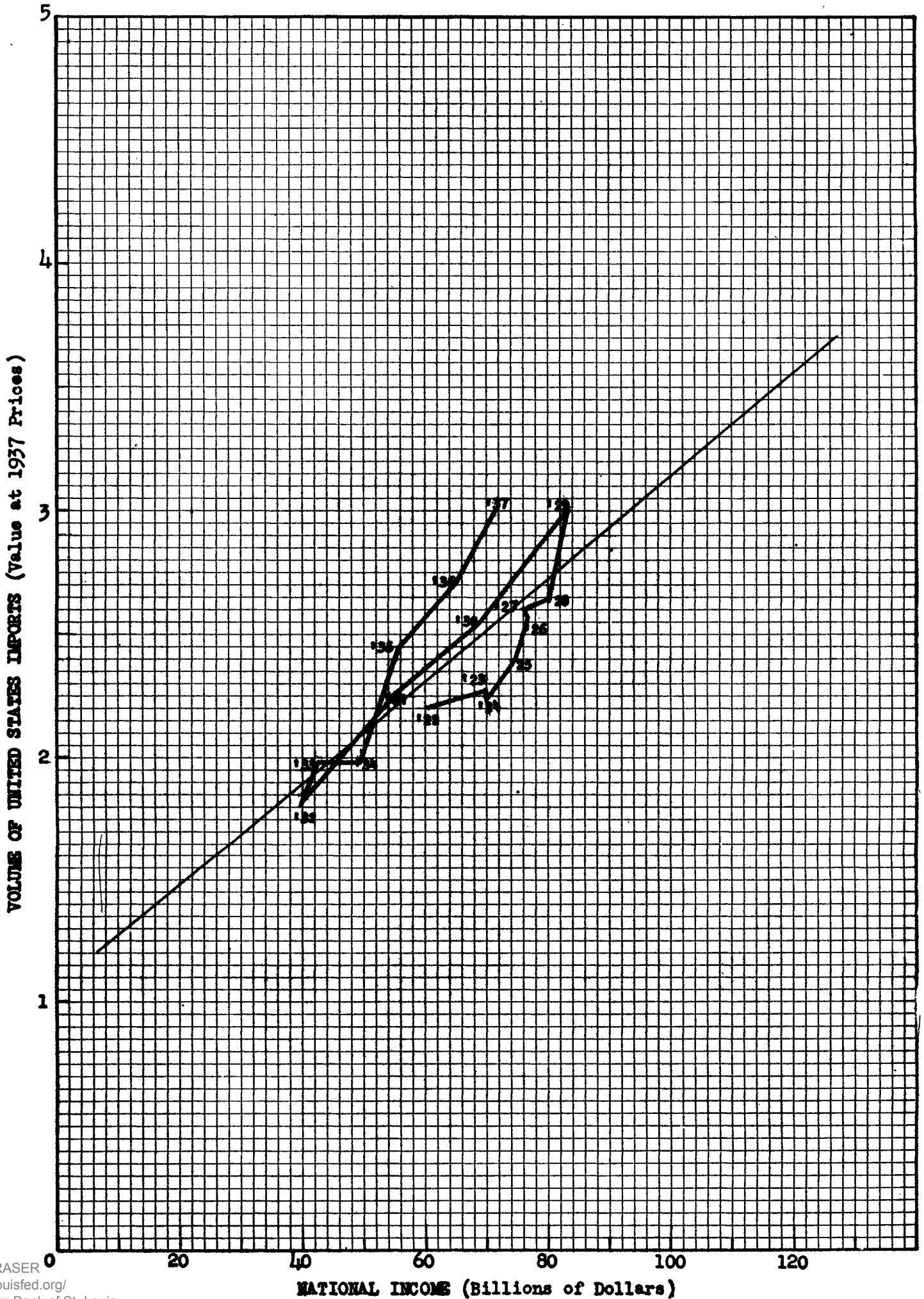


CHART II

NO. 3267. 10 DIVISIONS PER INCH BOTH WAYS. 70 BY 100 DIVISIONS.





NO. 3267. 10 DIVISIONS PER INCH BOTH WAYS. 70 BY 100 DIVISIONS.

CHART IV

NO. 3287. 10 DIVISIONS PER INCH BOTH WAYS. 70 BY 100 DIVISIONS.

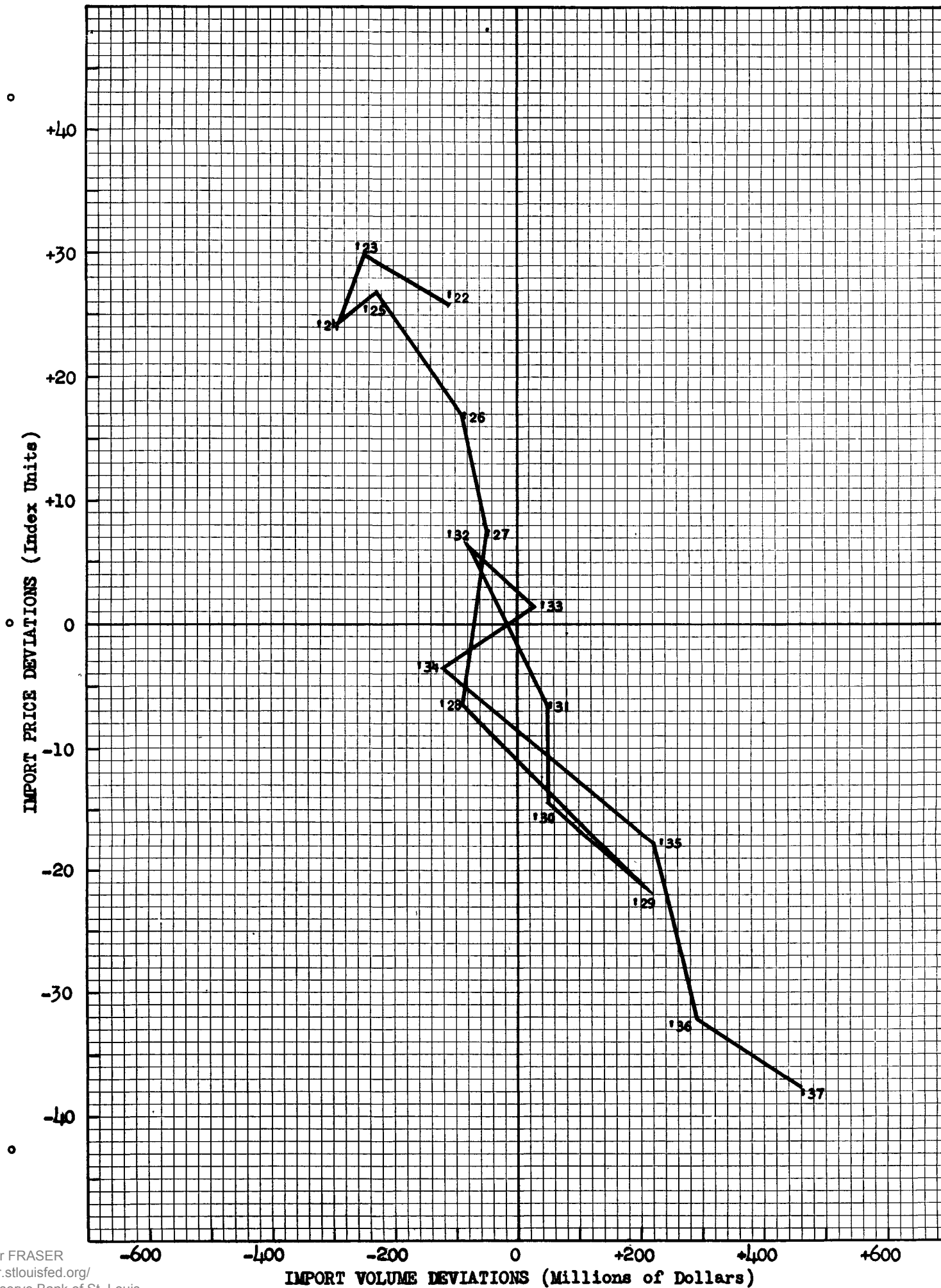


CHART V

NO. 3287. 10 DIVISIONS PER INCH BOTH WAYS. 70 BY 100 DIVISIONS.

