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THE DEMAND FOR BICYCLES IN THE NETHERLANDS¹

By J. B. D. DERKSEN AND A. ROMBOUTS

CONSECUTIVELY we shall discuss:

- a. The demand for bicycles. Attention will be paid:
 1. To the structural development of the use of bicycles in our country;
 2. To the influence of the trade cycle upon demand.
- b. The home production and the imports of bicycles into the Netherlands. The chief factors which determine their interrelation are investigated.
- c. The exports of bicycles from the Netherlands.

I. THE DEMAND FOR BICYCLES

In considering the demand for an article such as the bicycle, we have to distinguish between the *demand for replacement* of bicycles put out of use because of defects, etc. and the *demand for new purchases* (i.e., by new consumers).

TABLE 1
DEVELOPMENT OF THE USE OF BICYCLES IN THE NETHERLANDS

Year	Number of bicycles (thousands)	Population (January 1) (thousands)	Bicycles per 1000 inhabitants	Year	Number of bicycles (thousands)	Population (January 1) (thousands)	Bicycles per 1000 inhabitants
1899	94	5,075	19	1917	859	6,583	131
1900	113	5,140	22	1918	872	6,725	129
1901	133	5,179	26	1919	861	6,799	127
1902	159	5,263	30				
1903	188	5,347	35				
1904	227	5,431	42	1925	1,811	7,315	248
1905	274	5,510	50	1926	2,223	7,416	300
1906	325	5,591	58	1927	2,266	7,526	301
1907	378	5,672	66	1928	2,325	7,626	305
1908	435	5,747	76	1929	2,485	7,731	321
1909	487	5,825	84	1930	2,627	7,832	335
1910	540	5,898	92	1931	2,755	7,953	346
1911	592	5,946	100	1932	2,834	8,062	352
1912	647	6,022	108	1933	2,893	8,183	354
1913	708	6,114	116	1934	3,020	8,290	364
1914	767	6,213	123	1935	3,206	8,392	382
1915	789	6,340	124	1936	3,363	8,475	397
1916	811	6,449	126				

¹ This paper contains the results of a study made in the Section for Research of the Business Cycle of the Netherlands Central Bureau of Statistics, The Hague, Holland. We may mention here the numerous investigations made by this Bureau by or under direction of Prof. Tinbergen (now in Geneva) and published in *De Nederlandsche Conjunctuur*. We are much indebted to Mr. J. M. Fleming, Geneva, for his kindness in correcting the English manuscript.

It should be emphasized that these categories concern the population as a whole. Therefore it is of no importance to our investigation if someone sells his bicycle to somebody else, who makes further use of it.

It follows from the definition that the new purchases in any year are equal to the increase of the total number of bicycles in use. For each year this number can be seen from the statistics on taxes, except for the period 1919–1924, when no tax was imposed on bicycles. The figures are shown in Table 1, which also gives the number of bicycles per 1000 inhabitants. Whereas this number was 248 per 1000 in 1925, it is now 397 per 1000 and there are no signs yet that this rapid increase will come to an end.

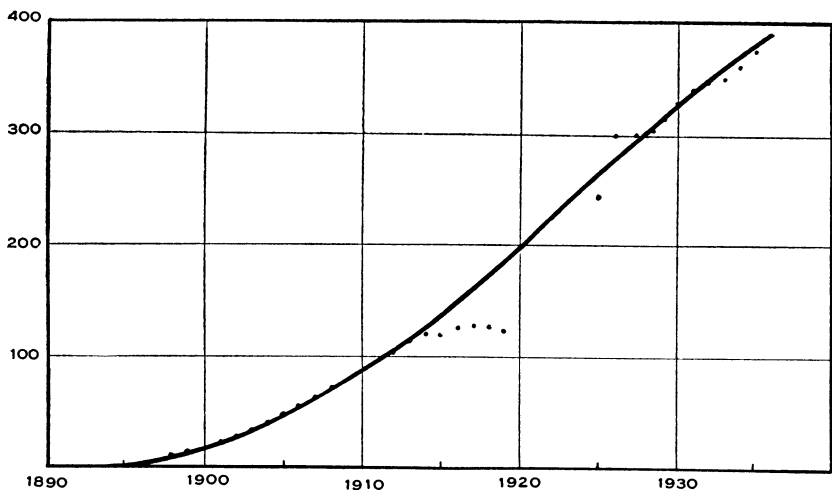


FIGURE 1.—Number of bicycles per 1000 of the population. The true figures are represented by dots to which the smooth curve was fitted.

Figure 1 shows a graph of the numbers of bicycles per 1000 inhabitants since 1890, when bicycles came in use. The figures in Table 1 are represented by dots, to which the smooth curve was fitted as a freehand curve. The curve has the well-known form of a saturation curve, $p = 100/(1 + e^{-\beta t})$, as observed in a number of other cases, e.g., for automobiles in U.S.A.²

From Figure 1 we may conclude that the market in Holland is not yet saturated.

One may naturally ask, whether this can be expected within a short time, which is practically the same as asking at what point saturation will be attained. A reliable result cannot be obtained as only too small a part of the saturation curve is known.

² Cf. *De Nederlandsche Conjunctuur*, Nov., 1936, p. 18.

We may guess at about 550 bicycles per 1000 inhabitants as the saturation point, an estimate which is supported by the data for Denmark, where the number of bicycles is estimated at 2 millions on a population of less than 4 millions.

The annual new purchases can be calculated from the increase of the total number of bicycles in use, which number may be derived from tax figures. This increase will be smaller than the sales. The difference between total sales and increase of the number of bicycles in use represents the number of bicycles for replacement. Those figures are found in Table 2.

TABLE 2
THE STRUCTURE OF THE DEMAND FOR BICYCLES

	1927	1928	1929	1930	1931	1932	1933	1934	1935
Total sales (in thousands)	318	366	395	390	318	299	417	419	403
New purchases	59	160	142	128	79	59	127	186	157
Replacement purchases	259	206	253	262	239	240	290	233	246

From Table 2 we may conclude that the greater part of the sales is required for replacement. By the time the number of bicycles has ap-

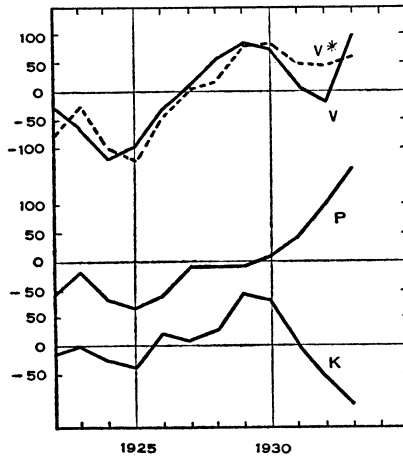


FIGURE 2.— V = total annual consumption.
 V^* = the same, as calculated from formula (1).
 P = influence of the price upon consumption.
 K = influence of the purchasing power upon consumption.

All variables are represented as deviations from their average during 1922-1933.

proached the level of saturation, the new purchases will have begun gradually to decrease. So long as the population grows, a certain number of new purchases will be necessary.

From the figures given in Tables 1 and 2 we may calculate that the mean length of life of a bicycle amounts to 8 or 9 years.

After the above explanation of the structure of the demand for bicycles, we will now investigate how far the annual consumption of bicycles is influenced by the trade cycle. The result of the calculation was that the price of bicycles and the real income of the consumers are the most important factors influencing consumption. The following relation was derived from the data of the period 1922–1933:

$$(1) \quad V = 11.2K - 8.6P - 379.$$

In this formula V represents the total annual consumption of bicycles (in thousands), K is an index of the purchasing power of the consumers, and P the price of bicycles (in guilders). From Figure 2 can be seen that the above formula gives a satisfactory explanation of the course of consumption (the correlation coefficient turned out to be 0.88). In considering the course of the true and the calculated con-

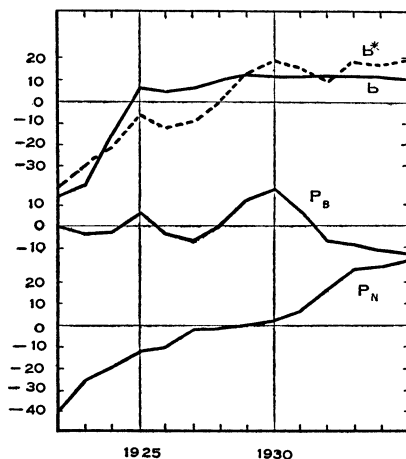


FIGURE 3.— b = annual home production as a percentage of total consumption.

b^* = the same, as calculated from formula (2).

P_N = influence of the price of Dutch bicycles.

P_B = influence of the price of foreign bicycles.

All variables are represented as deviations from their average during 1922–1935.

sumption one should remember that, because of the gaps in the available statistics, it was impossible to take into account such circumstances as irregularities in the demand for replacement caused by the stagnation of consumption during the war.

From formula (1) we can calculate that the elasticity of demand amounts to about 1.3.

TABLE 3

	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935
Purchasing power	99.6	101.0	98.4	97.4	102.8	102.1	104.6	109.5	108.8	102.4	96.6	91.9		
Price of foreign bicycles (in gld.)	39.4	34.2	35.7	44.8	35.5	30.3	39.8	53.9	58.5	48.1	30.0	29.0	24.8	23.7
Price of Dutch bicycles (in gld.)	88.9	75.4	69.4	62.6	61.1	54.9	53.7	52.9	51.6	47.0	40.3	32.1	29.7	28.2
Average price of all bicycles (in gld.)	59.1	53.8	59.6	61.5	59.1	52.8	53.2	52.9	51.6	47.0	40.0	32.0	29.6	28.1

TABLE 4

HOME PRODUCTION, IMPORTS, AND EXPORTS OF BICYCLES (IN THOUSANDS)

	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935
Home production	117	121	139	213	266	308	374	403	397	321	296	415	416	399
Imports	166	129	57.8	13.7	22.6	22.6	10.4	4.2	2.5	2.8	5.4	4.9	5.7	6.6
Exports	6.8	7.1	11.0	15.5	13.1	12.5	18.3	12.7	9.1	5.2	2.7	3.4	3.6	3.2

TABLE 5

IMPORTS OF BICYCLES FROM GREAT BRITAIN AND GERMANY

	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935
From Great Britain:														
Number of bicycles (thousands)	18.1	11.5	9.6	5.3	3.7	3.5	3.5	2.2	1.6	1.5	4.1	3.0	3.6	5.1
Average price (in gld.)	64.7	61.0	58.1	60.9	61.9	63.3	57.1	60.5	65.8	59.3	31.5	33.0	28.3	26.9
From Germany:														
Number of bicycles (thousands)	147	114	44	6.7	11.1	17.3	4.8	0.7	0.2	0.4	0.4	0.3	0.2	0.1
Average price (in gld.)	36.0	31.0	29.7	30.5	26.5	22.5	24.2	38.8	42.9	25.1	22.5	28.1	26.7	27.3

II. THE HOME PRODUCTION AND THE IMPORTS OF BICYCLES

The Dutch bicycle manufacturers have succeeded in making headway against foreign competition. Whereas in 1922 the greater part of the bicycles was imported, the share of imports in total consumption was less than 2 per cent after 1930 (Table 4). Further investigation showed that the interrelation between home production and imports can be chiefly explained by the prices of foreign and Dutch bicycles (Figure 3). This relation is shown by the following equation:

$$(2) \quad b = 87 + 0.77 (P_B - 38) - 1.22 (P_N - 53),$$

in which b is the home production as a percentage of total annual consumption, and P_N and P_B the average price of Dutch and foreign bicycles respectively.

The correlation coefficient was found to be 0.90.

This figure, however, may be affected by the circumstance that differences in quality could not be taken into account, as the available statistics do not give any information to this point. From the figures on the imports of bicycles from Great Britain and Germany, given in Table 5, it follows that the differences in quality are probably not insignificant.³

At the base of the development of the Dutch bicycle industry there is a high degree of rationalization, consisting principally in standardization. In connection with the fact that the necessary semi-finished articles and parts are now also made in Holland, this rationalization has made possible an important price reduction.

III. THE EXPORTS OF BICYCLES

The exports of bicycles from the Netherlands are not very important. They have declined since 1928 and now amount to less than 1 percent of the total home production. The main part is destined to the Netherlands East Indies and has to compete there with imports from Great Britain and for some years especially from Japan. On the other hand the imports of German bicycles have declined.

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³ It may be observed that a curvilinear regression would have given a closer relationship.