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Résumé. Concentration et technologie de la pêche pavie grecque. *L'industrie grecque des pêches de conserve a connu un développement rapide depuis 1978. La Grèce est aujourd'hui le deuxième pays producteur et le premier exportateur mondial. Ce développement est lié à l'importance des investissements réalisés, à la modernisation de l'industrie, au faible degré de concentration et à l'extension des vergers.*

Abstract. The cling peach industry is a fast-growing agricultural sector in Greece. This growth is associated with the competitiveness of Greek cling peach, low concentration, and intensive investment in fixed assets.

Key words. Peach – Canned fruit – Technology – Greece.

Introduction

The growth of Greece's cling peach industry between 1979 and 1987 is attributed to low concentration and technological progress in the sector. The paper examines this relationship, using 1988 as the base year for comparisons.

The cling peach industry with about 30 firms is one of the largest food industries in Greece. It is an export-oriented sector. The value of exports represent nearly 90% of the total output value of the industry. Greek exports to other EC countries increased substantially from 74 609 t to 126 018 t of the final product, which represents an increase from 36% to 62% of the total EC imports *(Table 1)*. Greece recently became the first exporter and the second producer of cling peach in the world (Ministry of Agriculture, 1988 and 1989). A special characteristic of the industry is that nearly 90% of the peach farms and processing plants are concentrated in three counties of northern Greece (Hmathia, Pella, Pieria).

I. – Importance of the Greek cling peach industry in the EC

While total EC imports of canned cling peach remained stable at about 200 000 t during 1979–1988, Greek exports during the same period increased considerably by 69% *(Table 1)*. Greece has supplied more than 50% of total EC imports since 1982 as it has increased its exports both in relative and absolute terms to each EC country (except Italy).

During the 1980s, Germany, the UK, France, and The Netherlands were the largest importers of Greek canned peach *(Table 2)*. Greece supplies more than half the total canned peach imported by each country in recent years. It is the main exporter to certain Mediterranean competitors such as Italy and France; Spain and Portugal do not import any canned peach from Greece. Their entry in the EC did not affect Greek exports to the Community. The share of imports from Greece even increased from 59% to 62% between 1986 (when Spain and Portugal entered the EC) and 1988.

1. Growth

The canned peach industry grew rapidly in Greece as evidenced by the substantial increase in the value of output and exports (corresponding to more than 4% of the total value of agricultural exports in 1987 *(Table 3)*.

Individual firms also increased their real fixed assets and output *(Table 4)*. The index (1985 = 100) of fixed assets increased from 116.06 to 150.33 between 1979 and 1987. The average fixed asset growth rate for the industry was about 3.8% compared with –3.7% for all other industries *(Table 5)*.

Output indices show a substantial increase from 116 to 150 between 1979 and 1987—with an average annual growth rate of 9.4%—while the corresponding average figure for the entire food industry shows a marginal decrease over the same period *(Table 5)*.

Fast growth of fixed assets and output during 1979–1987 made Greece one of the leading exporters of canned peach among EC and other countries.

2. Concentration

Concentration is usually regarded as a significant dimension of market structure, because it is thought to play an important role in determining market power, hence business behavior and performance. A conventional measure is the *Herfindahl Index (HI)*: $H = \sum Si^2$, where *Si* is the share of fixed assets or output in firm *i* within the total fixed assets or output of all firms. The upper bound is equal to 1 and the lower bound approaches 0 (when there are large numbers of small equal-sized firms); the index rises as concentration increases. The other index, *CR4*, is the concentration ratio which is defined as the percentage of total fixed assets or output for the four largest firms (Oustapassidis, 1988; Hay and Morris, 1985).

The *Herfindahl Index* and *CR4* of the cling peach industry were computed from 1979 to 1987 *(Table 6)*. There is a marginal increase from 0.04 to 0.05 in *HI* based on fixed assets and a marginal decrease from 0.06 to 0.05 in *HI* based on output. The same trends were repeated for the *CR4* indices based on fixed assets and output.

The marginal changes and repetition of the same pattern during the period indicate that there is a rather low level of concentration which remains stable. This shows that there is no large monopoly power in this industry.

There was a marginal increase in the number of firms from 27 to 30 between 1979 and 1987. Concerning the exits and entries of firms in the industry, there is considerable annual fluctuation in the number (0 to 10) *(Table 6)*. This mobility in the industry indicates the absence of strict entry barriers (Curry and George, 1983). Similarly, dynamic changes in the rank of leading firms according to their size show that conditions in the industry favor competition (Cort,1983).

Fast growth, low concentration, absence of entry barriers, and mobility among the leading firms are factors associated with a competitive industry. This has attracted new investors to the industry although no increase in investments was observed at national level.

3. Technology

Investments in fixed assets, mainly equipment, are expected to improve the quality of the finished products and to reduce their cost particularly for food processing firms. In a competitive industry, such investments ensure the long-term survival of a firm. A firm may lag behind its competitors in terms of

performance if it fails to keep pace with technological progress. New technology is adopted initially by a single firm to gain competitive advantage, which is reduced over time as the technology is disseminated, and competing firms also adopt the new process.

The value of fixed assets of a firm in real 1985 terms is taken as an indicator of invested capital and, consequently, of its technological level. Fixed assets of medium-size firms in the cling peach industry increased substantially from Dr366.6 million to Dr427.7 million, which corresponds to a 17–percent increase in the invested capital over the period 1979–1987. During the same period the corresponding figure for the entire manufacturing industry showed a considerable decrease in the value of investments. Given that there was no dramatic change in the identity of the firms, especially the large ones, and that they continued to use most of the old buildings and land, most of the fixed capital increase was focused on technology rather than buildings and land.

Investment in technology refers to the replacement, maintenance, and improvement of existing equipment. By using new technology the firms aim to reduce costs and improve quality of the finished product. Cost reduction necessitates the enlargement of the plant capacity through:

- Use of new equipment and replacement of old in such a way that bigger wooden boxes or bins (200–400 kg) can be used instead of old plastic ones (20 kg) at the beginning of the assembly line.
- Establishment of additional assembly lines within the same plant.
- Modern cutting technology (e.g., rotating peeling system), as this stage of removing the pit from the fruit is crucial for plant capacity and technology developed for this process is of significant importance, but these developments are quite expensive.
- More efficient pasteurization systems to increase capacity and improve quality standards. The first pasteurization system—the dripping type that is still used in most plants—has the advantage of low cost. The second system (rotary cooker) is more expensive (+100%) but is faster than the first. The third system (vacuum rotation) is the fastest but is very expensive (600% more than the first). Processing quality improves from the first to the third system.

The cost of this new equipment is high but not prohibitive for the small firms. Given the positive impact on performance, many small firms have acquired new technology in recent years. Some rather small firms that did not invest in new technology have run out of business.

Favorable conditions for competition in the industry encouraged modernization. New technology increased capacity, which in turn resulted in a substantial increase in the supply of raw material. Production of cling peach increased from 68 991 t to 246 137 t between 1979 and 1987 and had a positive effect on farmers' income.

The quality of the final product does not only depend on equipment but also on raw material quality. The government encourages cultivation of new varieties. Subsides are offered for new varieties such as:

- Vivian, Maria Serena, and Bowen as substitutes for Dixon,
- Merian, Everts, Bowen, Katherina, and Maria Serena as substitutes for Carolyn,
- Vivian, Everts, Bowen, Katherina, and Merian as substitutes for Jungerman,
- Merian, Bowen, Merian, Katherina, and Maria Serena as substitutes for Baby Gold,
- Vivian, Everts, Merian, and Maria Serena as substitutes for Harlford.

This is one of the policy instruments used by the government to persuade farmers to replace their old plants by new varieties.

Superior quality and a longer ripening period were among the crucial characteristics for the selection of new varieties. As a result, product quality improved, and the processing period was extended. In Greek conditions, the ripening period extends from 10 July to early September.

Problems related to fruit handling and collection, and rational fertilizer use have a significant effect on the quality of finished products, consumer health, and deterioration of the environment. They need more attention in the future. However, a detailed analysis of these issues is beyond the scope of this paper.

II. – Conclusion

The cling peach industry is an important export-oriented industry of the Greek agricultural sector. Greece recently became the leading exporter of cling peach to EC and world markets.

The rapid growth of the industry is linked to favorable competition conditions, low concentration, absence of entry barriers, and diffusion of modern technology. The significant increase in cling peach production at farm level in the recent years is attributed to the adoption of innovative techniques.

Small firms have the capacity to invest in new technology. The cost is high but not prohibitive for some of the medium-size and small firms that have the necessary capital for this kind of investment.

New technology improves the quality of the final product, but this also depends on the quality of raw material. Therefore, the replacement of the old peach trees by new varieties must remain a high priority. Only then can the existing position of the firms in the Greek cling peach industry be safeguarded in the EC and world markets.

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Table 1. Share of Greece in imports of canned peach by EC countries, 1979–1988

Year	Germany (%)	Italy (%)	France (%)	Neth. (%)	Belgium (%)	UK (%)	Ireland (%)	Denmark (%)	Spain (%)	Portugal (%)	Total (t)	EC (%)
1979	51	85	64	46	17	10	7	30	–	–	74 609	36
1980	48	86	69	46	22	15	17	28	–	–	75 365	38
1981	50	97	77	55	31	21	24	54	–	–	98 574	46
1982	56	97	79	59	31	28	36	82	–	–	107 616	51
1983	54	95	72	58	45	39	39	79	–	–	114 731	55
1984	66	96	77	72	52	42	22	85	–	–	123 578	61
1985	61	96	67	63	40	47	40	72	–	–	122 029	60
1986	60	86	67	63	39	50	43	80	0	0	124 626	59
1987	60	72	68	75	43	55	33	90	0	3	131 208	61
1988	60	66	69	69	44	61	21	84	0	0	126 018	62

Source: Eurostat

Table 2. EC imports of canned peach (in tons), 1979–1988

Year	Germany	Greece	Italy	France	Neth.	Belgium	UK	Ireland	Denmark	Spain	Portugal	Total EC
1979	86 355	–	–	3 944	18 456	12 164	8 152	71 061	3 105	5 051	–	208 288
1980	84 084	–	1 511	21 905	13 317	8 410	62 693	2 881	3 498	–	–	198 569
1981	85 678	–	3 779	24 525	11 078	8 570	71 282	2 693	4 758	–	–	212 392
1982	81 779	–	9 673	24 515	12 116	8 893	65 954	2 866	3 812	–	–	209 608
1983	77 770	–	14 080	23 905	13 578	8 353	63 116	2 711	5 291	–	–	208 824
1984	78 291	–	11 747	24 080	12 280	8 608	59 421	2 557	3 894	–	–	201 119
1985	74 855	–	18 818	19 896	15 280	9 032	57 529	2 853	4 691	–	–	203 224
1986	89 784	–	8 405	20 934	16 976	8 950	59 737	1 985	5 459	58	220	212 640
1987	89 232	–	5 664	21 480	18 357	9 166	63 334	2 626	6 107	94	551	216 571
1988	83 828	342	6 716	20 706	16 965	10 050	55 869	1 972	6 544	116	1 353	204 461

Source: Eurostat

Table 3. Output and exports of the Greek cling peach industry, 1979–1987[a]

	1979	1980	1981	1982	1983	1984	1985	1986	1987
Prod.	69 000	114 700	84 000	125 000	129 400	152 500	161 200	186 400	157 600
Value	4 035	6 458	5 321	7 077	7 325	8 776	9 323	10 282	10 067
Tot. exp.	126 962	154 667	139 619	150 147	196 413	213 586	194 791	225 578	220 230
CP exp.	3 632	5 812	4 789	6 369	6 593	7 898	8 391	9 254	9 060
% t. exp.	2.86	3.76	3.43	4.24	3.36	3.70	4.31	4.10	4.11

Sources: Ministry of Agriculture and National Statistical Service.
a. Prod.: Production of raw products in tons; Value: total value of output by the industry (in million drachmas, 1985 constant) ; Tot. exp.: total value of agricultural exports (in million drachmas, 1985 constant); CP exp.: value of canned peach exports (in million drachmas, 1985 constant); % t. exp.: percentage of value of canned peach exports in value of total exports.

Table 4. Fixed asset and output average for the Greek cling peach industry, 1979–1987

	1979	1980	1981	1982	1983	1984	1985	1986	1987
Average fixed assets[a]	366 925	296 505	291 308	398 983	401 664	295 633	266 746	354 997	427 740
Average output[a]	149 457	179 403	156 509	214 485	221 971	250 743	291 361	331 702	335 586
Number of firms	27	36	34	33	33	35	32	31	30

a. In thousand of drachmas, 1985 constant.

Table 5. Fixed asset and output indices (1985 = 100) for the cling peach industry (CP) and total manufacturing sector (TM) in Greece, 1979–1987

	1979	1980	1981	1982	1983	1984	1985	1986	1987	Average annual growth
Fixed assets of CP industry	116.06	125.05	116.03	154.25	155.28	121.22	100	128.93	156.33	3.81
Fixed assets of TM sector	125.05	114.66	100.16	94.74	100.83	95.01	100	99.53	91.73	–3.70
Output of CP industry	43.28	59.27	57.07	75.92	78.57	94.13	100	110.29	107.98	7.19
Output of TM sector	98.02	99.10	99.70	97.72	96.23	97.53	100	99.50	97.33	–.08

Table 6. Annual concentration indices for the Greek cling peach industry, 1979–1987

Index	1979	1980	1981	1982	1983	1984	1985	1986	1987
Herfindahl Index[a]									
Fixed assets	.04	.04	.05	.06	.06	.05	.04	.04	.05
Output	.06	.05	.05	.05	.05	.05	.05	.05	.05
CR4[a]									
Fixed assets	30	31	32	35	39	32	25	31	34
Output	40	31	33	32	31	30	33	33	32
Entries	0	10	2	2	2	5	4	1	4
Exits	0	1	4	3	2	4	6	2	5

a. See text for definitions.