THE ECONOMICS OF THE ISRAELI DIAMOND INDUSTRY

by

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CHAPTER I

INTRODUCTION

The Objective of This Study

This study, like most industry studies, has as its principal objective the analysis of market structure and firm behavior, in this case in the Israeli diamond polishing industry. Special emphasis will be given to the identification and evaluation of some of the forces making for the progress of the industry[1] and, in particular, the analysis of the economic influences making for the unique specialization of functions within the plant and among plants.

Probably the most immediate application of a study thus oriented is to make possible an evaluation of prevailing views of the industry as they are reflected in recent governmentally appointed commission studies, in the trade literature, and in reports of the Diamond Control Department of Israel. It thus may help to shed new light on existing government policies designed to foster the industry's development and possibly suggest as yet untried ways of achieving this objective. While

the Israeli industry in general differs in significant respects from those of the larger and more heavily industrialized countries, an attempt will be made to determine whether the diamond industry is "workably competitive" using criteria developed for the larger economies.

A secondary objective of the study is to meet the need for microeconomic studies in economic development. Economists in general, but particularly those of developing areas, including Israel, have preferred to analyze macroeconomic problems for which statistical data are more readily available, to the neglect of those of microeconomic nature. Harry Johnson expresses it as follows:

> Economic theorizing, research and policy discussion have tended to be excessively concerned with "macroeconomic" ... to the neglect of the microeconomic problems ... whose solutions are likely over the long run to be more important to the achievement of a highly productive and rapidly growing economy.[2]

Improved understanding of the inner working of industries in developing economies are therefore worthy of far more attention than they have so far received.[3]

An article in the New York Times first prompted my interest in the Israeli diamond industry, and additional investigation led to its selection as the subject of a doctoral thesis. On March 25, 1967, the New York Times carried a dispatch from Tunis headed "Growth of Israel Is Cited As Model." The dispatch was a summary of a speech delivered by Edmund de Rothschild, head of the investment banking concern in Paris, in an international seminar devoted to the development of the Mediterranean region. He hailed the contribution of small industry in modern economic development and cited the diamond industry in Israel as an example.[4]

In terms of employment and gross value of output, diamond

polishing ranks among the major industries of Israel, and is the fastest growing of all, its meteoric rise being accomplished in a very short span of time. Production is entirely export-oriented (216 million dollars in 1969), and it is the biggest foreign exchange earner of all manufacturing industries. This is so despite the low added value in this industry (about 30 million dollars in 1969), since all of its rough diamonds must be imported.

The diamond industry at the manufacturing stage approximates the classical concept of competition. Firms are numerous (over 460 in 1969), entry into the industry is very easy, brand name differentiation is absent and fixed investment per worker is very small (about 600 dollars). Employment varies from one to more than two hundred persons in one plant. The industry is also characterized by the absence of major technological requirements and there has been little change in the technology of production. It is, however, precisely these features that make analysis of the industry most rewarding. In the diamond industry we have a rapidly growing industry characterized by stiff competition to a far greater degree than most other industries in Israel.

Victor Fuchs, in his study of the American fur industry, attributes the fur industry's relative stagnation to its atomistic structure and to its existence within an economy of less competitive industries.[5] Despite similar structural characteristics the Israeli diamond industry, through government policies which Fuchs proposed for the American fur industry, has been able to flourish. These policies include the assurance of raw material supplies, research and innovation, manpower recruitment and credit availability.

Plan of Study

The aspects of the industry singled out for examination are

those that are related to problems which have been in the forefront of public concern in recent years. Their order of listing corresponds generally to the order of presentation in the study.

The study to follow inquires mainly into:

1) The degree of concentration and size distribution of sellers in diamond production and wholesale distribution. The writer will examine whether the persistent growth of small plants did in fact lead to the collapse of the larger plants,[6] and whether the diamond wholesale distributing function is being gradually taken over by a few single-function wholesalers who in turn may exploit the numerous producers,[7] as was recently asserted by the economist of the Diamond Control Department.

2) The comparative efficiency of firms of different sizes. Conclusions will be drawn about production characteristics and optimum plant size in the light of the finding by the Standards Committee that "no economies associated with size exist."

3) Conditions of entry in the industry with particular attention given to the influence of raw materials and working capital requirements.

4) The importance of subcontracting in the industry. An answer will be sought to the question of why there has been an expansion of this practice in the industry. It would seem that subcontracting should not be a characteristic of an industry faced with a limited supply of raw materials on one hand (the marketing of about 80 per cent of uncut diamonds and the concomitant price administration

is under the control of the Diamond Trading Co., commonly known as the Syndicate) and constant returns to scale, on the other hand. We also note the steady growth of the industry and the identical methods of production and equipment used by both prime and subcontractors.[8] The existence of subcontracting therefore means the existence of factors that limit the growth of the firm. Those will be enumerated and analyzed. Particular attention will be given to the relation between subcontracting and diversification on one hand and price-cost relationship on the other.

5) The contention that the average earnings of diamond workers are higher than their counterparts in "all manufacturing."

6) The variety of governmental assistance. The effectiveness of the many-sided programs in regard to supply of raw materials, credit availability, manpower recruitment, innovation and the extension of the industry into the developing areas are evaluated.

7) The relationship between market structure and market performance in the industry. The widely held assumption that a competitive structure produces the best possible performance results is questioned. If we are ready to accept the proposition, as I believe we should, that "public policy does not and should not require perfect competition in most markets, but it should seek to establish or encourage market patterns in which adequate performance is compelled by market structure,"[9] then public policy should also assume the responsibility of assisting and improving structurally defective industries, given the demand for the product exists, so that adequate performance would result. The diamond

industry would seem to fit this description.

Methodology

The methodology of the study is primarily empirical. The basic data collection was conducted in Israel in the summers of 1967 and 1969. As in all studies of this type, its orientation is conditioned by the accessibility and nature of the empirical data relevant to the industry. Data for the years immediately following the War of Independence in 1948 are scarce. Beginning in the 1950's the data become more reliable, detailed and voluminous.

The Diamond Control Department has made available to me almost all of their files. These contain memoranda, correspondence, documents, surveys of employment, committee studies, publications and so forth. Additional data came from the various censuses and surveys conducted by the Israeli Central Bureau of Statistics.

About fifty specialists in diamond cutting, exporting and government officials were personally interviewed. Personal contact was also made with diamond industry officials in New York with which the Israeli industry has established strong ties. Since the diamond industry is composed of family-owned establishments, bound by tradition to a policy of secrecy, access to their records was extremely limited.

The materials for the analysis of subcontracting and diversification are drawn from two detailed surveys of diamond producers conducted by the writer in 1969. These surveys and their analysis provide information, hitherto nonexistent, on this critical aspect in the industry's performance.

Finally, extensive data on the market prices of rough and

finished diamonds in the Israeli market were collected. These were used in developing the price indexes used to measure the trend in the value-added margin.

It is hoped that the results of this study[10] of a new, rapidly growing industry in a developing country will be of sufficient generality to enable some understanding of the growth process and the formulation of economic policy both in Israel and in other countries.

Summary of Major Findings

1. An examination of changes in the industry's structure during the period under discussion (1952-1968) has shown a persistent expansion of two main categories of establishments. The small, non-integrated plants (engaging from one to four persons) specializing in certain products and skills experienced remarkable growth. But this, however, has not in any way led to the "collapse of the large establishments" as was indicated by the economic adviser of the Diamond Control Department. On the contrary, the larger integrated firms (defined as plants employing 50 or more persons) experienced moderate expansion by increasing their share of industry employment from 21.9 per cent in 1952 to about 47 per cent in 1968.

That the two developments are compatible is explained by the fact that, to a considerable degree, the small plants are not in direct competition with the larger ones and the existence of factors that compensate for the slight diseconomies of small size.

As for the structure of distribution of export between the two main channels (diamond fabricators and single function wholesalers), it was revealed that contrary to the conclusion reached in the Diamond

Control Department, the wholesalers' share has declined substantially in recent years. In 1960, they accounted for over 40 per cent of export, while in 1968 the figure declined to 21 per cent. Therefore, there is no basis for any apprehension concerning oligopsonistic effects which may be generated by a few wholesalers. It would appear that some effective steps should be taken to strengthen the single function wholesalers segment of the industry by attracting foreign wholesalers to establish offices in Tel-Aviv. This may relieve the strain upon fabricators by permitting them to abandon some process of marketing.

2. Economic concentration in diamond fabrication is very low. The liberal policies of the government in regard to granting licenses, coupled with its vigorous assistance programs, resulted in a substantial decrease in concentration. From 1952 to 1969, concentration in the eight leading firms declined from 22.0 per cent to 14.1 per cent of total industry employment. Concentration at the distribution level is fairly low, but is far in excess of that prevailing at the production level. The largest eight exporters accounted for about 32 per cent of the total value of diamonds exported in 1968.

The minimal optimal plant size for melees (include between one and seven stones in one carat), arrived at on the basis of survival data, labor productivity indices and deductive-engineering estimates, is within the range of 50-99 persons engaged.

There are strong indications that the average cost curve is L-shaped, in the sense that economies of scale tail off as output increases. The record also demonstrates the tendency of diamond establishments to adjust their plant scales toward the efficient scale of operation. In

1952 the minimum optimal size class and the two adjacent classes accounted for 55.4 per cent of total employment. In 1965 this figure has risen to 61.3 per cent. Consequently, the findings are at variance with those arrived at by the Standards Committee, which stated that no economies associated with large size exist.

3. Barriers to entry into diamond fabrication are minimal. Capital requirements and shortage of uncut diamonds may pose difficulties for anyone contemplating entry with an optimum size plant. However, entry via specialization or subcontracting may reduce or virtually eliminate their significance. A potential entrant can initiate his venture on a tiny scale for which small means are required and then grow toward the upper end of the size distribution to a position of maturity. In fact, this has been the experience of almost all large establishments.

The problem of firm size limitation turns on the element of product heterogeneity and the entrepreneurial capacity to deal with it.

4. Subcontracting was found to form a significant factor in the industry's expansion and diversification, a finding which is contrary to officially held opinions by the chief diamond manufacturing association and the economic adviser of the Diamond Department.

It was established that four forces: flexibility, employment relations, cost, and quality influence the prime contractor to embark upon a subcontracting program. The prime contractors were found to be favorably inclined toward subcontracting in all of the four areas. Attitudes were found to be most favorable with respect to the flexibility and avoidance of employee problems provided by subcontracting. The relationship between the prime and subcontractor is to a very large

degree complementary. Thus, the former have concentrated mainly on those stones which easily lend themselves to chain processing (like melees), while the latter fabricate stones that generally do not fall in this category (like flawed stones, fancies and smalls).

An examination of the price behavior of both rough and polished diamonds, during the last two decades, dispels the widely held misconception that the industry operates within a market characterized by a price squeeze, i.e., price of rough has increased, while that of polished diamonds has decreased.

5. There is nothing to support the repeated allegations, on the part of both industry and government, that average earnings of diamond workers are higher than those in "all manufacturing." All the available statistical surveys rather persistently reveal a contrary finding. However, since the industry's dependence on adolescent labor is much greater than in "all manufacturing," it is suggested that a study be made of the relationship between age and average earnings for the purpose of ascertaining whether the young diamond workers obtain higher earnings than their counterparts in "all manufacturing."

6. The various assistance programs initiated by the government in the areas of raw material acquisition, credit availability, manpower recruitment, technical innovation and the extension of the industry into the developing areas were generally found to be well received and beneficial to the industry as a whole. I have questioned, however, the unrealistic optimism reflected in the reports emanating from the Diamond Control Department in regard to the industry's expansion in the developing regions. The failure of this program to live up to the high hopes

once held for it in terms of expansion and diversification was thoroughly documented. Thus, the share of total industry plants and employment in the developing regions (the northern and southern parts of the county) declined from 6.1 and 10.2 per cent to 5.9 and 7.5 per cent, respectively, during the period of 1964-1968.

7. Whether competition is a positive or negative factor in an industry's performance depends on the condition of the industry. In the Israeli diamond industry the well selected assistance programs of government have seemed to complement its atomistic structure, providing the necessary environment in which powerful "indigenous" competitive forces could freely operate.

It is thus possible to classify the industry as workably competitive, and reject the signficant presence of kinds of behavior and performance that would lead us to characterize the industry as excessively competitive.

NOTES TO CHAPTER I

[1] It is worthy of note that E. Hagen specifically advocates analysis of rapidly growing industries in order to understand "the forces which cause a given industry to develop fast and efficiently." Handbook for Industry Studies (Glencoe: The Free Press, 1958), p. 1.

[2] H. Johnson, "The Economic Approach to Social Questions," Public Interest (Summer, 1968), pp. 68-79, quoted by O. W. Williamson "Allocative Efficiency and the Limits of Antitrust," American Economic Review (May, 1969), p. 112.

[3] E. Staley and R. Morse, of the International Industrial Development Center, Stanford University, lament the neglect that has been accorded to the role of small-scale manufacturing in the industrialization process. Delving into the footnotes of their study will make clear the extreme lack of industrial case studies in developing economies. Modern Small Industry for Developing Countries (New York: McGraw Hill Book Co., 1965), p. V.

[4] Although a few books and one master thesis have been written dealing with the industry, they are almost exclusively concerned with the problems of mining in Africa, historical development of the diamond marketing syndicate of the De Beers Co. of London, and diamond technology. See Van der Laan, The Sierra Leone Diamonds (London: Oxford University Press, 1965); T. Gregory, Ernest Oppenheimer and the Economic Development of Southern Africa (London: Oxford University Press, 1962); W. Aronheim, The Development of the Diamond Industry and Trade in Peace and War (New School for Social Research: Unpublished M.A. Thesis, 1943); P. Grodzinski, Diamond Technology (London: N.A.G. Press, 1953).

[5] V. Fuchs, The Economics of the Fur Industry (New York: Columbia University Press, 1957), p. 99.

[6] Diamond Control Department, Memorandum Concerning Proposals to Organize the Distribution of Polished Diamonds (Tel-Aviv: July 6, 1963), p. 3.

[7] Ibid., p. 4.

[8] In Japan and India, by contrast, subcontracting is made possible by the more labor intensive methods used by the subcontractor. G. Rosen, Industrial Change in India (Glencoe: The Free Press, 1958), p. 187.

[9] J. W. McKie, Tin Cans and Tin Plate (Cambridge: Harvard University Press, 1959), p. 7.

[10] Professor Joe Bain succinctly sums up three contributions that industry studies have made: (a) They explore in considerable detail the fundamental institutional, technological and geographic conditions which

lie behind "demand and supply" and affect enterprise behavior. (b) A related contribution is to reveal the complexity of competitive behavior and its determinants in actual situations, and thus to suggest reasons for wide divergences in observed behavior of industries, which would seem to fall within a single category in a priori theory. (c) A third contribution ... is of course in finding and measuring the significant results of competitive behavior in various industries. Joe Bain, "Price and Production Policies," A Survey of Contemporary Economics, ed. by H. Ellis (Philadelphia: The Blakiston Co., 1949), II, pp. 146-147.

CHAPTER 2

DIAMONDS IN THE ECONOMY OF ISRAEL

The Diamond and Its Characteristics

The name diamond describes a non-metallic mineral which for centuries has been the preeminent gem stone. It occurs in nature in various crystal forms, the most common of which is the octahedron shape or some modification thereof.

The diamond possesses several exceptional qualities. It is the only precious stone composed of a single chemical element - crystallized carbon. The strongest acids and alcalis do not affect it, but if heated in air to a high temperature of 900°C it burns to carbon dioxide. Its extreme hardness, which exceeds that of any other known substance, is of great industrial importance, the discolored and very impure diamonds, unsuitable for gems, being used as abrasives.

The optical qualities of the diamond (high light dispersion and refraction) combined with the remarkable transparency and translucence give to the cut gem great brilliancy and displays of prismatic colors.

The diamond not only shows a great variety of shape and size but also of color. White, yellow and brown specimens are the most common, with the pure white the most prized of all.

Geologic Occurrence of Diamonds

A diamond crystal in the state in which it is recovered from the earth is called a rough diamond or rough. Rough diamonds occur generally in two types of deposits: (1) in igneous rock masses of kimberlite, called pipes, and (2) in alluvial gravel, both inland and marine, into which they were washed from the kimberlite through some volcanic action or underground pressure.

Recovery from kimberlite rock or sea deposits requires large-scale mining processes, while that from alluvial surface fields may be operated on a small scale and worked by individual diggers.[3]

In order to obtain five tons of diamonds, the approximate yearly output, 125,000,000 tons of ore are required to be processed; this is about one carat of rough for each twenty tons of rock and gravel.[4] While only one ton of the annual output is suitable for gems, its value is usually twice that of the remainder, which is suitable only for industrial use.[5]

Geographic Location of Diamonds

Over 95 per cent of the world production of rough diamonds originates in Sub Saharan Africa, the rest coming from the U.S.S.R., India and South America. (Table 2-1)

The Congo (Leopoldville) continues to be far in the lead reckoned by carat weight[6], followed by South Africa, Ghana and South West Africa. By value, however, the leading producers are South West Africa, South Africa and Sierra Leone.

TABLE 2-1

WORLD PRODUCTION OF DIAMONDS
(in thousand carats)
BY PRINCIPAL AREAS, IN SELECTED YEARS

Area	Average 1949-54	Average 1955-60	1963	1965
Africa:				
Angola	706	904	1,084	1,156
Central African Republic	139	105	402	538
Congo	11,195	14,613	20,447	17,808
Ghana	1,729	2,902	2,678	2,273
Guinea	70	417	54	100
Ivory Coast	73	158	180	198
Lesotho	-	3	5	5
Liberia	-	50	50	50
Sierra Leone	493	1,104	1,411	1,492
Republic of South Africa	2,197	2,746	4,376	5,026
South West Africa	520	928	1,195	1,785
Tanzania	185	465	591	757
Other Nations:				
Brazil	-	50	50	50
Guyana	37	48	100	113
Indonesia	-	-	5	5
U.S.S.R.	-	-	3,400	3,900
Total	-	-	36,000	35,250

Source: "Diamonds" in Non-Metallic Minerals, No. 2 (London: The Commonwealth Secretariat, 1966)

Though the division between gem and industrial diamonds is rather an arbitrary one[7], the following percentage data indicate the distribution of diamond output into the two categories for the major producers in recent years:

	Gem	Industrial
South West Africa	90	10
Angola	70	30
Sierra Leone	40	60
South Africa	40	60
Ghana	10	90
Congo	3	97

Marketing of Mined Diamonds

The Central Selling Organization and Its Practices

Like firms in so many other extractive industries, the competing diamond mines, faced with widely fluctuating commodity prices, early began attempts to coordinate their general trade policy.

The present marketing schemes are the outgrowth of the two depressions in 1893 and in 1929. In the aftermath of the 1893 market collapse, Cecil Rhodes succeeded in consolidating the majority of the South African diamond mines within De Beers Consolidated Mines and formed the London Diamond Syndicate.[8]

The present-day successor of the original Diamond Syndicate is the Central Selling Organization (CSO)[9], which, reorganized by E. Oppenheimer in 1929, has a commanding position in the distribution of the rough. It controls about 80 per cent of the world output through

the exploitation of its own mines in Africa (these account for about 40 to 50 per cent of world output)[10] or through purchasing contracts concluded with the majority of independent diamond producers.[11]

Stabilization of the supply of rough and thus also of prices by the CSO is accomplished in three ways:

1) Allocation of production quotas for the mines with a guaranteed minimum quota sufficient to secure continuity of production, regardless of the state of the world market. In fact, no quotas have been imposed since World War II because of the prevailing high demand.

2) Monthly offerings of rough, known as sights, to cutters and dealers in the various diamond centers. These change not only in volume but also by type in accordance with the market situation that is investigated by the CSO.

3) Accumulation of stocks when demand cannot sustain the prices, until the market improves.

In short, the position of the CSO is powerful but not invulnerable, since it depends on the cooperation of the mining companies and the governments where the mines are located. Such opposing tendencies exist especially on the African continent, where many countries have recently achieved independence. Lately even Portugal granted a concession to an American company - Diamond Distributors, Inc. - for diamond exploration in western Angola.[12]

The sales system of the CSO is both an elaborate and selective one. It consists of three essential features: the buyers' list, the sights, and the boxes.

The buyers' list is a carefully selected limited group of over 240 cutters and dealers with whom the company wishes to do business. From time to time some are dropped from the list. Others are added to it, having earned this privilege through their financial strength, establishment size, reputation, geographical distribution, skill and refusal to deal with sources of supply other than the CSO.

The company's sales, which are made periodically (usually once a month) in London, are known as sights. Each buyer invited to a sight is queried in advance about the types and sizes of rough he is interested in buying. On the basis of these applications and particularly upon what the CSO is willing to offer, the diamonds, after being sorted and graded,[13] are placed in boxes[14] marked with the names of the purchasers and the price. The buyer is given ample time to study his allotted parcel after which he can accept or reject it, in toto. There is no bargaining over the price (paid in immediate cash) or over the composition of the parcel. Irregular purchases may lead to exclusion from the list.

Outside Supplies

All supplies of rough (about 20 per cent of world production) that do not pass through the CSO are called outside supplies by industry officials. These come mainly from Ghana, Liberia, the Central African Republic, Brazil and Venezuela. The extracted diamonds are then placed on the diamond markets of Accra, Abidjan (Ivory Coast), Monrovia,[15] as well as on the site whenever allowed by the respective governments. Illegal traffic in rough diamonds stolen from mines may account for half of the outside supplies.[16] The prices of outside rough have been equivalent to those of CSO owing to the fact that CSO deliberately enters

these markets as purchasers.[17] Thus, the CSO functions in this case as a price leader.

It should be noted that the CSO rough possess certain advantages over the outside supplies. Foremost among these is the detailed grading of uncut diamonds that runs into hundreds of classes, based on color, weight, and cuttability. Furthermore, it offers a wide range of diamonds, because of the geographical and geological variety of its mines. Finally, CSO supplies are reliable as they are based on continuous mining operations.

The Varieties of Rough Diamonds[18]

The position of prominence that the rough occupies in the industry, high initial value coupled with qualitative variability, renders material procurement a difficult task, indeed. The Diamond Trading Co. is said to sort the rough into 2,500 varieties, which can be grouped under four general categories: weight, shape, color and clarity.

1) Weight

From the weight standpoint the uncut diamonds are subdivided into:

a) sizes - diamonds whose weight exceeds one carat.

b) melees - includes between one and seven stones in one carat.

c) smalls - includes between eight and twenty stones in one carat.

d) sand - includes between twenty and more stones in one carat.

2) Shape

So far as shape is concerned, the rough include the following groups, the first of which is the most prized:

a) zeigers - stones whose occurrence in nature is in the ideal form -

octahedron. As such they lose only up to 60 per cent of their weight in the fabrication processes. This shape is responsible for the emergence of the round brilliant cut.

b) kaps - irregular crystals which lose up to 80 per cent of their weight during fabrication.

c) shapes - misshapen elongated crystals from which fancy styles are created, that is, any style of diamond faceting other than the round brilliant including the marquise, emerald, heart shape, pear shape and so on.

d) cleavages - misshapen crystals that require the employment of the cleaving process. Chips are small diamonds that require the same special treatment.

e) maccles - crystals that posses a thin triangular shape in the upper and lower halves of the stone which introduces great difficulties in polishing.

f) flats - irregular flat crystals which look like piece of broken glass.

3) Color

Sorting according to color covers the whole spectrum of nineteen types of colors from the most valued - bluish white - to the least prized - very dark brown.

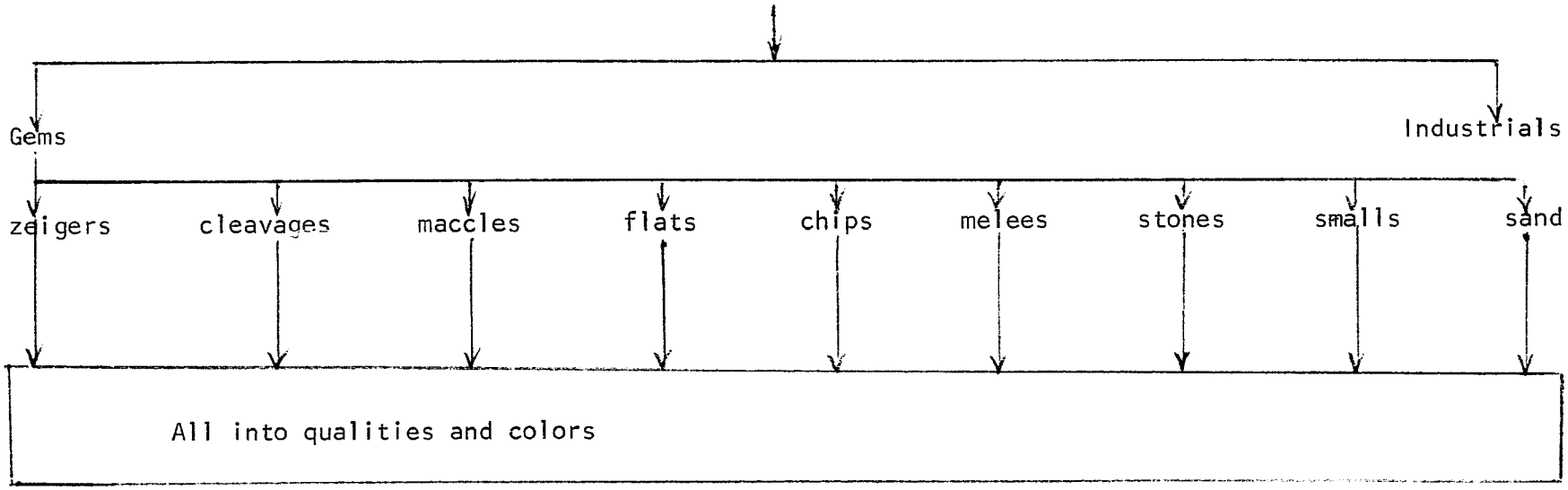
4. Clarity - Quality

Fineness is designated by the number of flows, cracks, cavities and scratches.

Figure 2-1 summarizes the foregoing description of rough diamonds. The principal types used by the Israeli industry are zeigers of melee size.

FIGURE 2-1

Assortment of Rough by the CSO



Source: Yediot, op. cit., p. 15

The Development of Diamond Cutting and Polishing in Israel

International Distribution of Industry

The diamond industry of Israel as explored in this study consists of over 400 establishments engaged in cutting of diamonds (cutting and polishing factories, sawing plants and independent cleavers) and scaife reconditioning workshops in Israel. Establishments whose principal function is the cutting of semi-precious stones are not considered part of the industry, neither are fabricators of jewelry or agents, brokers and dealers in diamonds.

The processing of diamonds constitutes an appreciable industry in eight countries: Belgium, Israel, India, U. S., Western Germany, South Africa, the Netherlands and the United Kingdom. During the early postwar years the diamond processing industry branched into several main centers, each specializing in certain lines of stones. India processes those diamonds that lie on the boundary between gems and industrials. South Africa and the U. S. fabricate big sized stones, while Belgium and Israel process mainly small stones (less than 10 stones in a carat) and medium stones (from 1 to 7 stones in a carat), respectively. Thus, product competition among the international centers is indirect.

It is estimated that, at present, the number of workers throughout the world is of the order of 36,000, of which one-third are situated in Belgium. The following comparative estimates of diamond workers in various countries shows the changes in the geographic distribution of the industry from 1939 to 1965 (Table 2-2).

Among these centers, Israel alone rose to a position of significance in her economy through consistent and signal expansion since 1950.

Furthermore, it is the only manufacturing industry in which Israel is a world factor.

As a result of this development Israel is currently the second largest diamond center in the world, both in terms of manpower and product value. (She markets close to 30 per cent of the world's total polished diamond exports.) Moreover, the gap between Israel and Belgium, the foremost diamond processor, is rapidly diminishing.

Developments in the 1930's

The evolution of the Israeli diamond industry may be roughly divided into three major phases.

The early phase, lasting up to 1946, saw the industry emerging from a stage of isolated enterprise into a more expansive pattern. The occupation of the Low Countries by the German forces paralyzed the traditional diamond centers and catapulted the infant Palestine enterprises, reinforced by an influx of craftsmen and managers fleeing Europe, to a position of prominence.[19] This was preceded, in the late 1930's, by successful pioneering attempts by such men as Z. Rosenberg, A. Daskal, I Fuchs, A. Moritz, K. Pickel, M. Offen and other Jewish Belgian immigrant polishers who introduced and launched the first diamond enterprises intially in Petach-Tikva and then in Netanya, with the active help of Oved Ben Ami, the latter's Mayor, who furnished free land, loans on easy terms, and other benefits for that purpose.

O. Ben Ami was also instrumental in arranging a meeting with George Prins of the London firm of diamond brokers, I. Henning and Co., Ltd., which brought about the Diamond Syndicate's first interest in the young diamond industry of Palestine.

The third phase comprises the years since the close of the War for Independence (1948), and is characterized by the recovery of the industry in the early years of the period and its phenomenal growth between 1955 and the present day.

The War and Its Aftermath, 1940-1950

The expansive tendencies of the industry during the war were facilitated by three factors:

1) the steady supplies of rough, namely sand and melee's provided by the Diamond Trading Company, which would normally have been allocated to the then defunct diamond centers on the European continent.
2) the imaginative and extreme degree of labor specialization, namely the chain system which shortens the training period and allows attainment of high worker efficiency levels. The principle followed is that each trainee specializes in one, and only one, of the eight phases involving the cutting and polishing of a diamond.
3) the increased demand for polished diamonds generated by the war throughout the world and especially in the U. S.

The advance of the industry took place against the background of increasingly intense physical control of a product that had great potential value to Germany. With that object in view, the colonial authorities directed the local manufacturers to form an association that would become the sole importer of rough for its members, and whose source of rough supply must be restricted to the Diamond Trading Company.

However, at the end of 1942, the Secretary of State for the Colonies under the pretense of "preserving the sound development of the

industry,"[20] but whose real purpose was to arrest its growth, forbade issuance of manufacturing licenses or addition of new shareholders to the existing factories. Governmental intervention, on one hand, brought stability, a high degree of solid prosperity, highly centralized production and low level of competitive vigor, previously unknown to the industry, but it also left it unprepared to handle future crises.

In 1945, the closing year of the war, the future of the industry looked unpromising, as the European diamond centers strove to recover lost ground and the Diamond Trading Company began to redivert the rough to Europe.

After a brief period of wartime Palestinian preeminence in the gem market, a series of reverses set in. As the favorable conditions provided by the war evaporated, the industry was threatened with extinction. Firms disintegrated and mass layoffs were made. In 1947 the Histadrut (the Israeli Labor Federation) tried to alleviate the resultant economic woes by assisting the workers to form cooperatives (20 in number), but by then the War of Independence, the military mobilization required by, and the cutting off of rough from the CSO, aggravated the crisis. Eventually, all the collectives failed. Tables 2-3 and 2-4 summarize the industrial experience in the period preceding the establishment of the State of Israel.

The Pattern of Growth, 1950-1968

This section presents a detailed review of the growth pattern of the diamond industry from 1950 when it was in a state of almost total collapse to the late 1960's when it had reached a position of strength and prominence in the Israeli economy.

TABLE 2-2

Estimated Geographical Distributions of Employment in Diamond Cutting and Polishing, 1939 and 1965

Area	Employment[a] 1939	1965
Total	37,080	35,750
Belgium	23,000	12,500
Israel	80	8,000
India	n.a.	8,000
United States	1,000	3,500
Germany	8,000	1,500
Netherlands	4,000	800
Britain	200	650
South Africa	400	600
France	400	200

Sources: 1939, unauthored typed paper on Belgian Diamond Trade and Industry, 1950, 7 pp. (in the files of the Israel Diamond Control Department).
1965, Folksgazet, Antwerpen (Feb. 2, 1965); Kredietbank Bulletin, Brussels (July 3, 1965); Fisher, op. cit., p. 159.

a. Figures of employment differ sharply among the various sources due to the existence of a substantial rural home industry in Belgium, Germany and India, existence of small workshops engaged in recutting of gemstones in Britain and the U. S., and lumping together employment in the cutting of precious and semi-precious stones in West Germany and the Netherlands.

TABLE 2-3

Growth of the Palestine Diamond Industry, 1939-1948[a]

Year	Number of Enterprises	Number of of Workers	Export of Polished Diamonds Carats	Export of Polished Diamonds ($000) Value
1939	4	197	1,595	n.a.
1940	5	200	n.a.	70
1941	12	1,200	n.a.	560
1943	33	3,750	61,740	7,280
1944	33	3,750	76,996	9,240
1945	33	4,000	n.a.	16,520
1946	34	4,000	n.a.	15,372
1947[b]	45	2,000	n.a.	1,680
1948[b]	30	800	n.a.	840

Sources: Compiled from the Colonial Report, op. cit., and Ministry of Commerce and Industry, Israel's Industrial Future - Outlook 1960-1965, (Jerusalem: 1960), p. 229.

Notes: a. Minor discrepancies exist among various sources that probably stem from different methods of recording information on employment and sales.

b. Estimate. n.a. - Not available.

TABLE 2-4

Size Distribution of Diamond Establishments, 1943[a]

(By Persons Engaged)

	Establishments		Persons Engaged	
	Number	Percentage of Total	Number	Percentage of Total
1-19	-	-	-	-
20-49	1	3.1	24	0.7
50-99	13	41.6	1,092	30.5
100 and more	18	66.3	2,455	68.8
Total	32	100.0	3,571	100.0

Source: Jewish Agency for Palestine, The Statistical Handbook of Jewish Palestine (Jerusalem: 1947), p. 217.

a. Data for establishments during the war period understates concentation since some were part of multiunit firms.

Table 2-5 summarizes the principal dimensions of the industry's growth. The value of polished diamonds increased from 2 million Israeli pounds in 1949 to 700 million in 1968, a three hundred fifty-fold gain. Physical output of diamonds (in carats) recorded a much smaller rise, amounting to only about a nineteen-fold jump during the same period of time. The annual rate of increase of physical output of diamonds for the initial decade was 17.7 per cent as opposed to an 11.4 per cent increase for the nine years following 1959. The same picture is provided when value added and employment figures are examined. Value added rose from 319 thousand to 115 million Israeli pounds, a three hundred sixty-fold jump. Employment grew from 800 to 10,100, a twelve-fold gain.

Turning now to an examination of the diamond industry's position in the economic order, we find that with respect to employment, one of the most meaningful and reliable criteria of importance and size,[21] it ranked, in 1965, eleventh among eighteen major branches (two digits), accounting for 3.8 and 1.6 per cent of total civilian non-agricultural employment and establishments, respectively.

A more refined classification, obtained by division of the major branches into more homogeneous groups - "minor branches" (3 digit)[22] - shows the industry to rank third both in terms of employment and value added.

In 1965/66 the industry accounted for about 7 per cent of gross revenue, 3 per cent of value added and 4 per cent of employment of the total Israeli manufacturing activity. This represented a sizable gain over all three of these categories only a decade earlier (Table 2-6).

The industry is distinguished by the fact that it is the only major branch whose establishments belong all to the private sector. It

TABLE 2-5

Growth of the Israeli Diamond Industry, in Selected Years

Year	Production in Carats (000)	Gross Revenue (Israeli Pounds, 000)	Census Value Added by Manufacture (Israeli Pounds, 000)	Employment
1949	76	1,827	319	800
1952	134	11,462	1,976	2,194
1955	231	37,109	7,046	2,723
1958	331	59,327	11,571	3,476
1960	574	101,374	17,239	5,520
1962	838	247,019	40,512	6,804
1964	1,084	354,617	61,044	9,808
1966	1,281	493,988	119,184	10,000
1968	1,472	681,807	114,633	10,455

Sources: 1955-1964, Central Bureau of Statistics, Survey of Industry and Crafts, and Diamond Control Department, Statistical Report (annual).

Note: The estimates of gross revenue and physical output are based on export data. For the years 1949, 1966 and 1968 the estimates of value added are arrived at by subtracting imports from exports.

TABLE 2-6

Growth of the Diamond Industry as a Percentage of All Manufacturing Industries and GNP, in Selected Years

Year	Per Cent of Gross Revenue	Per Cent of Census Value Added by Manufacture	Census Value Added as a Per Cent of GNP	Per Cent of Employment
1949	n.a.	n.a.	0.1	1.0
1952	n.a.	2.1	0.4	2.3
1955	4.6	2.1	0.3	3.0
1958	4.2	1.9	0.3	3.0
1960	4.9	1.9	0.4	4.0
1962	7.3	2.7	0.6	4.1
1964	7.3	2.8	0.7	3.9
1966	6.7	2.8	1.0	3.9

Sources: Compiled and computed from Survey of Industry and Crafts (various years) and Statistical Abstract of Israel, 1968.

n.a. - Not available.

also provides a major economic base for certain localities in the country, particularly in Tel-Aviv and Netanya.

Diamonds and Israel's Foreign Trade

This section will consider two aspects of the diamond industry's export performance, namely, its geographic distribution and position in Israel's trade balance.

Viewed in the light of world trade figures, Israel is not among the leading nations, for its share in the total value of world exports constitutes only about 0.1 per cent. If, however, population is taken as a basis for comparison, i.e., if the value of export trade is calculated on a per capita basis, Israel, with a $242 average in exports per person in 1966, surpasses many important trading nations.

In terms of aggregate international flow of industrial exports for Israel, only the diamond industry occupies a prominent place in the world economy, accounting for about 30 per cent of both the total value of world export and employment. In the case of one of its products - melee's - Israel maintains a near monopoly in the world market, producing over 80 per cent of total value produced.

Geographic Distribution of Exports

Table 2-7 describes the expansion of Israeli diamond exports in terms of their geographical distribution over the period 1956[23] through 1968. The value of Israeli diamond exports was about $5 million in 1949, gradually increasing to about $15 million in 1954. Then in the years 1955 through 1968 the absolute value of exports increased meteorically, recording in 1968 the total of $195 million, about 10 times as much as

TABLE 2-7

Israel's Diamond Net Exports to Main Trading Areas, in Selected Years

(in millions of dollars)

Area / Year	1956	1960	1964	1968
Grand Total	25.9	56.3	118.2	194.8
North America	14.5	19.4	38.9	75.0
Europe	7.7	26.4	55.4	74.8
Asia	2.2	7.0	17.4	33.9
Rest of the World (including Australia)	1.5	3.5	6.5	11.1
United States	13.3	18.4	37.3	71.6
Belgium	4.4	9.4	13.7	20.7
Netherlands	0.4	4.8	11.0	13.4
Switzerland	1.6	6.5	14.9	17.8
Hong-Kong	2.0	6.3	9.1	16.5
Japan	-	0.1	6.0	14.0

Source: Appendix Table A-1

in 1955. The growth was unbroken except for the years 1958 and 1967. The 1958 decline was due to a world recession; that for 1967 resulted from a combination of a European economic slowdown and the Six-Day War.

Although the U. S. continues to maintain its position as the leading importer of diamonds exported from Israel, its share in total exports declined noticeably from 51.3 per cent in 1956 to 29.6 per cent in 1963.[24] It subsequently has increased somewhat, reaching 36 per cent in 1968. The overall decline signifies successful inroads made by the industry into new markets in other countries.[25] In 1968, three leading countries, the U. S., Belgium and Hong-Kong, accounted for about 55 per cent of the total value of Israeli diamond exports. The next three countries, Switzerland, Japan and the Netherlands, with nearly equal shares each, account for about 23 per cent of the total value of exports.

An examination of the export pattern reveals that the percentage increase of diamond exports to Asia (particularly to Japan) was the highest of the 6 major importing areas (i.e., Asia, the Common Market, America, EFTA, Australia and Rest of World), registering almost a four-fold increase from 1962. As a result of this impressive growth, the share of Asia in the Israeli diamond export structure rose from 8.5 per cent in 1956 to 17.4 per cent in 1968.

Exports to the Common Market increased over 200 per cent during the same period, that for the EFTA countries grew 153 per cent; Australia, 286 per cent; and other unclassified countries (encompassing such diverse regions as Ceylon, Iran, Portugal, Hungary, Poland and various Latin American countries) rose 229.1 per cent.

From 1956 to 1968 exports increased by $168.8 million. The American market contributed most to this increase, accounting for 35.8

per cent of the total increase. The rates of contribution of other principal regions to the increase in the value of diamond exports, during the same period, were 26.5 per cent for the Common Market, 18.8 per cent for Asia, 13.2 for EFTA, 5.9 per cent for "other" countries and 0.6 per cent for Australia.

Diamond Exports in Israel's Trade Balance

Table 2-8 illustrates the importance of two commodities, namely citrus fruit and polished diamonds, in the country's balance of trade. Sales abroad of citrus fruit constituted the dominant single export item in the first decade of Israel's independence, though in steadily decreasing proportion from 63.2 per cent in 1949 to 34.4 per cent in 1958, at which time it was surpassed by polished diamonds. In 1968, citrus fruit export accounted for only 13.8 per cent of the total value of exports.

As described above, diamond exports showed a virtually unbroken expansion over this two-decade period. The share of cut diamonds in total exports grew from 18.2 per cent in 1949 to 35.8 per cent in 1968. During the same period, there was a slight decrease in diamond exports as a percentage of total exports of industrial goods from 50.0 to 43.5 per cent. This reflects the expansion of the country's exports of other industrial products, particularly textiles, processed food, and chemicals.

The volume of diamond exports should not, however, be taken as the measure of the industry's role in the earning of foreign exchange. The value of imported rough amounts to nearly 80 per cent of the value of exports and the industry is completely dependent upon imports for its rough. The foreign currency earning rate, defined as:

TABLE 2-8

Composition of Israeli Total Exports
in Selected Years
(in $000)

Year	Total Exports	Industrial Exports	Citrus Fruit Exports	Citrus Fruit as Percentage of Total Exports	Polished Diamonds Exports	Polished Diamonds as Percentage of Total Exports	Polished Diamonds as Percentage of Industrial Exports
1949	28,495	10,372	18,000	63.2	5,191	18.2	50.0
1950	35,147	18,150	16,755	47.7	8,811	25.1	48.5
1952	43,489	26,801	16,519	38.0	11,462	26.3	42.8
1954	86,300	50,546	33,456	38.8	15,743	18.2	31.1
1956	107,135	63,489	40,160	37.5	24,711	23.1	38.9
1958	140,617	83,775	48,400	34.4	34,256	24.4	40.9
1960	216,605	153,452	46,626	21.5	60,858	28.1	39.7
1962	279,197	210,819	49,240	17.6	89,307	32.0	42.4
1964	372,350	305,651	52,810	14.2	137,649	36.9	45.0
1966	503,282	408,355	74,733	14.8	189,536	37.6	46.4
1968	639,705	526,529	88,372	13.8	229,253	35.8	43.5

Source: Compiled and computed from CBS, Statistical Abstract of Israel, 1968.

TABLE 2-9

The Foreign Current Earning Rate of the Israeli Diamond Industry, in Selected Years

Year	Net Export ($000) (1)	Net Import ($000) (2)	(1)-(2) / (1)
1949	5,118	4,225	17.4
1951	11,653	9,769	16.2
1952	11,462	9,817	14.4
1954	15,699	13,793	12.1
1956	25,983	21,588	16.9
1958	32,959	25,166	23.6
1960	56,319	49,160	12.7
1962	82,340	67,976	17.5
1964	118,206	102,246	13.5
1966	164,663	124,935	24.1
1968	194,802	162,050	16.8

Source: Statistical Report (annual).

Note: The compilation of the net figures began in 1958. For the period 1949-1957, gross values of exports and imports are used.

$$\frac{\text{Export Value} - \text{Value Import Content}}{\text{Export Value}}$$ [26]

ranged between 12.1 and 24.1 per cent[27] (see Table 2-9).

Summary

In the second decade of its development, diamonds emerged as the major export of Israel. This expansion has been accompanied by a broader distribution of the product over the world market, as is seen by changes in the importance of the major importing countries during this period.

These achievements in the diamond export markets are offset, however, by the industry's low net foreign currency gain in comparison with other commodity groups, resulting from the high value of the rough stones that have to be imported.

Having related the diamond industry to the growth of the economy and its foreign trade, the two immediately following chapters will turn to the analysis of the industry's structure and efficiency.

NOTES TO CHAPTER 2

[1] A fuller description of the physical properties of precious stones may be found in A. Bateman, Economic Mineral Deposits 2nd ed. (New York: John Wiley and Sons, Inc., 1950), Chapter 24. E. Kraus and C. Slawson, Gems and Gem Materials (New York: McGraw Hill Co., 1947).

[2] Since 1940, the U. S. Department of Defense has classified industrial diamonds as a strategic material.

[3] An economic study of diamond mining is included in H. L. Van der Laan, The Sierra Leone Diamonds (New York: Oxford University Press, 1965). See also P. Wagner, The Diamond Fields in South Africa (Johannesburg: The Transvaal Leader, 1914). Illustrated accounts of the diamond mining processes are to be found in P. Fisher, The Science of Gems (New York: Charles Scribner's Sons, 1966), Chapter 3 and J. Dickinson, The Book of Diamonds (New York: Crown Publishers, Inc., 1965), Chapter 2.

[4] S. Tolansky, The History and Use of Diamonds (London: Methuen and Co., Ltd., 1962), p. 124. A high grade kimberlite ore has one part diamond to twenty million parts rock and gravel. By contrast, medium grade properties of copper, zinc or lead have one to two parts metal in every 100 parts of ore. Also, "A Cartel and Proud of It," Business Week (October 18, 1958), p. 124.

[5] S. Tolansky, op. cit., p. 125.

[6] Gems are measured by a special weight unit, the carat. It is standardized at 200 milligrams; 142 carats equal an ounce.

[7] Mention must be made here of the successful development of synthetic diamonds, which involved converting ordinary carbon under 1.8 million lbs. per square inch pressure and 4,400 degrees F temperature into diamond crystal, by the General Electric Company in 1955. However, these are only suitable for industrial uses. C. Suits, The Synthesis of Diamond - A Case History in Modern Science (New York: General Electric Laboratory, Schenectady, 1960). Thus the production of industrial diamonds which until General Electric's synthesis was mined as a by-product to the gem stones is no longer tied to the production of the latter. A situation arose in which attention, at present, is focused on finding new souces of supply for gems for which demand is increasing, and of finding new uses for the industrials whose supplies are growing.

[8] The literature abounds with accounts that trace in detail the history of the De Beers Co. and its Syndicate. Some of these contain extensive bibliographies. H. Chilvers, The Story of De Beers (London: Cassel and Co., 1939); W. Aronheim, The Development of the Diamond Industry in Peace and War (Unpublished M.A. thesis, New School for Social Research, 1941); T. Gregory, Ernest Oppenheimer and the Economic Development of Southern Africa (New York: Oxford University Press, 1962).

[9] The CSO consists of several bodies: The Diamond Corporation and the Diamond Trading Company respectively engage in the purchase of rough (gem and industrials) from the mines and sale of uncut gem diamonds. Industrial Distributors sells industrials.

[10] Financial Times (Sept. 7, 1964).

[11] It is worthy of note that even the U.S.S.R. was an official member of the CSO from 1958 until May 1964, having dropped out in protest against South Africa's racial situation. "Diamond Deal to Remain Secret", New York Times (Jan. 20, 1960), p. 43. Industry sources feel that the association between the two continues on a secretive basis.

[12] "Diamond Hunt Set in Western Angola by a U. S. Concern," New York Times (May 13, 1969).

[13] Stones weighing over 14 carats are sold individually.

[14] The sale of rough through box arrangement is an additional way to stabilize the price fluctuations of rough. At any time there is a greater demand for a particular type of rough, and as a consequence its price will increase in relation to other types in the cutting centers. This will also be reflected in the buyers' applications to the CSO. However, the CSO arranges the box in such a way that it includes a variety of sizes and qualities so that the total value of the box will change very little. (For further elaboration of this point, see Van der Laan, op. cit., pp. 100-103.) From time to time, upward adjustment of prices, either for the whole range of gems or for particular categories, are made by the CSO.

[15] There is considerable smuggling of rough from Guinea and Sierra Leone into Liberia. See "Diamonds Are Still Among Africans' Best Friends," New York Times (January 20, 1960).

[16] Van der Laan, op. cit., p. 91.

[17] Brussels Kredientbank, Weekly Bulletin (July 3, 1965), p. 3.

[18] This description of the types of rough is based upon "Sorting Rough Diamonds," Yediot (Jan. 1966), pp. 14-16, and S. Tolansky, The History and Use of Diamonds (London: Methuen and Co., 1962).

[19] Because of the war, other production centers sprang up in Cuba, Brazil and Mexico. However, with its termination came their demise.

[20] Report of a Committee Appointed by Government to Examine the Question of Post-War Regulation of the Palestine Diamond Industry (Jerusalem: 1945), p. 5 (hereafter to be referred to as the Colonial Report). One need hardly note that the views of the report were colored by the close cooperation of the British Government with those of Belgium and the Netherlands (in exile). The report abounds with references that clearly indicate the concern of the authorities with the eventual reconstruction of the European industries rather than with the development of a competitive industry (see pp. 4-7).

[21] This is particularly true in the context of less mature economies where compilation of statistics on other than employment basis is less precise.

[22] Manufacturing comprises 17 "major branches" (2 digit), divided into 115 "minor branches" (3 digit) which in turn are subdivided into 221 "sub branches" (4 digit). See introduction to the Census of Industry and Crafts, 1965 (Jerusalem: Central Bureau of Statistics, 1967).

[23] In the years 1950-1954, the share of the U. S. in Israel's total diamond export constituted nearly 80 per cent. In general, the share of exports to any of the other countries did not exceed 3 per cent. CBS, Israel's Foreign Trade, Special Publications Numbers 5, 23, and 76 (Jerusalem: 1950-1954).

[24] The statistics used in this section are given in Appendix Tables A1-A4.

[25] One should note, however, that Israeli exports to some countries are destined to be re-exported to other regions. For instance, a predominant portion of gems exported to Belgium and the Netherlands are earmarked for use in the U. S. In the same manner, Hong-Kong serves as a transit point for other areas in Asia.

[26] Processing of diamonds necessitates some importation of bort (or diamond dust), whose value is negligible in comparison with the total value of imported rough. On the other hand, the export value of polished diamonds is a minimum figure, since exporters (or importers), in this way, reduce their payment of customs taxes, which in the U. S. amounts to 6-10 and in Italy to 20 per cent of the total value imported.

[27] The problem of added value and its determination in the diamond industry is examined in Kesselman and Kesselman, Report on the Determination of the Value Added in the Diamond Industry (Tel-Aviv; March 1963), p. 51, and G. Lahav, Value Added in the Diamond Industry (Tel-Aviv: 1965), p. 7. In the files of the Diamond Control Department.

CHAPTER 3

STRUCTURE OF THE ISRAELI DIAMOND INDUSTRY

Economic theory and industrial experience suggest the importance, among others, of the following structural elements determining firm behavior and industry performance: the degree of seller concentration given the scope of the market, the nature of the marketing mechanism, patterns of entry and exit, economies of scale in production, and vertical production arrangements. These five dimensions of structure are investigated because they may help to shed light on the workability of competition in this market and, in particular, on the relationships between large and small establishments and the rationale for the extensive development of the practice of subcontracting in this industry. This chapter (3) examines the first two elements with regard to the diamond industry. Chapter 4 examines economies of scale and patterns of entry and exit. Chapter 5 then focuses on the role of subcontracting as a form of vertical production arrangement.

The Scope of the Market

A diamond is a very expensive product in relation to its weight and bulk. This fact extends the geographical scope of the diamond market, since transportation costs play a negligible role. At first glance, the internationality of the markets would suggest that concentration data based on national totals may not be significant. However, diamonds differ markedly by type and the Israeli industry specializes in the processing of melee's, accounting for over 80 per cent of the world's total.

Mechanism for Price Making

The Local Diamond Exchange provides the framework within which prices are determined. The diamond trade is centered mainly around the Exchange, to which membership is open to persons who have been recommended by two other members of the Exchange. Admission also requires the approval of the Diamond Control Department, since Israel's foreign trade is still subject to certain foreign currency regulations.

The Diamond Exchange is largely a personal market, in which transactions are completed through verbal contracts.[1] There are two important reasons for this practice. In the first place, except in cases when the supplies of rough originating in the Diamond Trading Co. come in sealed graded parcels, the rough must be inspected before business is transacted. The same is to be said about polished diamonds, since their grading is not standardized. Second, personal relationships count for a great deal in the industry, characterized by mutual trust and good faith.

The institutional mechanism for price determination is hindered

by the complete absence of price quotations. Each sale is thus the result of individual bargaining between buyer and seller. To keep abreast of developments, one must constantly be in contact with other industry people.

Size Distribution of Firms

The number and size distribution of firms in an industry is relevant to the question of the character, intensity of competition and determination of the market category into which it falls. Markets characterized by insignificant concentration fulfill one of the requirements for effective competition, namely large numbers of sellers providing many alternatives to buyers. In other words, it provides a measure of the ability or inability of individual firms to exercise market power.

A variety of indices exist to measure concentration.[2] For our purposes the volume of employment is the best indicator of size, since the industrial units throughout the industry employ almost identical equipment and there has been little change in production techniques.[3]

Trend

Table 3-1 presents the cumulative percentage distribution of establishments and persons engaged, for the years 1952, 1961 and 1965. Though crude, the distribution suggests the relative stability of the median size groups with respect both to the number of establishments (10-19 persons engaged) and to the number of persons engaged (20-49 persons engaged). However, growth in the industry has not been spread evenly over the size classes. Profound changes have occurred at both ends of the distribution.[4]

In the smallest size class (1-4 persons engaged) the share of

TABLE 3-1

Number and Cumulative Percentage of Establishments
and Persons Engaged
Diamond Industry, 1952, 1961 and 1965

Size Group (by Number of Persons Engaged)	1952				1961				1965			
	Establishments		Persons Engaged		Establishments		Persons Engaged		Establishments		Persons Engaged	
	Number	Cum. % of Total	Number	Cum. % of Total	Number	Cum. % of Total	Number	Cum. % of Total	Number	Cum. % of Total	Number	Cum. % of Total
1-4	7	6.8	21	1.0	20	9.8	93	1.6	82	20.7	192	2.4
5-9	25	31.1	185	9.3	28	23.6	200	5.0	93	44.2	610	10.2
10-19	28	58.3	407	27.9	56	51.2	786	18.6	95	68.1	1261	26.4
20-49	35	92.3	1099	78.1	68	84.7	2342	59.1	85	89.6	2713	61.1
50-99	8	100.0	482	100.0	26	97.5	1768	89.7	37	98.9	2519	93.4
100 and above	-	-	-	-	5	100.0	595	100.0	4	100.0	514	100.0
Total	103	100.0	2194	100.0	203	100.0	5784	100.0	396	100.0	7809	100.0

Source: Censuses of various years.

establishments in 1965 is about 14 percentage points larger than in 1952, whereas that of persons engaged was higher by 1.4 percentage points, an indication of the tendency of those plants to become smaller.[5] At the upper levels of distribution we find no plants with more than 100 workers in 1952. In 1957 there were 3 plants, this rose to 5 in 1961 and stood at 4 in 1965.

In the larger size classes (establishments engaging 50 or more workers) the share of establishments in 1965 is only 2.6 percentage points larger than in 1952, whereas that of employees was higher by 17 percentage points. This suggests that an increase in scale of operations has been accompanied by an increase in the degree of concentration within those establishments.[6]

Polishing and Sawing Functions

The foregoing discussion includes plants in both the polishing and the sawing sections of the industry. Polishing and sawing operations are, for the most part, carried on in separate plants. Changes in the size distribution of sawing plants, as shown in Table 3-2, suggests some tendency for such plants to become smaller and to cluster in the smallest size class (1-4 persons engaged).

As for the polishing segment, the most striking feature of the size distribution is the pronounced tendency in this period (1961-1968) for size classes at both ends of the distribution to become more important. As far as the larger establishments are concerned (defined as plants employing 50 or more employees), we find a somewhat smaller proportion of establishments in 1968 than in 1961 (about 2.6 percentage points less), but a much larger proportion of employees in 1968,

TABLE 3-2

Number and Cumulative Percentages of Establishments and Persons Engaged, 1961 and 1968

a. Polishing Plants

Size Group (By Number of Persons Engaged)	1961				1968			
	Establishments		Persons Engaged		Establishments		Persons Engaged	
	Number	Cum. % of Total	Number	Cum. % of Total	Number	Cum. % of Total	Number	Cum. % of Total
1-15	52	30.0	498	8.9	201	54.6	1,940	19.6
16-30	45	56.0	931	25.8	72	74.2	1,646	36.1
31-50	44	81.5	1,763	57.5	36	84.1	1,581	52.0
51-100	26	97.1	1,768	89.3	48	97.1	3,336	85.7
100 & more	5	100.0	595	100.0	11	100.0	1,412	100.0
Total	172	100.0	5,555	100.0	368	100.0	9,915	100.0
b. Sawing Plants								
1-4	13	43.4	27	14.8	38	51.4	103	19.1
5-9	11	80.0	71	53.6	22	81.1	206	57.3
10 & more	6	100.0	85	100.0	14	100.0	231	100.0
Total	30	100.0	183	100.0	74	100.0	540	100.0

Sources: 1961: CBS, Survey of Employment of Equipment in Diamond Industry (Jerusalem: 1962).

1968: Report of the Diamond Control Department.

indicating that these large plants have tended to grow relatively larger. There thus may have been an increase in concentration in this segment of the industry.[7]

Reasons for the survival of the small plants, here defined as establishments employing nine or fewer persons, have changed. While primarily related to the sawing operation in the 1950's, in the 1960's it appears to be primarily related to the performance of special polishing functions. These include handling particular types of rough-like sizes, kaps, achtkant and fancies, which require either special treatment or are not amenable to the chain type processing characteristic of melee's, typically fabricated in the larger plants. This suggests some successful attempts at diversification involving market complementarity among products.[8]

Concentration Ratios

Comparison of concentration ratios for the industry as a whole is possible for the years 1952, 1961, 1965 and 1969. The data in Table 3-3, which show the concentration of employment among the leading four, eight and twenty establishments, indicate a trend toward deconcentration until 1965 and its reversal after that year. In 1952, the top twenty establishments controlled 33.4 per cent of the total employment; by 1965, this figure declined to 22.6 per cent, and thereafter it has risen to 26.2 per cent in 1969. The four and eight largest plants accounted for about 10 and 21.9 per cent, respectively, of total industry employment in 1952. Comparison of these figures for 1961, 1965, and 1969 suggests that control by the four and eight top establishments declined until 1965 and then by 1969 had risen slightly.

TABLE 3-3

Concentration Ratios for Diamond Cutting and Polishing
in Selected Years

Year	Four Largest Firms		Eight Largest Firms		Twenty Largest Firms		Total
	No. of Persons Engaged	Per Cent of Total	No. of Persons Engaged	Per Cent of Total	No. of Persons Engaged	Per Cent of Total	No. of Persons Engaged
1952	n.a.	n.a.	482	22.0	734	33.4	2,194
1961	491	8.5	865	14.9	1,699	29.4	5,784
1965	538	6.9	879	11.3	1,765	22.6	7,809
1969	860	8.4	1,490	14.1	2,735	26.2	10,455

Sources: 1952: Census of Industry and Crafts.

1961, 1965: Compiled from the files of the Diamond Control Department.

1969: The writer's survey.

TABLE 3-4

Shifts in Rank and Share of Total Diamond Employment of the Eight Largest Diamond Fabricating Firms of 1969

	Rank in			Share of Employment		
Name	1969	1965	1961	1969	1965	1961
Daskal Schmuel	1	n.a.	n.a.	2.3	n.a.	n.a.
Lustig Bros. Ltd.	2	1	1	2.1	2.3	2.4
Goldfinger and Fluk	3	9	10	1.9	1.0	1.4
Barik	4	3	3	1.9	1.5	2.1
Moldavsky	5	n.a.	68	1.7	n.a.	0.6
Elhanan	6	n.a.	-	1.5	n.a.	-
Birnbach	7	n.a.	n.a.	1.4	n.a.	n.a.
Choczner	8	2	5	1.3	1.7	1.7

Source: Appendix - Tables B2 to B4.

n.a. - Not available.

Shifts in Market Shares of the Eight Largest Fabricating Firms

Table 3-4 demonstrates relatively small shares in the market held by the eight leading firms and the high turnover among the leaders. The largest firm engaged 2.3 per cent of the total employment, which is less than twice the amount of the eighth largest firm on the 1969 list. The significance of this finding is somewhat magnified by the fact that the composition of the eight leading firms has changed constantly since 1952. Of the eight largest firms in 1961, only three were left on the list by 1969, and each was lower in rank. Five companies dropped out of the Big Eight group but remained as substantial producers. It seems fairly clear that establishments which have risen to the top of this industry have failed to maintain their position for any extended period of time.

The exceedingly high rate of entry, coupled with the subcontracting movement, has helped to keep concentration ratios at very low levels. These two "indigenous" forces, abetted by the liberalization policies pursued by the Diamond Control Department, have imbued the diamond industry with an individualistic and competitive spirit, reflected in its competitive structure and behavior.

Structure of Distribution Channels

The diamond industry's modest trend toward increased concentration at the production level does not represent a significant trend away from a highly competitive structure. However, attention must also be directed toward the structure of the market at the distribution level. If this function is served by a few wholesalers as was recently asserted by the economist of the Diamond Control Department[9], an element of

FIGURE 3-1

Schematic Diagram of Principal Distribution Channels for Polished Diamonds

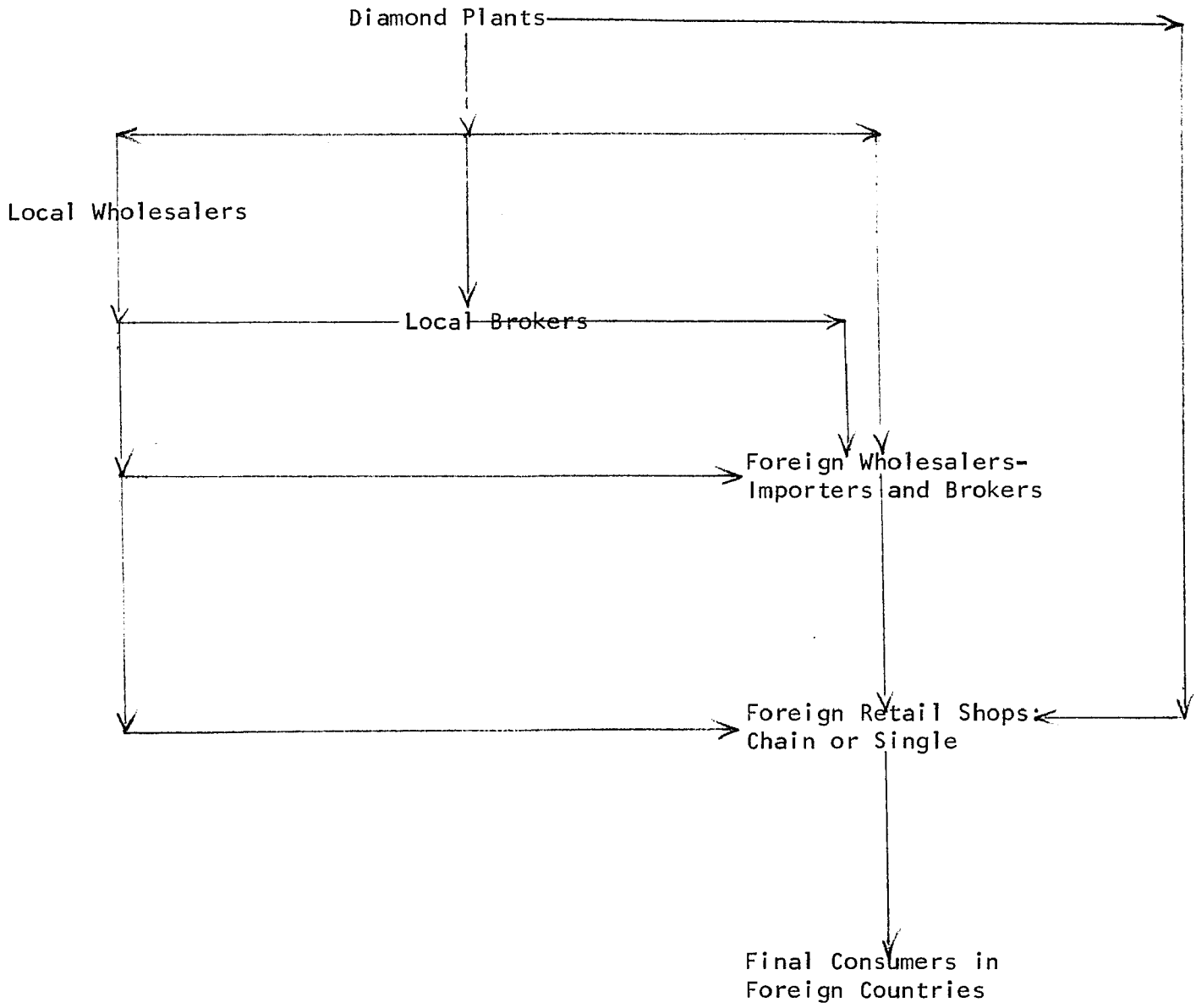


TABLE 3-5

Distribution of Exports of Polished Diamonds
by Main Intermediaries, in Selected Years

	Diamond Fabricators			Single Function Exporters			Non-Certified Exporters[a]		
	No.	Amount Exported (in $000)	Per Cent of Total Exported	No.	Amount Exported (in $000)	Per Cent of Total Exported	No.	Amount Exported (in $000)	Per Cent of Total Exported
1960	50	28,579	50.7	30	22,917	40.8	123	4,769	8.5
1961	50	31,481	48.2	30	28,573	43.8	140	5,231	8.0
1962	50	35,926	43.6	30	38,157	46.3	120	8,257	10.1
1964	42	64,623	54.7	18	30,517	25.8	177	23,064	19.5
1966	55	94,785	57.6	20	45,322	27.5	149	24,555	14.9
1968	64	127,332	65.3	20	41,086	21.1	146	26,385	13.5

Source: Based on figures compiled from annual Certified Exporters lists of the Diamond Industry. A certified exporter in the diamond industry is defined as a firm whose exports in one year total $500,000 or a firm which employs at least 50 workers and exports from $100,000 to $500,000.

[a] An accurate estimate of the characteristics of the non-certified group has been made possible by an examination of the available 1965 list of all exporters (both certified and non-certified). The list demonstrates the significance of producers (as against exporters) in terms of numbers (95 against 48 single-function non-certified exports), and their relative equality in terms of value exported (the non-certified producers account for 4.9 per cent of total value exported against 3.9 per cent for the exporters).

oligopsonistic market power may affect the performance of the diamond industry.

Figure 3-1 describes the principal routes by which polished diamonds move from producers to consumers. Table 3-5 shows the distribution of exports among the main channels. The trend for diamond fabricators and single function wholesalers reveals that the wholesalers' share has declined substantially. In 1960 they accounted for over forty per cent of export, while in 1968, the figure declined to twenty-one per cent. This development is due more to the inability of the wholesalers to absorb the growing flow of the polished diamonds than to the attempts of the fabricators to integrate forward for profit purposes. The wholesalers have been reluctant to take title to polished goods and prefer operating on a commission basis.[10] This practice has encouraged the forward integration of the larger producers.

The evidence with respect to marketing profits supports the foregoing generalization. Minimum profit rates as computed by the accounting firm Kesselman and Kesselman, for presentation to the Diamond Control Department, are said to be lower than those of other industries![11] Direct sales of diamonds by fabricators abroad yield an estimated minimum return of 1.5 per cent on turnover, while those in Israel yield 0.5 per cent.

Maintenance of a distributive outlet represents a substantial investment and requires the ability to offer a wide line of processed diamonds to potential customers. In general, the greater the variety and range offered, the greater is the chance of securing high margins, since the seller is able to follow changes in demand. This can be accomplished only by a large fabricator or a large wholesaler who has the financial

TABLE 3-6

Concentration Ratios for Diamond Export
in Selected Years

Year	Four Largest Firms[a] Value Exported ($000)	Four Largest Firms[a] Per Cent of Total	Eight Largest Firms[a] Value Exported ($000)	Eight Largest Firms[a] Per Cent of Total	Total Amount Exported
1961	15,492	23.7	22,751	34.8	65,285
1962	18,895	22.9	29,267	35.5	82,339
1965	27,976	21.2	43,013	32.6	131,760
1966	34,949	21.2	54,102	32.8	164,662
1968	40,162	20.6	62,084	31.8	194,802

Source: Compiled from annual Certified Exporters of the Diamond Industry lists.

Note: a. A firm is defined as either a diamond cutting and polishing establishment or a single function exporter.

TABLE 3-7

Distribution of Diamond Exports by Size Group
in Selected Years

Size Group (by amount exported - million $)	1960			1964			1966			1968		
	a	b	c	a	b	c	a	b	c	a	b	c
Under 1/2	167	11,212	19.9	185	21,900	18.5	160	26,946	16.4	158	28,724	14.8
0.5 - 1	17	10,622	18.8	13	8,443	7.1	23	14,659	8.9	19	12,136	6.2
1 - 2	13	16,601	29.5	24	32,961	27.9	19	28,536	17.3	27	39,737	20.4
2 - 3	6	17,884	31.8	7	16,306	13.8	9	22,492	13.7	11	26,802	13.8
3 - 4	-	-	-	3	10,111	8.6	3	9,450	5.7	6	20,828	10.2
4 - 5	-	-	-	3	13,391	11.3	4	17,447	10.6	3	13,900	7.1
Above 5	-	-	-	2	15,094	12.8	6	45,133	27.4	6	52,675	27.1
Total	203	56,319	100.0	237	118,206	100.0	224	164,663	100.0	230	194,802	100.0

Source: Annual Reports of the Diamond Control Department.

Notes: a. number of exporters
b. amount exported (in $000)
c. per cent of total value exported

resources to stock gems whenever market conditions warrant. There is also a growing tendency to dispatch the polished diamonds on consignment - a practice requiring a substantial amount of working capital.

A small plant, unable to meet these requirements, must either rely on brokers in locating customers or utilize the services of wholesalers and large establishments to dispose of his tiny amount of processed diamonds, very frequently, at reduced prices. This may put the small fabricator at a disadvantage since it increases his marketing costs, and hence it represents a moderate barrier to entry. Offsetting this, however, is the presence of a large number of brokers (142 in 1968)[13] associated with the bourse.

Evidence on the marketing function taken as a whole available for the years 1960 and 1968 suggests that concentration at the distribution level is fairly low (Table 3-6), but is far in excess of that prevailing at the production level. The largest four exporters accounted for about twenty per cent of the total value of diamonds exported in 1968. The next four accounted for 11.2 per cent. This leaves a large number of small establishments (220) each performing a miniscule fraction of exporting, which in total account for more than two-thirds the total industry exports. This is further illustrated in Table 3-7. The six largest exporters accounted for 31.8 per cent of total exports in 1960, 27.4 per cent in 1966 and 27.1 per cent in 1968. This comparison over time indicates addition of new firms and a clear but slight reduction in concentration ratios in the short span of seven years.

Examination of the identities of the eight largest exporters revals a fairly substantial turnover in the period 1961-1968. Of the eight leading exporters of 1961, five were among the eight largest of

TABLE 3-8

Shifts in Rank and Share of Total Diamond Exports
of the Eight Leading Exporters of 1968

Name	Rank in			Share of Exports		
	1968	1965	1961	1968	1965	1961
M. Schnitzer and Gruenstein[a]	1	1	1	8.6	9.1	9.3
Paz Diamonds	2	3	15	6.9	4.2	2.2
Steinmetz Reuven	3	7	21	4.6	2.8	1.3
Moldawsky Bros. Ltd.	4	8	4	4.5	2.7	6.0
Lustig Bros. Ltd.	5	4	3	4.4	3.6	6.2
Zales Jewellers[a]	6	5	-	3.2	3.2	-
Schechter Diamonds Ltd.	7	6	8	2.9	3.1	3.0
Genachowsky Nahum	8	11	6	2.8	2.3	3.5

Source: Appendix Tables B5 to B7.

a. Single-function exporters.

1968 (Table 3-8). Of the three that dropped out of the top eight group, the second ranking one was twelfth in 1968, the fifth ranking was eleventh, and the seventh ranking liquidated its operations.[14]

Summary

The Israeli diamond industry has a highly competitive structure at both production and distribution levels. The examination of the change in the industry's structure has shown two main kinds of developments. First, the small non-integrated units experienced remarkable growth developing complementary relationships in production. Second, the larger integrated[15] establishments experienced moderate expansion. This finding is contrary to the one offered by the economist of the Diamond Control Department according to which increase in small plants has led to the collapse of the larger establishments.[16]

We find that two basic conditions of effective competition - relative ease of entry and the presence of a large number of independent producers (none of whom has a sizable share of the market) engaged in competition with one another - are satisfied to a very high degree.

NOTES TO CHAPTER 3

[1] A business deal is irrevocably closed when the words "Mazal Uberacha" (luck and congratulations) are uttered accompanied by a handshake.

[2] A critical evaluation of concentration measurements is to be found in: M. A. Adelman, "The Measurements of Industrial Concentration," Review of Economics and Statistics (November, 1951), reprinted in Readings in Industrial Organization and Public Policy, ed. G. Stocking and R. Heflebower. Also, "Measures of Concentration" by G. Rosenbluth in Business Concentration and Price Policy, A Conference of the Universities - National Bureau Committee for Economic Research (Princeton: Princeton University Press, 1955).

[3] In fact, Israel's censuses, as those in most other countries in the world, measure plant size only in terms of employment. The use of this standard measurement of size is less fully satisfactory whenever it is affected by differences in capital intensity in production, worker productivity, length of work day and week, and rate of utilization of plant. In the diamond industry, the variation of most of these variables among plants is negligible.

[4] More on this point - Chapter 4.

[5] A 1965 breakdown of firms in this group of plants reveals 39 self employed establishments out of the total of 82. 1965 Census of Industry.

[6] An examination of the 1965 size distribution of all manufacturing and two other industries chosen for their importance in the export trade reveals that the diamond industry consists of slightly larger establishments at the lower end of the distribution, whereas the two industries and all manufacturing are made up of significantly larger establishments at the upper end of the distribution.

To illustrate, all manufacturing plants employing nine or fewer persons account for 85.1 per cent of all establishments, nearly twice the percentage of diamond establishments in the same size group. Small plants accounted for 26.6 per cent of persons engaged compared with 10.2 per cent for the diamond industry. Examining the upper end of the distribution, establishments engaging 50 or more persons comprise 2.7 per cent of the total, and employ 46.2 per cent of the total number of employees. For diamonds, the 10.4 per cent of establishments in the same group account for 38.9 per cent of the industry's employment. Furthermore, in all manufacturing, 18 per cent of the employees are situated in the largest size class employing 300 or more persons, whereas the diamond industry includes no plant in this size group (see Appendix Table B1).

[7] Establishment data for the postwar years reflect true concentration since the period is characterized by a negligible amount, if not complete absence, of multiplant ownership.

[8] The reader is referred to the chapters discussing economies of scale and subcontraction for an elaboration of these points.

[9] Diamond Control Department, Memorandum Concerning Proposals to Organize the Distribution of Polished Diamonds (Tel-Aviv: June 9, 1963), p. 4.

[10] On this point, see Mr. Schnitzer, "Export Problems and the Exporter," Yediot (Dec., 1959), pp. 10-11; and the response in the same journal by M. Razili (January, 1960), pp. 14-15.

[11] Kesselman and Kesselman, Report on the Inquiry into Value Added - Diamond Industry (Tel-Aviv: 1963), p. 19.

[12] One must also take note of the market variation in the profit rates among firms and at different times. That entry of additional firms has not ceased suggests that the firms have enjoyed higher rates of returns on their own private capital.

[13] Diamond Control Department, 1968 Statistical Report, op. cit., p. 18.

[14] 1968 list of Certified Exporters.

[15] Integration is based on a plant's ability to procure imported raw material, process it, and export the finished product.

[16] Diamond Control Department, Memorandum Concerning Proposal to Organize the Distribution of Polished Diamonds, (Tel-Aviv: June 9, 1963), p. 3.

CHAPTER 4

ECONOMIES OF SCALE

Empirical Measures of Optimum Plant

The first attempt to discover the optimum plant size in the Israeli diamond industry was made by a special committee,[1] appointed by M. Tzur, the then Director of the Ministry of Commerce and Industry. Its function was to explore certain economic and engineering aspects associated with diamond production within a plant. These were insufficiently dealt with by the Hatzor's Committee[2] and so the special committee was appointed to shed additional light on possible ways to meet the difficulties encountered by the industry in the developing areas of the country and facilitate the formulation of government policies toward the industry as a whole.

In dedicating two pages to the question of "the ideal diamond plant" it expressed the view that with regard to their "principal finding, no economies associated with large size exist."[3] The four members who authored the report based their findings on two bits of information. First,

the ratio of fixed to total costs is quite low (2-4 per cent).[4] Second, the 1961 Survey of Employment and Equipment lists establishments varying from small (one person engaged) to large (a hundred and more). The authors, while taking note of the existence of small companies acting as subcontractors, summarily reject this fact as "bearing no significance."[5]

The committee's report contains no analysis of the reasons for the compatible survival of diamond plants so disparate in size. No mention is made of how economies of scale may be affected by the balancing of machinery and manpower, the mix of styles and sizes of diamonds, alternative marketing channels, and other factors.

This writer attempted, through personal interviews, to obtain information on optimum plant size. An answer was sought from industry executives to the following question:

"What, in your opinion, is the most efficient size for a single plant in terms of labor cost?"

The answers, ranging from a 6-man to a 200-man and more shop, probably reflected the officers' conception of their talent at supervision of the particular plant size in which they were employed.[6]

One explanation for this variety of responses[7] lies in the negligible amount of quantitative evidence pertaining to the question of economies of scale. The paucity of good cost data is partly traceable to the reticence of manufacturers and partly to the inherent difficulties an investigator encounters in his attempts to obtain empirical evidence of the relationship between volume and cost.

A more systematic analysis of this issue is therefore necessary. It rests upon three kinds of evidence. The first section bases its estimate of the optimum plant size on the survivor technique. The second

relates labor productivity to establishment size. Finally, the results are checked against deductive-engineering findings.

The Survivor Technique

The basic postulate of this approach is that those sizes of plants which have minimum costs will tend to have a higher probability of survival in the market place than the less efficient ones.

G. Stigler, the modern advocate of this technique, maintains that "an efficient size of firm is one that meets any and all problems the entrepreneur actually faces: strained labor relations, rapid innovation, government regulation, unstable foreign markets and what not. This is, of course, the decisive meaning of efficiency from the viewpoint of the enterprise."[8] T. Saving, who applied the technique to 137 industires, asserts, "If we simply find that a certain size of plant is gaining more and more of the total industry output (or input), we can say with almost complete certainty that this size of plant lies within the range of optimum size of plants."[9]

An examination of the conditions prevailing in the industry must precede any mechanical application of this technique. Only when an industry is characterized by minimal market imperfections, absence of multi-plant enterprises, and by most of its plants at an identical stage of technological development, will the survival estimates be likely to be valid. The diamond industry appears to meet these criteria. The industry likewise appears to be free from the objection that the efficiency of a particular size class may be traceable to predatory or restrictive policies rather than to size. Nor does it appear that the survival quality of diamond plant sizes reflects the paternalistic attitudes of the larger plants toward smaller ones due to fear of strict enforcement

TABLE 4-1

Distribution of the Israeli Diamond Industry Employment by Plant Size in Selected Years

Size Class	1952			1961			1965		
	Number of Plants	Employment	Per Cent of Total Employment	Number of Plants	Employment	Per Cent of Total Employment	Number of Plants	Employment	Per Cent of Total Employment
1-4	7	21	1.0	20	93	1.6	82	192	2.4
5-9	25	185	8.4	28	200	3.4	93	610	7.8
10-19	28	407	18.5	56	787	13.6	95	1,261	16.2
20-29	15	365	16.7	23	579	10	40	963	12.3
30-49	20	734	33.5	45	1,763	30.5	45	1,750	22.4
50-99	8	482	21.9	26	1,768	30.6	37	2,519	32.3
100 & over	-	-	-	5	595	10.3	4	514	6.6
Total	103	2,194	100.0	203	5,784	100.0	396	7,809	100.0

Sources: Central Bureau of Statistics, Census of Industry and Crafts, 1952 and 1965; Survey of Employment and Equipment in Diamond Industry, 1961 (Jerusalem: 1962).

of antitrust laws[10], or their ability to circumvent the law in other respects.

Optimum Plant Size

The data are available for the years 1952, 1961 and 1965 on a comparable basis. The survival record should be approached with some circumspection since the industry registered remarkable growth. Such growth, particularly when accompanied by high profitability, permits even inefficient plants to prosper. The diamond industry, however, despite its phenomenal growth, is famous for its low profitability.

Table 4-1 presents data on number of plants, volume of employment and per cent of total employment by seven size classes. Plants engaging from 1 to 4 and from 50 to 99 persons consistently expanded their share of industry employment, while all other size classes show declines. Only one size class, that of 30-40 persons engaged, shows an uninterrupted loss, declining from 33.5 per cent of the total employment in 1952 to 22.4 per cent in 1965. The other four size classes experienced declines, then increases, in share. They lost substantial ground from 1952 to 1961 and then slightly recovered in 1965.

The survivor technique quite vividly establishes the minimum optimal plant size[11] - 50-99 persons-engaged-for the fabrication of melee's. The record also demonstrates the tendency, unsteady as it is, of diamond establishments to adjust their plant scales toward the efficient scale of operation. In 1952 the minimum optimal size class and the two adjacent classes accounted for 55.4 per cent of total employment. In 1965 this figure has risen to 61.3 per cent.

The explanation for the growth in relative importance of the smallest size class over the whole period is found in the relative

TABLE 4-2

Distribution of Diamond Employment by Main Occupational Functions
In Selected Years

Occupation	1958 Number of Skilled Operatives	1958 Per Cent of Total	1961 Number of Skilled Operatives	1961 Per Cent of Total	1963 Number of Skilled Operatives	1963 Per Cent of Total	1968 Number of Skilled Operatives	1968 Per Cent of Total
Sawers	173	4.5	287	4.9	459	5.3	540	5.4
Girdlers	415	11.3	748	12.9	1,062	12.2	1,183	11.7
Polishers	2,815	74.0	4,066	70.4	6,316	72.8	7,197	71.1
Scaife Reconditioners	n.a.	n.a.	56	0.9	126	1.3	105	1.1
Cleavers	n.a.	n.a.	47	0.8	n.a.	n.a.	95	0.9
Others	388[b]	10.2	580	10.1	734	8.4	995	9.8
Total	3,791	100.0	5,784	100.0	8,697	100.0	10,115	100.0

Sources: 1958, 1963 - Compiled from unpublished surveys conducted by the Diamond Control Department.
1961 - 1961 Survey of Employment and Equipment, op. cit.
1968 - 1968 Statistical Report of the Diamond Control Department.

Notes: n.a. - not available.
b. Including scaife reconditioners and cleavers.

expansion of the sawing, cleaving and scaife reconditioning functions in the industry, which became more and more concentrated in this class. In the 1950's the sawing and cleaving skills presented bottlenecks and had to be "imported" in the form of sawn stones, mostly from Belgium.[12]

Table 4-2 indicates the expansion of the above mentioned skills, in the years 1958 to 1968. The proportion of sawers in the industry's labor force has grown from 4.5 to 5.4 per cent, while that of cleavers and scaife reconditioners has risen from 0.8 and 0.9 in 1961 to 0.9 and 1.1 per cent in 1968, respectively. The heavy concentration of particular skills in the smallest size class is shown in the following table. The share of cleavers, scaife reconditioners and sawers in the industry's total amounts to 66, 25, and 8.7 per cent, respectively, whereas that of polishers and girdlers is only 0.4 and 0.1 per cent, respectively.

TABLE 4-3

Relation of Occupational Functions in Class Size 1-4 to All Classes - 1961

Occupation	Total Number in All Classes	Total Number in Class 1-4	Number in Class 1-4 as Per Cent of Total in All Classes
Sawers	287	25	8.7[a]
Scaife Reconditioners	56	14	25.0
Cleavers	47	31	66.0
Polishers	4,066	17	0.4
Girdlers	748	1	0.1
Other	580	5	0.8
Total	5,784	93	1.6

Source: Compiled and computed from: 1961 Survey of Employment and Equipment in Diamond Industry.

a. In 1964 the per cent of sawers in the smallest class size out of the total number of sawers (439) was 14.6. Diamond Control Department, 1964 Statistical Report.

TABLE 4-4

Distribution of the Diamond Industry Employment in Cutting and Polishing
By Plant Size, 1961 and 1968

Size Class	1961 Number of Plants	1961 Employment	1961 Per Cent of Total Employment	1968 Number of Plants	1968 Employment	1968 Per Cent of Total Employment
1-15	52	498	8.96	201	1,940	19.5
16-30	45	931	16.8	72	1,646	16.5
31-50	44	1,763	31.7	36	1,581	15.9
51-100	27	1,768	31.8	48	3,336	33.6
Over 100	5	595	10.7	11	1,412	14.2
Total	173	5,555	100.0	368	9,915	100.0

Sources: 1961 Survey of Employment, op cit.; 1968 Statistical Report.

Note: Size classes for 1961 polishing and cutting plants differ as follows: 1-14, 15-29, 30-49, 50-99 and 100 and over instead of 1-15, 16-30, 31-50, 51-100 and over 100.

According to the 1961 Survey only 17 out of 93 employees (or 18 per cent) in the smallest size class are polishers and 12 of them engage in special functions of polishing (like processing of all facets of a stone or fancy diamonds). The remainder is divided among the cleavers (34 per cent), sawers (27 per cent),[13] scaife reconditioners (15 per cent) and other (6 per cent).

More detailed data on plant size distribution, available for the years 1961 and 1968, permits closer examination of the plants which engage in polishing (Table 4-4). The distribution with its broad limits at the lower end, shows a clear expansion in employment of the size class engaging from 1 to 15 persons (from 8.9 to 19.5 per cent) and the two largest size classes, engaging from 51 to 100 (from 31.8 to 33.6 per cent) and over 100 persons (from 10.7 to 14.2 per cent), respectively. The other two size classes, those of 16-30 and particularly 31-50 persons engaged, experienced a loss in employment share. Unfortunately a subdivision of the broad size group engaging from 1 to 15 persons is not available and so it is unclear whether its sharp expansion is to be primarily attributed to the 1-4, 5-9 or 10-15 employee class. Nevertheless, the data presented are consistent with the previous findings.

One additional reason may have accounted for the expansive trend exhibited by the 1 to 15 person size class, namely a change in product composition. As Table 4-5 illustrates, gross imports of particular types of rough diamonds like spots, ships, kaps, cleavages, fancies and sizes have been rising relative to the preeminent melees. The significance of this lies in the fact that these atypical types of diamonds, along with sizes, require either special treatment or are not amenable to the chain type processing characteristic of melees, typically fabricated in

TABLE 4-5

Israel's Gross Imports of Rough Diamonds, 1966-1969
(in percentages)

	1966		1967		1968		1969	
Types	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Stones, Sizes	6.6	12.4	2.8	6.2	4.5	10.8	6.9	17.1
Melee's	67.5	72.7	64.7	73.5	62.3	68.7	58.3	63.1
Spots, Chips, Cleavages, Kaps	10.1	4.2	12.8	6.7	13.2	7.5	16.1	7.8
Mixed Smalls	1.8	1.6	1.9	1.6	1.8	1.0	1.0	0.7
Fancies	5.6	6.1	7.5	8.6	8.8	9.6	8.0	8.6
Coateds	8.0	2.1	10.1	2.8	9.3	2.2	9.2	2.3
Sundries (Partly Processed)	0.4	0.9	0.2	0.6	0.1	0.2	0.5	0.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources: Hayahalom, (March, 1969), p. 2; M. Bashkin, "Import of Rough Diamonds in 1969," Israel Diamonds (Feb., 1970), p. 6.

the larger establishments. All this suggests that qualitative and quantitative variability of the rough diamonds enhances the survivability of the very small plants. Again, the survivability data seem to support the following conclusion: the minimum optimal plant size engaged in the polishing and cutting of the predominant rough-melee's appears to be one employing from 50 to 99 persons. On the basis of information presented there is strong indication that the small size industrial units (those engaging between 1 and 15 persons) may be effective competitors on account of product and skill specialization. Medium size units, however, are at a serious disadvantage, having neither the large scale integrative efficiency of the bigger establishments, nor the skill specialization of the small ones.

Labor Productivity Approach

The second major source of evidence bearing on plant scale economies is based on the relationship between labor productivity and establishment size. Since the industry is characterized by a piece rate wage structure,[14] earnings per employee provide a useful efficiency criterion.[15] On balance the more efficient firms will be led to pay higher wages per man, although certainly not per carat polished.

Estimates developed from yearly survey data (1959-1964), adjusted to account for the variation in the ratio of owners to operatives in the different size classes, reveal a pattern of rising labor productivity (Table 4-6). The highest productivity measures are found between the two largest size classes, those of 50-99 and 100 and more.

However, "a rising labor productivity pattern does not guarantee falling average production costs; it is necessary but not a sufficient

TABLE 4-6

Average Earnings per Hired Employee by Size of Establishment, 1959-1964
(in Israeli Pounds)

Year/Size of Establishment	1-4	5-9	10-14	15-19	20-29	30-49	50-99	100 & over
1959	1779	2682	2846	2767	2433	3321	3896	3847
1960	2222	2902	2570	2676	2644	3207	3625	4250
1961	2265	3067	2856	3031	3275	3563	4149	4509
1962	3196	4742	4424	4218	4576	4385	4917	4680
1963	3987	4416	4909	3777	4106	4950	5206	5874
1964	3861	4461	4674	4369	4513	5487	6342	6821

Source: Central Bureau of Statistics, Survey of Industry (annual).

condition for that result."[16] Thus prior to any inference about the nature of long-run costs, information relating capital intensity to plant size must be presented. We must show the ratio of non-labor inputs declining or remaining constant with the size of establishment, so that non-labor costs per unit of output will not rise.

Figures available for 1942[17] and 1958[18] on levels of capital intensity as indicated by machine horsepower per employee disclose a definite tendency for this ratio to decline with size. To illustrate, in 1958, the small size units engaging from 1 to 4 and from 5 to 9 persons employed 1.5 and 0.9 machine horsepower per employee, respectively. The medium size units engaging from 10 to 24 and from 25 to 49 persons harnessed 0.5 and 0.6 horsepower per employee, respectively. The two largest size classes engaging from 50 to 99 and from 100 and over persons employed, respectively, 0.5 and 0.3 machine horsepower per employee.

Another shortcoming of the labor productivity index stems from the fact that it ignores the differences in the composition of labor force as between different size groups.[19] To evaluate this problem we consider what industry sources regard as a "less productive element," on the assumption that the improved performance of larger factories may be attributable to the absence of this element. In this category are listed juveniles between the ages of 14 to 19. The diamond industry depends heavily on juvenile production workers. In 1960, the median age of persons engaged in the industry was 29[20] and the proportion of workers in the 14 to 19 age bracket was over 12 per cent. In 1967, the median age declined to 24 years,[21] signifying a growing tendency to rely on the very young group. It is also worth bearing in mind that this youthful element derives mainly from Asian or North African countries.[22]

The growing reliance on younger and younger recruits[23] whose education seldom exceeds that of an elementary school has produced substantial problems of employee effectiveness, the principal one of which is the lack of work commitment. According to Moore and Feldman, "commitment involves both performance and acceptance of behaviors appropriate to an industrial way of life."[24] Labor force commitment is especially important in the diamond industry, based so much on an extreme division of labor, for the reliability of each of the parts is imperative if the whole is to operate successfully.

The industrial worker should be able to recognize his responsibility to complete the assigned task; he should be where the task is performed and carry out orders about when and how to accomplish the work. The youngish workers, however, frequently do not accept such industrial norms. Capable of earning large amounts of money relative to their age, because of the piece rate system of remuneration,[25] having no family responsibilities, and anticipating military service, they move from one place of work to another, absent themselves from work or come late to work.[26] Two owners mentioned several instances in which juveniles, in the midst of work, will suddenly decide to leave to visit a local movie. It is obvious that such behavior disturbs work procedures within the plant. Stringent measures against such behavior are often impossible, due in large measure to labor shortages.

Table 4-7 relates this juvenile component to 1961 plant size for the polishing and girdling occupations; the data suggest no definite tendency for the percentage of juveniles in the labor foce to be related to plant size. Consequently, in so far as our data reflect this factor, the labor productivity findings are consistent with the survivor technique

TABLE 4-7

Relation of Juvenile Polishers to Total Number of Polishers and Juvenile Girdlers to Total Number of Girdlers in Different Sized Units, 1961

	Total Number of Polishers	Number of Juvenile Polishers (14-19)	Per Cent of Total	Total Number of Girdlers	Number of Juvenile Girdlers (14-19)	Per Cent of Total
1-4	17	0	-	1	0	-
5-9	97	20	20.6	15	1	6.7
10-19	558	77	13.8	87	8	9.2
20-29	413	60	14.5	64	4	6.3
30-49	1,302	209	16.1	238	22	9.2
50-99	1,246	189	15.2	260	33	12.7
100 & over	426	39	9.2	83	3	6.3

Source: Computed from the 1961 Survey of Employment, op. cit., p. 94.

findings on optimum plant size.

Technical Aspects of Diamond Cutting and Polishing

As an introduction to the deductive-engineering analysis of economies of scale, we shall briefly describe the nature of diamond fabrication.

The main production processes consist of the following sequence of operations:

1) Cleaving
2) Sawing
3) Bruting or Girdling
4) Polishing

Cleaving is mainly employed in the case of large stones and especially to those misshapen ones that do not lend themselves to sawing. The rough gemstones which, in their natural state, ideally appear in octahedral forms (two four-sided pyramids joined at their bases), are reduced to proper shape either by cleaving or sawing. The diamond crystals cleave in the four planes parallel to the crystal faces of the octahedron. If the crystal is irregular, then great expertise is required to determine the direction of the cleavage plane.

In cleaving, the diamond is cemented to the end of a dop (a brass cup used to hold the diamond) and a groove is scratched by a small pointed diamond set in another dop. A steel blade is placed in the groove and struck with a wooden mallet. Thus it is possible to trim those portions of the stone that contain flaws or separate a large rough diamond into pieces more advantageous for cutting. Such a chisel crack is a quick, yet very risky operation since an ineptly directed blow may fracture or shatter the diamond. No wonder, therefore, that considerable time is devoted to the examination and planning of the intended cleavage.

Nowadays, cleaving is declining.[27]

Sawing is more economical and involves fewer risks; thus it is generally the initial procedure in which the uncut stone is divided into roughly two halves. The saw is a thin phosphor bronze disc 1/300 of an inch thick, the edges of which are impregnated with a mixture of diamond dust and olive oil. During the operation, the rough is secured in a metal dop which is then clamped into an arm which rests on top of the spinning blade. Revolving at about 4,000 times per minute, the disc can saw through a one carat stone in 3 to 4 hours. In the process 3 to 4 per cent of the rough is lost. One sawer mans from 10 to 20 machines, depending upon the size and quality of the stones.

In the bruting or girdling operation the corners and edges of the stone are rounded away to give the diamond the shape desired. The stone is cemented into a dop mounted on a revolving lathe (400 revolutions per minute). Another diamond set into another dop and attached to the end of a long stick is pressed against the rotating stone by a bruter. The diamond is thus worn down by friction.

The rounding completed, the stone enters the province of the polishers, who form the specified geometrical pattern of facets. The gem is divided into two portions, the upper, or crown, and the lower, or pavilion, or bottom. The girdle is the plane of the greatest circumference, and divides the crown from the pavilion. The table is the largest flat surface at the top of the crown.

The polishing of diamonds is done in the following manner. The stone is set into a dop and held by hand against a horizontal running disc, called a scaife, which rotates at 2000-4500 r.p.m., coated with a compound of bort (or diamond dust) and oil. The disc of porous metal

measures about one foot in diameter and half an inch in thickness. The bort wears the stone down, thus forming a flat surface (facet). The position of the stone is reset for the cutting of each facet. In the process the stone loses between 12 and 20 per cent of its weight. First, the top main facets are polished, then in turn bottom main facets and then the top and bottom corner facets. For the small diamonds called achtkant (eight-cut - 8/8 - or single cut) the work is completed. These are generally cut with only 17 facets - 8 facets plus the table in the upper half, and 8 in the lower half. The melee's require two additional operations: top and bottom brillianteering with 40 or 41 facets. Thus the conventional brilliant or full cut has 57 or 58 facets. (32 and the table above the girdle, 24 plus the culet, if there is one, below it.)

Mention should be made of the fact that there are many variations of this style; it is possible to add or subtract facets on either the crown or the pavilion portion.[28]

The Swiss cut brilliant has 34 facets (16 facets and a table on the crown and 16 facets plus a culet on the pavilion, or perhaps 24 facets on the crown plus the table, and only 16 plus a culet on the base, the fancy of the polisher prevailing).[29]

The Israeli industry is characterized by an extreme subdivision of the polishing process. This shortens the training period and increases the productivity of the workers, but it also curtails their expertise.

The development and adoption of more automatic equipment is hindered by the endless variety of sizes, quality, and styles of gems. A more recent method, as yet not well received in Israel, consists of a mechanical device to hold the dop at various angles, and permits the stone to be rotated by automatic means in placing the facets in proper position.

This method is much faster than hand faceting but, because of the lower quality of polishing involved, it is used only in the case of very small stones.

Although faceting requires precise mathematical angles between adjacent facets and the proper symmetry to capture the diamond's optical properties, the craftsmen themselves judge their exacting work with the help of a magnifying glass-loop alone. Variation of even a fraction of a degree diminishes the brilliance of the gem. A well cut diamond is one in which the rays of light that enter the stone from the top will be totally reflected from the base facets, to be returned again, undiminished, through the top of the gem.

Even under the best conditions, a stone is likely to lose half its weight in sawing and polishing and about 1 per cent of all stones are shattered when being reduced to a gem. The diamond dust and chips are recovered for future use by air extraction methods and other devices. Repeated inspection and supervision at the various stages in manufacture and assortment of the stones must be maintained.

The large manufacturers typically maintain a separate department that prepares the scaifes. Initially the smooth cast iron wheel is ridged into grooves whose purpose is to hold the diamond dust. After they are centered and balanced with the help of lead weights, impregnation with diamond dust follows. A skilled polisher uses from 4 to 5 scaifes a month.[30] In the polishing of one carat stone about half a carat of dust is needed.

Cost Analysis

Table 4-8 presents an approximate breakdown of costs for the manufacture of medium (melees - 1 to 7 stones in a carat) and small sized

diamonds (smalls - 7 to 10 stones in a carat). It illustrates the high share of materials expenditure and the relative unimportance of machinery costs.

TABLE 4-8

Typical Cost Breakdown for Melees and Smalls, 1965

Item	Percentage of Total Costs	
	Melees	Smalls
Materials	77	66
Direct labor including social benefits	17.5	25
Supervision	1	1.5
Financing	2	1.5
Depreciation, insurance, maintenance	1	1
Other overhead	3.5	6
	100.0	100.0

Sources: Report on the Determination of Standards in a Diamond Plant, op.cit., p. 2; Interviews.

Table 4-9 shows a breakdown of labor and machine costs by processes for 5 types of diamonds:

TABLE 4-9

Labor and Machine Costs by Process, 1967

Process	Direct Labor Costs as Percentage of Total Direct Labor Costs					Machine Costs as Percentage of Total Machine Costs
	(1)	(2)	(3)	(4)	(5)	
Sawing	8.8	8.8	23.8	3.6	0.8[a]	41
Bruting	15.4	15.6	25.8	22.5	-	16
Polishing	75.8	75.6	50.4	73.9	99.3	43

Sources: Interviews; Table 16.

a. Information on baguette diamonds was obtained from the Report on Value Added by Kesselman and Kesselman (Tel-Aviv: 1963), p. 38.

Column (1) refers to the finishing of rough stones of 1 carat from a parcel of original melees, Column (2) to the finishing of rough stones of 1 carat from a parcel of collection melees. Columns (3), (4) and (5) refer to the finishing of uncut stones of the achtkant, marquise and baguette

types, respectively. The finishing of melee's (Columns (1) and (2)) dominates diamond fabrication in Israel. The estimates demonstrate the greater relative importance of labor and machinery costs in the polishing operation for all types of diamonds, and the high relative machinery expenditure as compared to that of labor in the sawing operation.

The greatest opportunity for realizing the potential economies of specialization exists in the polishing operation. Furthermore, efficient utilization of equipment and manpower requires an adequate balancing of the output of the set of machines and operatives. Otherwise, there will be excess capacity in some facilities when other facilities are running at below capacity.

Since the skill of employees varies[31], many industries attempt to solve this problem by positioning the most competent operatives where skill levels are most crucial. Balance may also be achieved by having one employee perform two operations. Employees in some operations may be assigned overtime, and manual operations may be substituted for machine operations.

For the most part, however, such flexibility is not available to management in the diamond plant. The workers specialize in only one of the many functions and the type of machinery used in the various processes is not affected by the size of output. Higher levels of output are achieved by installing a duplicate battery of equipment. An exception to this is a newly patented girdling machine costing $400 (about four times as much as the one generally used) and supplementary machines for which the plant must be large enough to employ fully. As revealed by Table 4-10 those size classes engaging fewer than 9 persons do not possess any sawing machines, while those classes employing fewer than 30 persons typically do

TABLE 4-10

Equipment Installed in Cutting and Polishing Plants by Size of Establishment, 1961

Size Group	Number of Plants	Sawing Machines	Bruting Machines	Polishing Benches	Balancing Machines	Scaife Lathe Machines	Lathes for Scaife Recon-ditioners
1-4	7	-	6	24	-	-	-
5-9	18	-	27	121	-	-	-
10-19	49	142	142	512	-	-	-
20-29	23	134	94	358	-	-	-
30-49	44	833	319	1,020	16	12	15
50-99	27	1,384	379	970	24	20	21
100 & over	5	455	97	264	4	4	4

Source: 1961 Survey of Employment, op. cit., pp. 56-57.

not retain such supplementary machines as scaife lathes, lathes for scaife reconditioning and balancing machines.

The size of the establishment for an efficient craft mix varies with the type of rough diamond and the variety of styles fashioned. The following craft mix is an example of a plant specializing mainly in melees fabrication:

2 supervisors
1 cementer
1 assorter
2 sawers
1 scaife reconditioner
8 girdlers
48 polishers:

10 for the top main facets
10 for the bottom main facets
5 for the top corner facets
5 for the bottom corner facets
10 for the top brillianteering
8 for the bottom brillianteering

Such a crew would use the following equipment:

40 sawing machines
8 girdling machines
24 polishing machines
1 balancing machine
1 scaife lathe machine
1 lathe

One reflection of the difficulties involved in the balancing of processes is the abandonment of a sawing and a scaife reconditioning section[32] in 75 per cent of the polishing factories, mostly located at the lower end of the size distribution. The same can be said about marketing and cementing and, to a lesser extent, bruting. Table 4-11 indicates that size classes engaging fewer than 19 workers employ hardly any assorters or cleavers and those plants employing fewer than 30 workers do not employ cementers or scaife reconditioners. These firms farm out rough diamonds to be sawn or girdled or else become subcontractors to

TABLE 4-11

Persons Engaged in Cutting and Polishing Factories by Occupation and Size of Establishment, 1961

Size Group	No. of Plants	No. of Persons Employed	Polish-ers	Assort-ers	Cleav-ers	Sawers	Gird-lers	Scaife Recon-ditioners	Cement-ers	Fore-men	Unskilled Workers	Manage-ment and Office Staff
1-4	7	20	17	-	-	-	1	-	-	-	-	2
5-9	18	129	97	1	-	-	15	-	-	6	-	10
10-19	49	722	558	-	-	11	87	-	-	21	-	45
20-29	23	558	420	4	5	9	64	-	-	11	1	44
30-49	44	1,763	1,302	7	1	44	238	14	2	45	5	105
50-99	27	1,768	1,246	16	9	48	260	23	10	50	14	92
100 and over	5	595	426	12	1	21	83	5	4	14	4	25

Source: 1961 Survey of Employment, op. cit., pp. 72-73.

larger companies. The cost penalty that a small plant would incur is thus limited. Another practice that operates in the same direction is the use of foremen as operatives in the smaller plants. Thus any waste caused by the existence of spare time on their part is somewhat diminished.

As to the problem of the quality of the finished diamond and its relationship to economies of scale, industry sources assert that quality is partly dependent on the time devoted to operations and partly on the readiness of management to sacrifice weight in the polishing process. Inasmuch as it is a function of time, it imposes lower productivity per employee and per machine in terms of numbers of stones cut.[33] Where such conditions prevail, the economies of scale operate over a lower range of output.

The larger plants, apart from the problem of balancing machines and operations, also achieve higher levels of flexibility. There is more scope for maneuverability in the case of absenteeism, machine breakdown or mobility of workers.[34] Also, as Table 4-12 shows, their utilization of a floor space is much more efficient. The highest average area per person engaged (7.7 sq. meters) is in small establishments with 1-9 persons engaged, and the lowest (3.3 sq. meters) in the large ones engaging more than 50 workers. There is a definite tendency for floor space per employee to decline with size.

Financial and Materials Cost Factors

When we drop the assumption that input prices are not affected by scale, it becomes clear that the advantages of a larger plant become more pronounced. A large firm obtains more favorable credit terms, crucial in an industry in which material carrying costs are important. Also, the rental costs per square meter are smaller the larger the industrial unit.

TABLE 4-12

Area of Cutting and Polishing Factories in Square Meters by Size of Establishment, 1961

Size of Establishment	Average Area	
	Per Person Engaged	Work Shops per Worker
1-4	8.6	9.0
5-9	7.6	8.0
10-19	4.5	4.1
20-29	3.6	3.7
30-49	3.6	3.6
50-99	3.4	3.3
100 and over	2.9	2.8

Source: 1961 Survey of Employment, op. cit., p. 52.

In regard to material procurement there is a greater chance for a large than a small plant to obtain a sight with the Diamond Trading Co., and so be assured a steady supply of assorted rough diamonds (Table 4-13). On the other hand, it is also expected of the sight receiver to purchase rough diamonds whenever offered (about 11 times a year), even during periods of adverse market conditions.

The rough available from primary sources outside the control of the syndicate is usually cheaper but it lacks assortment. Even in this case, however, the large plant has the advantage in that, since there is sufficient work to keep them fully employed, it is able to offer employment to assorters.

TABLE 4-13

Sight Receivers in Different Sized Units, 1960

Class Size	No. of Plants (1)	No. of Sight Receivers (2)	Ratio (2)/(1)
1-10	25	1	4
10-15	53	8	15
25-30	44	27	61
50 and over	21	16	76

Source: Compiled from documents in the files of the Diamond Control Department.

The practice of renting machinery in the industry may tend to limit economies of scale, particularly if rent is based on machine usage. However, in the diamond industry a fixed machinery rent is charged.[35] Moreover, there is a definite tendency for the ratio of rented machinery to the total number of machines used to decline with size of firm. The smallest ratio is obtained in the next to largest size class. According

TABLE 4-14

Equipment Installed in Cutting and Polishing Factories by Ownership of Equipment and Size of Establishment, 1961

Size Group	Sawing Machines				Bruting Machines				Polishing Benches			
	Total	Owned by Plant	Rented	Per Cent Rented	Total	Owned by Plant	Rented	Per Cent Rented	Total	Owned by Plant	Rented	Per Cent Rented
1-4	-	-	-	-	6	6	-	-	24	18	6	25
5-9	-	-	-	-	27	12	15	56	121	47	74	61
10-19	142	142	-	-	142	104	38	27	512	294	218	43
20-29	134	134	-	-	94	82	12	13	358	292	66	18
30-49	833	515	318	38	319	257	62	19	1,020	836	184	18
50-99	1,384	1,286	98	7	379	374	5	1	970	943	27	3
100 & over	455	395	60	13	97	95	2	2	264	253	11	4

Source: Computed from the 1961 Survey of Employment, op. cit., pp. 56-57.

to Table 4-14, this size group (50-99 persons engaged) rented 7, 1 and 3 per cent of the total number of sawing, bruting and polishing machines it operated, respectively, whereas the size group with the highest ratio (56 and 61 per cent of bruting and polishing benches) were plants engaging from 5 to 9 persons.

Variety and Economies of Scale

One must also consider the variety of styles being fashioned in a plant. Fabrication of a range of styles increases the costs of production per stone, but since there are innumerable ways of achieving a given style it is difficult to quantify these additional costs. In contrast to many other industries, there are no first copy costs involved in the diamond industry. The equipment, which is mostly general purpose, can be used without modification for a wide variety of shapes, sizes and styles, and thus usually no preparation costs are involved.[36]

The concept of a production run is helpful. It is defined as the number of stones of one type and of a particular style made before changing to another type or style. The length of a production run is determined by the number of cuts made, type of rough used, the ability to forecast sales of each cut and the financing of stocks. The resultant diseconomies caused by short production runs express themselves in lower labor productivity and increased costs of supervision.[37]

If a wide range of rough diamonds are used, and a variety of styles are fabricated, the difficulties encountered by management may more than offset any economies to be obtained by specialization and a more effective balance of processes. The division of departments into sections in which the various styles are grouped is not easily achieved, given the conditions existing in the Israeli diamond industry, where the piece rate structure

applies to a limited number of styles and types of rough. Expansion in terms of additional types of rough and styles leads to serious grievances from the employees.[38] In case of low quality rough or special cuts daily remuneration is substituted for piece rate payments. However, a reduction in variety or, more specifically, lengthening the production run leads to difficulties in marketing.[39] The ability to offer a wide range of cut diamonds makes it possible to obtain higher prices per parcel.

Subcontracting and Specialization

To diminish its labor problems a large plant frequently subcontracts the rough (like smalls, achtkant, kaps and fancies) or styles it does not wish to fabricate, or rough from which it wishes to obtain a high weight recovery, to a small plant called "Kvutzah" or group. In this way management is able to exploit the advantages of both specialization and marketing.

Smaller plants are operated by an owner-manager with minimal managerial or office staff assistance. As Table 4-15 shows, there appears to be a definite tendency for management and office staff to increase as the size of the industrial unit increases. The explanation for this is that larger establishments use extra staff for production planning and supervision of the firm's subcontracted finished products, marketing and commercial activities. The scope of managerial activities in the smaller establishment, in large measure in the hands of owners, is much more limited.

TABLE 4-15

Relation of Administrative Staff to Persons Engaged in Different Sized Units, 1961

Size Group	Persons Engaged (1)	Management and Office Staff (2)	(2) as Per Cent of (1)
1-4	93	-	-
5-9	200	5	2.5
10-19	786	7	0.9
20-49	2,342	71	3.1
50-99	1,768	59	3.4
100 and over	595	20	3.4

Source: 1961 Survey of Employment, op. cit.

In the great majority of cases small plants are associated with the larger plants through subcontracting ties. In addition, the owners possess more powerful incentives and are ready to devote more time and effort to their task. The viability of the kvutzah is attributable thus to a multitude of socio-economic forces. Their need for operating capital is minute, since most of the gemstones they fashion are financed by dealers or larger plants. They may be able to avoid, to a large degree, payment of taxes and social benefits and are preferred by a substantial element of the labor force for this reason. The lenient enforcement of working conditions by the union with regard to small plants operates in the same direction.

The willingness to work for themselves and the possibility of functioning as an entrepreneur plays a role. A potential entrant, in almost all cases a skilled worker, is satisfied with such a low level of profit in comparison with that of established firms that he can easily overcome the seemingly small risks of entering the industry. Finally, family connections that extend beyond the borders of Israel are a

significant factor. It is not unusual to find rough sent for fabrication to Israel because of family ties.

The account of economies of scale would not be complete without some remarks about technological change.[40] The optimum is a dynamic concept in that it changes as techniques change. The introduction of the automatic dop, mentioned earlier, and its wider acceptance in the polishing of small gems will probably raise the optimum size for those plants specializing in them. However, the development of more automatic equipment is hindered by the endless variety of sizes, quality of rough and cuts of gems.

Capital Requirements

The need for large financial outlays to erect and operate new plants can deter entry by barring small producers from the industry, particularly if interest costs for new financing are high relative to the cost of capital for existing firms. Conversely, low financial prerequisites for entry open the industry to a large number of prospective entrants.

The circumstances giving rise to capital requirements which may create an entry barrier consist of (1) the construction costs of an efficient plant and (2) working capital.

Construction Costs of a Diamond Plant

Two aspects will be examined: first, the cost of entry with a minimum optimal size plant for melees and, second, minimum construction costs for types of rough other than melees. As the following table illustrates, the capital requirements to erect an optimum new plant are comparatively small.

TABLE 4-16

Estimated Cost of Erection of an Optimal Diamond Plant, 1962-63
(in Israeli Pounds - IL 3 = $1)

Department	Equipment	Operatives	Cost of Machinery in IL	Cost of Building
Sawing	40 machines + accessories	2	9,000	
Girdling	8 machines + accessories	8	3,600	
				50,000
Polishing	24 polishing benches + accessories	48	9,600	
Scaife Reconditioning	lathe balancing machine	1	3,500	
			25,700	

Sources: Calculated from Israel Diamond Manufacturers' Association, Ltd. "Cost of Erection of a Diamond Center in Tel Aviv," (Memorandum, 1960); Report on the Determination of Standards in a Diamond Plant (unpublished, Tel Aviv: 1962), pp. 3-4; Various investment proposals advanced by individuals, copies of which are available in the files of the Diamond Control Department.

According to the 1961 Survey of Employment and Equipment, the average area per skilled employee is 4.3 sq. m. (for a sawer the figure is about 10 sq. m.). Therefore, a work force of 57 skilled workers will require about 250 sq. m. In Tel Aviv where 46 per cent of the establishments and 44 per cent of the persons engaged are situated, it is difficult to determine the building cost because of the wide variation in the price of land. However, in more remote locations the cost per sq. m. was IL 200, so that a plant with the above specified area, including new equipment, would have cost in the neighborhood of only $26,000 at 1963 prices.

Considering the fact that potential entrants consist, in most cases, of foremen or skilled workers, this cost may constitute a moderate barrier to entry. On the other hand, this initial outlay may be reduced

in a number of ways, the most important being the rental of physical facilities and equipment. In fact, a predominant portion of diamond plants (70 per cent of the total area occupied by the plants) operate in rented structures.[41] Rental of machinery, however, is less widespread, especially among the optimal plants (see Table 4-14).

A different picture emerges when one considers the most commonly chosen method of entry into the industry, i.e. opening a small plant in a rented room with hired equipment. In 1962, the following fixed rents per month for machinery prevailed: for a sawing machine 67 cents and for a bruting and polishing machine 7 cents each.[42]

Mention should be made of the fact that about 75 per cent of the polishing plants possess neither a sawing nor a scaife reconditioning department. However, in the more remote areas it is desirable to set up a scaife reconditioning shop since the scaife is susceptible to damage when transported.

In brief, the preceding analysis suggests that construction costs are not sufficient to block entry, even on an optimal (50-99 employees) scale.

Working Capital Requirements

In view of the importance of raw material costs, working capital is of crucial significance for the industry, especially since few if any of the Israeli manufacturers or dealers finance their transactions out of their own capital.

The volume of working capital required depends on three principal factors: (1) the type of raw material, (2) the terms of credit, and (3) the speed of fabrication. Industry sources, including the Diamond Control Department, contend that, considering all these factors, a period of about

3 months, on average, is required from the time the rough diamond is bought until proceeds are obtained from the foreign purchaser for the polished diamond.

The following table, based on the Diamond Control Department information, documents the need to acquire substantial sums of working capital in order to function in the industry at the production level. To illustrate, at 1962 prices working capital requirements for the purchase, processing and sale of melee's would have ranged between $3,400 and $12,300 per worker for three months (Table 4-17). Considering an optimal plant with 48 polishers, the financial requirements would have varied between $163,200 and $590,400. It is not entirely surprising, therefore, that for this reason mainly, it is a rare occurrence, indeed, for anyone to contemplate entry with an optimum size plant, particularly when interest costs are high relative to the cost of capital for existing firms.

Difficulties of access to the requisite capital, however, do not provide an enduring obstacle to the potential entrant, when entry via product or skill specialization is possible. In a previous section we have described the factors which offset the economies of scale. In like manner, these factors reduce the potential entrant's capital requirements, as well. For instance, the financial requirements for smalls or kaps, efficiently fabricated within a smaller plant engaging 10 workers, are extremely low by comparison with the above estimates, being about $20,000 at 1962 prices. Finally, subcontracting offers a method of entry with even lower financial requirements, since the raw material is financed by other firms or dealers.

TABLE 4-17

Operating Capital per Worker by Type of Rough Diamonds, 1962
(in dollars)

Type of Rough (1)	Average Percentage of Recovery (2)	Price of 1 Carat Rough (3)	Value of Rough Used for 1 Polished Carat (4)=(3)/(2)	Production Expenses of 1 Polished Carat (5)	Total Expenses for 1 Polished Carat (6)	Average Monthly Productivity per Worker in Polished Carats (7)	Total Expenses per Worker for Polished Diamonds for One Month (8)	Operating Capital per Worker for Three Months (9)
Parcel of Melee's	52	39	75	12.2	87.2	21	1,831	5,494
Parcel of Collection Melee's	48	45.5	94.8	13.5	108.3	21	2,274	12,316
11, 12, 13	54	45.5	84.3	8.4	92.7	30	2,781	8,343
±9	50	39	78	17.5	95.5	12	1,146	3,438
Blacks	49	29	59	14.2	73.2	17	1,295	3,734
Open Goods[10] (9-10 stones in a carat)	46	34	73.9	37.4	111.3	6	668	2,004
Coateds[11]	11	8.5	77	25	102	15	1,530	4,590

Source: Compiled and computed from documents in the files of the Diamond Control Department.

1. The types of rough diamonds (except coateds) listed in the table dominate the Israeli industry.
3. The price of the rough reflects the price paid by the sightholder to the syndicate plus 2 per cent commission.
5. Production expenses consist of basic wages, social benefits and indirect expenses.
10. The price of the "open goods" reflects the market price.
11. Figures on coateds refer to the year 1965.

Other Factors

It will be well to conclude this examination of economies of scale with a few remarks on some other factors which affect the viability of a diamond manufacturing enterprise. The quality of management is the most decisive of these forces.

For one thing, it engages in inspection, assortment and weighing of stones whose fabrication requires over one hundred operations, performed by skilled workers. For another, it must establish personal contact for the purpose of raw material procurement, acquisition of capital and marketing of the finished product. Frequently this requires traveling abroad. It also must maintain an even flow of work in this cyclical industry.

In addition, relatively small variations in the prices of the variable factors (93 per cent of the total costs) can easily offset any disadvantages caused by operating at the "optimal" scale. Unlike many other industries there are no posted prices for diamonds, and consequently it is usual for prices of identical parcels of diamonds to vary in the bourse within the range of 2 to 4 per cent at the same time.

Equally important is the percentage of the rough lost in the process of cutting and polishing. This depends on the skill of the operatives and the effectiveness of supervision. The weight greatly affects the average value realized from a finished diamond.

The existence of a bureaucracy so characteristic of firms in other industries[43] is absent in the diamond industry. Only 3 per cent of the industry's labor force engaged in management and office work as against 13.8 per cent in industry in general.[44] An informed and competent management in controlling all these factors is undoubtedly more crucial

to the profitability of a diamond enterprise than economies of scales traditionally measured.[45]

Summary of Findings on Scale Economies

The above discussion suggests that the main sources of economies of scale for large plants stem from flexibility, the division, balancing, and synchronization of processes, and the use of more specialized equipment and personnel. The findings on plant economies are consistent and strongly suggest that the minimum optimal scale for melees is in the range of 50-99 persons engaged while for small diamonds, sizes and fancies the minimum might even be in the range of 1-9 persons engaged. The persistent expansion of the very small plants may be explained by the fact that to a large degree, they are not in direct competition with the larger establishments with respect to certain products and the existence of factors that compensate for the diseconomies of small size. There is strong indication that the average cost curve is L shaped, in the sense that economies of scale tail off as output increases.[46]

Consequently our findings with reference to optimum plant size are at variance with those arrived at by the Standard Committee, which stated that no economies associated with large size exist. The only possible reasons for the Committee's conclusion may be found in the fact that economies of plant scale are not pronounced in this industry, and that the Committee may have thought about forces other than economies which may dominate the choice of plant size.

It is also clear that the minimum optimal scale of a diamond plant is too small to obstruct entry, preclude the existence of a large number of plants within the industry and to foreclose from it a high degree of competition. As a percentage of industry employment, minimum

optimal scale of plant is of the order of 0.6 to 1.2 per cent.

Capital requirements may pose some difficulties, but certain ways exist whereby entry via specialization or subcontracting may reduce or virtually eliminate their significance. Even in the short run it would appear that they do not constitute a barrier to entry.

As a result, each period of increasing demand sees a large number of new plants springing up and enjoying short-run profitability. Conversely, in times of adverse market conditions for diamonds exits are equally common among members of this group.[47]

Implications for Assessing Barriers to Entry

It has been suggested that certain imperfections in the market have been found, which, in combination, may pose a substantial deterrent to the prospective entrant. While technical scale economies are of little significance (the minimum optimal plant size is very small relative to the market demand for diamonds), entry barriers may arise from other sources.

In the first place, the maintenance of adequate and continuous supplies of rough diamonds is a major factor, since the industry is completely dependent on imports which are subject, in large measure, to artificial constraints. For a newcomer to obtain a sight with the Diamond Trading Company is a formidable task. Thus, an entrant must rely on second-hand and costlier sources of rough (except in cases of material procurement from Pituach - the government importing firm). Secondly, since the cost of rough constitutes such an unusually high proportion of the industry's product value, easier access to the capital markets, often at much lower costs by the existing firms, is a financial impediment to

the potential rivals. Moreover, at times of depressed demand for gems the potential competitor is hampered by the existing distributional channels. However, competition at the production level is not thwarted by significant oligopsonistic control in wholesale diamond distribution.

On the other hand, entry is facilitated by the almost complete absence of product differentiation based upon brand name, and of superior techniques exercised through patents or secrets. Entry is enhanced by the possibility of renting both floor space[48] and equipment. Finally, no substantial impediments have been erected, either by the state or by the industry itself, though the Diamond Control Department requires several years of experience for a potential entrant. A detailed record of entry by surviving firms, presented in Table 4-18, reveals that the rate of new entry has been high in recent years,[49] its peak reached in 1962-1963 when there was a net addition of 104 firms.[50] With respect to the number of persons engaged, the greatest net addition occurred between 1960 and 1963 when 2384 workers were added to the industry.

In many other industries the prospect of success is based on the necessity for new firms to establish themselves on a very large scale. It is clear that the technical conditions of diamond fabrication accord no such laurels of distinction to the large-scale plant as to greatly hamper a small plant in its attempts to establish himself. A potential entrant has a reasonable chance of making a successful entry. He can initiate his venture on a tiny scale for which small or moderate means are required, and then grow toward the upper end of the size distribution to a position of maturity. In fact, this has been the experience of almost all large establishments.

Expansion of the industry, and its recent moderate diversification,

TABLE 4-18

Surviving Establishments and Number of Employed Persons by Period of the Establishments First Opening in Israel

Period	Establishment	No. of Persons Engaged
Up to 1939	4	113
1940 - 1947	38	1,583
1948 - 1951	26	983
1952 - 1955	32	696
1956 - 1957	30	930
1958 - 1959	23	511
1960 - 1961	69	1,129
1962 - 1963	104	1,255
1964 - 1965	57	544
1965 - 1968	59	2,371
Not known	13	65
Total	442	10,115

Sources: 1965 Census of Industry and Crafts and 1968 Statistical Report.

has led established firms to abandon certain functions and products, thus opening the way for other firms to specialize in them.[51] Requirements for working capital on the part of the new entrant have been diminished through the increasingly widespread use of the subcontracting arrangements that the small plant develops either with supplying firms or dealers. A detailed examination of the subcontracting system is presented in the following chapter.

Implications for Assessing Limitations to Firm Size

After an examination of the strong indications pointing toward the prevalence of both constant returns to scale, at least for the establishments employing 50 or more employees, and subcontracting, it readily becomes apparent that an explanation regarding the limitation of firm size is called for.[52] At the same time, additional comments will be offered concerning the special reasons why the diamond industry is characterized by a large number of firms and a wide dispersion in their sizes.

The writer's analysis follows closely, at the beginning, Scitovsky's line of argument in which he suggests the nature of the market and entrepreneurial capacity as absolute limitations to firms operating in a monopolistically competitive environment.

The important distinction to be made is between an "informed" and "uninformed" market. Let us consider Scitovsky's main body of the discussion in his own words.

The Uninformed Market

> In some markets, sheer size and goodwill are assets of great importance. Ground once gained in such a market is easily held, because the mere fact that a firm has once succeeded in establishing itself and making itself known creates a goodwill in its favor against which others find it difficult to compete. It is apparent that in such markets the

entrepreneur's limitations do not restrict the size of his firm, but only its rate of growth. We shall call this type of market the uninformed market.[53]

A market is uninformed when the average buyer in the market has an incomplete idea of the nature of the goods or services he buys, and judges their quality not by his own standards but on the basis of advertising and indexes of quality. By indexes of quality, we mean trademarks; the reputation, size, nationality, and age of the manufacturing or distributing firm; inessential but eye-catching features of the good itself; the price of the good -- in short, anything by which the uninformed buyer is likely to judge quality.

The consumer is usually uninformed in the markets for all complex goods and services . . . He lacks an independent and reliable judgment of the quality of complex goods through no fault of his own but as a result of the nature of such goods.[54]

The Informed Market

There are . . . markets, however, where the nature of competition is such that ground once gained is easily lost again by firms unable to maintain enough drive and flexibility. The premium put on flexibility and initiative in such markets renders entrepreneurship an essential factor not only for the growth of the firm but for its mere survival, which means that in such markets, the entrepreneur's limitations restrict also the size of his firm. This type of market we shall call the informed market.

The informed market is a market in which the average buyer knows enough about the quality of the goods and services offered to appraise them on their own merits.[55]

Buyers in the informed market usually display a variety of tastes and a taste for variety. This creates demand for a whole range of types and models of the same commodity; but, at the same time, it limits the demand for any particular type of model within that range . . . (The producer) can never rely on an assured demand, since the demand for his model depends on what other models are like . . . his competitor's desire to expand keeps each producer under constant pressure to improve his product on pain of losing sales and profits . . . even if the producer keeps up with improvements, the market for his particular model is still likely to remain limited due to the variety of tastes, which characterize the informed market.

To expand his business and extend his sales in the informed market, the producer must offer an additional model which caters to a different need . . . For if the producer must diversify his product in order to increase his sales, he will enjoy few if any economies of scale ... He may still have certain advantages over a newcomer; but these are limited and therefore easily offset if the newcomer has more drive and ingenuity and brings a fresh mind and new ideas to his business.[56]

The insistence on craftmanship may even discriminate in favor of the small firm.[57]

Such behavior on the buyer's part facilitates the entry of newcomers, encourages competition and the establishment of a large number of firms, and explains the existence, side by side, of both mass-produced and custom or hand made products in informed markets.[58]

As one may readily realize, the problem of size limitation turns on the element of product heterogeneity and the entrepreneurial capacity to deal with it.

The chain system, prevalent in the diamond industry, is highly adaptable to volume operations processing melees. It is primarily in this segment that large firms operate. But diamond fabrication is not their exclusive domain; one observes the viability of a large number of small and medium sized firms which create an extremely competitive environment. This primarily arises from the multifarious diversity of the product that runs in almost every possible direction, since diamonds differ in color, cut, weight and craftsmanship, coupled with the limited entrepreneurial capacity or what is referred to by R. Buchele as "the leadership crisis."[59]

This occurs when the establishment reaches the size, at which point the entrepreneur reaches his limit of efficiency. It is a point at which running the company is beyond the capacity of two or even three executives working in a partner-type relationship. This is the point beyond which it is impossible to "extend into the sphere of coordination itself the principles of the division of labor"[60] and cost of management per unit of output tends to rise. In general, this arises for firms employing from 150 to 250 employees[61] in which case it applies to the diamond industry quite directly.

The other side of the story is provided by the desire on the part of consumers to promote product versatility. It was shown that many kinds

of diamonds do not lend themselves to chain-type fabrication which in itself provides an incentive for even tiny firms (1 self-employed person) to enter the industry without having to overcome serious barriers.

The diamond manufacturing firms are located in a compact geographical area and are surrounded by a multitude of firms offering them every type of goods and services on competitive terms. It is the "deintegration" of diamond production processes, the availability of external economies, that makes entry into the industry so very easy. The point has been well explained in the following terms:

> "The small firm can survive easily if markets are well organized, so that it can buy cheaply such factors as specialist advice, engineering services, component parts, raw materials and the like, and can dispose easily of its product, whether to final or to intermediate buyers. The better organized the market, the less each firm needs to do for itself and the small is the advantage of large-scale production."[62]

Even where firms operate below minimum optimal size, the incomplete costing of management may confer a positive production advantage. Considerable weight must also be given to the Jewish craftsman's preference for independence[63] which induces the owner to spend long hours of work at his plant and perform a variety of services which he does not value for costing purposes at anything approaching their market price. Surely, the mortality rate of the small firms is frequent, but some can become established and compete successfully with the larger firms.

NOTES TO CHAPTER 4

[1] M. Baskin, B. Lieberman, Margalit and M. Goldman, Report on the Determination of Standards in a Diamond Plant (unpublished, Tel-Aviv: April, 1962), p. 10 in file of the Diamond Control Department. Despite the brevity of the report, its authors (the first two are members of the Diamond Control Department) also examined questions related to the industry's value added, operating and fixed capital, duration of fabrication of various types of diamonds, productivity of trainees, their quality of work and percentage of raw material waste experienced during the processing of uncut diamonds and, finally, profitability of a plant in its gestation period.

[2] Report of the Hatzor's Committee to Examine Diamond Plants in Developing Areas (unpublished, Tel-Aviv: July 5, 1961), p. 22.

[3] M. Baskin, et al., op. cit., p. 1.

[4] My estimate based on examination of plant records and discussions with managers places fixed costs between 5 and 7 per cent of total costs. The 1962 report neither defines nor lists the components of fixed costs. This writer has followed R. Moyer, Competition in the Midwestern Coal Industry (Cambridge, Mass.: Harvard Univ. Press, 1964), p. 96, in defining fixed costs as establishment charges that remain unchanged over various positive levels of output and include taxes, rent and insurance of plant, depreciation, supervisory salaries, selling expenses, interest and plant maintenance.

[5] M. Baskin, op. cit., p. 1.

[6] C. F. V. Fuchs, Economics of the Fur Industry (New York: Columbia University Press, 1957), p. 53.

[7] This diversity of views is also found in the replies of several industry officials polled on the question of "whether large or medium (or small) enterprises were better for the industry." E. Levi, "The Big Enterprise or the Small Enterprise - Which is Preferable for the Diamond Industry," Israel Diamonds (September, 1969), pp. 16-18.

[8] G. Stigler, "The Economies of Scale," Journal of Law and Economics (October, 1958), p. 56.

[9] T. R. Saving, "Estimation of Optimum Size of Plant by the Survivor Technique," Quarterly Journal of Economics (Nov., 1961), p. 573. See also L. Weiss, "The Survival Technique and the Extent of Suboptimal Capacity," Journal of Political Economy (June, 1964), pp. 246-261; G. Shepherd, "What Does the Survivor Technique Show About Economies of Scale?", The Southern Economic Journal (July, 1967), pp. 113-122.

[10] For a concise discussion of these points, see J. Bain, "Survival-Ability as a Test of Efficiency," American Economic Review (May, 1969), pp. 99-104.

[11] Following Weiss, op. cit.

[12] The Association of Sawers, Memorandum Concerning the Sawing Segment of the Diamond Industry (Tel-Aviv: June 20, 1960), p. 1. It also asserts that "in 1960 the sawing branch has doubled its capacity while the growth of other skills was limited to a 20-30 per cent."

[13] In 1964, the smallest class engaged 64 sawers (or 33 per cent) out of 192 employees (1964 Statistical Report). Appendix Table C1 reveals the per cent of total employment of sawers accounted for by each of three sawing plant size classes for 1961 and 1968. Again, only the smallest size class (employing 1-4 sawers) expanded its share of total sawers employment from 14.8 to 19.1 per cent. In the other two size classes a decline in employment occurred.

[14] In the developing areas where about 10 per cent of the workers reside, a slightly lower piece rate prevails. The workers, the majority of which are newcomers to the industry, are employed by 26 plants, distributed in size groups between 20-100 persons engaged.

[15] The reader should take cognizance of the fact that underreporting of wages by the smaller plants probably exists, motivated by the desire to avoid payment of taxes.

[16] J. Johnston, Statistical Cost Analysis (New York: McGraw Hill Book Co., Inc., 1960), p. 110.

[17] The size classes engaging from 1 to 50 and from 51 to 100 employees, harnessed, respectively, 0.6 and 0.4 machine horsepower per employee. The largest size class engaging 100 and more employees harnessed 0.3 horsepower per employee. The Colonial Report, op. cit., p. 22.

[18] 1964 Survey of Industry, op. cit.

[19] E. Smith, "Productivity Analysis and Measurement," Productivity Measurement Review (Nov., 1957), p. 7.

[20] 1961 Survey of Employment, op. cit., p. X. By contrast the median age of persons engaged in all manufacturing was 36 in 1960.

[21] Hayahalom (July, 1967), p. 10. The corresponding figure for the Belgian worker is 53 years.

[22] In 1960, the proportion of the industry's labor force made up of Asian and African immigrants amounted to over 32 per cent. If we add to this group the Israeli born diamond workers who largely come from the same group, then this proportion increases to about 55 per cent. CBS, Population and Housing Census 1961 (Jerusalem: 1963), p. 144. That this proportion has further increased can be deduced from the fact that in recent years the Labor Exchanges have directed to the industry recruits coming only from these countries. Interview with Mr. I. Jungstern. See the section on Manpower Recruitment (Chapter 6).

[23] One senior worker complained that the diamond establishments begin to look like kindergartens. E. Levi, "What Do Workers Think?", Hayahalom (March, 1968), p. 7.

[24] W. Moore and A. Feldman (eds.), Labor Commitment and Social Change in Developing Areas (New York: Social Science Research Council, 1960), p. 1.

[25] No statistics relating age with total earnings is available, but all industry executives interviewed raised this point. See also Z. Moscovitz, "The Youngsters Think Only of Money," Hayahalom (November, 1967), p. 39.

[26] Ibid., p. 39.

[27] For legends evolved around this critical operation see J. Dickinson, The Book of Diamonds (New York: Crown Publishers, Inc., 1965); V. Argenzio, The Fascination of Diamonds (New York: David McKay Co., 1966); M. Schumach, "Tools and Skill Cleave a Diamond - Error Would Have Made a 240 Carat Valueless," New York Times (December 2, 1964), p. 41.

[28] The Cullinan which weighs 530 carats has, for example, 74 facets.

[29] Other popular cuts for the solitaire diamond are: a) Marquise - 58 facets; b) Baguette - 25 facets; c) Emerald - 58 facets; d) Square Cut - 30 facets; e) Oval Cut - 58 facets; f) Pear Cut - 58 facets; g) Heart Shaped Cut - 58 facets.

[30] See Appendix Table C2.

[31] By comparing wages at the plant level in the girdling and polishing departments, it was found, for a given type of rough, that the most productive employees were more than three times faster than the slowest. In addition, there is wide variation in physical productivity of workers due to variation in quality of the rough. See Appendix Table C3.

[32] These two departments also require considerable space. While the average area per person engaged in the polishing plant is 3.7 sq.m., it is 8.5 in the sawing plant. 1961 Survey of Employment, op. cit., pp. 54-55.

[33] In practice where the resultant productivity of workers is low due to quality of the rough, they obtain daily rather than piece remuneration. Also, the piece rate structure applies to average quality fabrication; higher quality leads to an increase of about 10 per cent in the rates; lower quality entails a decrease of about 10 per cent in the rates.

[34] The substantial youthful element of the industry that derives mainly from countries where discipline and commitment to industrial work is weak coupled with the compulsory reserve service (minimum 30 days a year, often served intermittently) are the main contributing factors to the absenteeism that is plaguing the industry. In 1961, 34 per cent of all persons engaged ranged in age from 14 to 24. The median age is 29. This is a much younger average than in other diamond industries in the world. In addition there is a substantial turnover of workers in plants

arising from mobility of workers among plants, and especially from workers leaving the industry. In contrast, in the as yet largest diamond center in the world, Belgium, in 1957 two-thirds of the persons engaged were above the age of 40. A. Moyar, The Diamond Industry in 1957-48 (Antwerpen: 1959). In Israel only 18 per cent were above 40 years. It should be noted that in both these countries, the divergent tendencies are continuing.

[35] In 1962 the following fixed rents per month prevailed for a sawing machine - 67¢ and for a bruting or polishing machine - 7¢ each.

[36] These costs are often referred to as "made ready costs."

[37] Be it noted that the management of a diamond plant does not face the problem of many other consumer industries, that of style variation, but rather that associated with a range of styles.

[38] The great majority of all grievances revolve around the issue of rough-quality, assigned to workers, which is a significant determinant of their productivity. (Interview with Mr. Gradstein of the Histadruth, August, 1967).

[39] This in fact sets a limit to the degree of specialization.

[40] This point is explored in a later section (Chapter 6).

[41] 1961 Survey of Employment, op. cit., p. 5.

[42] Investment proposals in files of the Diamond Control Department.

[43] A. Papandreau, "Some Basic Problems in the Theory of the Firm" in B. Haley, ed., A Survey of Contemporary Economics (Homewood: R. Irwin Co., 1952), II 191.

[44] 1961 Survey of Employment, op. cit., p. IX.

[45] Bryce, a senior economist of the industrial development consulting firm of Arthur D. Little, Inc., argues that this is equally true for other factors besides economies of scale. "No matter how good the market prospects, how sound the financial structure or how outstanding the engineering, every project will ultimately succeed or fail on the strength of its management." Mr. Bryce, Industrial Development (New York: McGraw Hill Book Co., Inc., 1960), p. 158.

[46] There are doubts expressed as to the very existence of diseconomies of scale "in the presence of modern administrative techniques." See L. Weiss, op. cit., p. 247, and especially N. Ross, "Management and the Size of the Firm," Review of Economic Studies, 1952, No. 3. Also P. Wiles, Price, Cost and Output (Oxford: Basil Blackwell, 1956), Ch. 12.

[47] Mr. Lerner, Vice President of Union Bank, in personal conversations with the writer in July, 1967.

[48] In fact, several of the smallest firms have commenced production in their own home.

[49] This development, which was to be expected, is a product of two factors: the successful agreement reached in 1960 with the Diamond Trading Company to increase its supplies of rough, and the emergence and activities of Pituach that brought increased supplies of rough from sources outside the control of the Syndicate.

[50] Unfortunately no tabulation of the number of disappearances, i.e., the mortality rate of establishments, is available.

[51] A theoretical exposition of those points is to be found in: G. Stigler, "The Division of Labor is Limited by the Extent of the Market," The Journal of Political Economy (June, 1961), pp. 185-193.

[52] The question of developing a theory of size of the firm has been discussed and researched periodically since the early 1930's. For a brief summary of some of the works relating to this problem, see E. Penrose, The Theory of the Growth of the Firm, op. cit., Ch. 1. Interestingly enough, T. Scitovsky's, Welfare and Competition (Chicago: Richard D. Irwin, Inc., 1951), who provides one of the most comprehensive treatments of the factors involved is neither mentioned nor commented upon in E. Penrose's book.

[53] Ibid., p. 327.

[54] Ibid., pp. 333-334.

[55] The buyer in this paragraph refers to an importer rather than to a consumer.

[56] Ibid., pp. 327-328.

[57] Ibid., p. 329.

[58] Ibid., p. 330.

[59] R. Buchele, Business Policy in Growing Firms (San Francisco: Chandler Publishing Co., 1966), p. 45.

[60] E. A. G. Robinson, The Structure of Competitive Industry (Chicago: University of Chicago Press, 1958), pp. 46-47.

[61] R. Buchele, op. cit., pp. 45-46.

[62] W. A. Lewis, The Theory of Economic Growth (London: George Allen and Unwin, Ltd., 1955), p. 77.

[63] For an excellent discussion of this Jewish preference, see the appendix to V. Fuchs, Economics of the Fur Industry (Ph.D. dissertation, Columbia University, 1954). The dissertation without the appendix has been published under the same title by Columbia University Press in 1957.

CHAPTER 5

THE SUBCONTRACTING SYSTEM

This chapter examines what is regarded by the Deputy Director of the Diamond Control Department as the "principal problem of the diamond industry"[1] - its subcontracting system. For purposes of this study, subcontracting may be defined as the practice of having an outside contractor produce all or some part of a product that could be produced in the prime contractor's own facilities.[2] Generally the relationship is between a larger firm and one or more small firms.[3]

Relationships Between Manufacturers and Subcontractors

Two types of establishments operate in the diamond industry. The first is the integrated manufacturer who procures rough diamonds, employs craftsmen in his own plant to saw, cut and polish them and sells the finished products. The second is the subcontractor who produces goods to specification, never takes title to the goods which he is processing, and is never involved in the marketing of the gems. The Central Bureau of Statistics or the Diamond Control Department do not report separately the activities of subcontractors because, in addition to

contract work, a subcontractor may also be producing goods for his own account. Some of the subcontractors carry out preparatory steps in the processing of diamonds like scaife reconditioning or cleaving. Others engage in sawing, cutting or polishing, and still others complete the whole work from start to finish.

Indeed, there is no operation in the entire fabrication process that cannot be farmed out. Because of this, the ease of entry into all branches of the industry has been remarkable. The fact that every type of operation that requires specialized skill or equipment (like powder to cement the diamond into the dop) can be farmed out may mean their full economic use by the industry as a whole.

The relationship between the prime and subcontractor is a direct one, based on the prime contractor's knowledge of the subcontractor. The final decision on a subcontracting program ordinarily comes from the owner. The company placing the order, in all cases, supplies its subcontractors with the rough diamonds and specifications for the goods to be processed. Inspection is done by the purchasing firm upon completion of the order. Adjustments, if necessary, are made without additional charge.

The Central Bureau of Statistics estimated that a third of the industry's labor force in 1961 was engaged in polishing for others.[4] Some of the largest fabricators, such as Lustig Brothers, engage approximately the same number of employees in their own plant as there are in the employ of the subcontractors with whom they maintain continuous links throughout the year.

The economic and social patterns that have developed with the growth of subcontracting arrangements have given rise to considerable

misunderstandings and controversies, and have led to concern on the part of both governmental and industry officials. Perusal of governmental files and articles in the trade paper and information gained from interviews with industry executives reveal a considerable diversity of opinion on the subject.

Ben Moshe summarized the criticisms and accolades handed subcontracting before Dr. Arnon's committee exploring certain aspects of the industry as follows: "There are those who argue that subcontracting is an important factor in the industry's expansion; others claim, on the contrary, that such a system contributes to its destruction. Furthermore, it is argued, that subcontractors pirate workers from established firms and evade income tax payments. Also, faced with a shortage of working capital, they are forced to sell the gems they process on their own account, at any price, and thus lower the prices for the industry as a whole."[5] In a recent memorandum,[6] the economist of the Diamond Department, Mr. Lieberman, states that subcontracting leads to the "collapse of established firms and contributes to the undermining of the industry."

The editor of the bimonthly trade paper Israel Diamonds asked seven industry officials (including prime contractors, banking and brokerage executives) "whether it was desirable to process rough in an integrated enterprise only or only through subcontractors."[7] He found that "most of the answers were in favor of an integrated enterprise." The respondents shared an unfavorable view regarding a "mixed system" according to which production is divided between the two. Significant, perhaps, is that opinions of the manufacturers in the group were not unanimous in regard to this question. In concluding his survey E. Levi, recognizing that mistaken conclusions can be arrived at from such unscientific

limited polls urged a detailed study of the subcontracting system, "the sooner the better."[8]

That the reasons for subcontracting remain shrouded in mystery are not entirely surprising. Its growth has been too recent to permit a full grasp of its workings. Moreover, absence of basic data has given rise to many misconceptions about its impact. One objective of this chapter is to bring together and blend the various ideas about diamond subcontracting that extend beyond the level of individual introspection and studies. In this it may be possible to establish a stronger basis for a judgment of the total prime-subcontractor relationship, the reasons for its success, and its possible future role.

The Questionnaire Survey

The first task in the design of the questionnaire was one of unearthing all the existing arguments, whether they seemed important or trivial. This was done in order to select statements of opinion which would range from the feeling that a subcontractor should be treated on a par with a prime contractor to those assigning a lower degree of importance to the subcontractor.

The statements that served as the basis for the construction of the questionnaire were collected from three sources: (1) published material in the trade press, (2) government files and (3) interviews with a score of government and industry personnel ranging from owners of companies to clerical employees in both prime and subcontractor organizations. One hundred and ten statements were collected, ranging across the spectrum of opinion. The search for statements extended over a period of a year.

Attitudinal Measurement

It was important that the statements which are used in the final questionnaire be clear, concise, unambiguous and that they contain no irrelevant elements. Accordingly the list of opinions was sorted, edited and refined according to these criteria. This screening process reduced the original list to 67 usable statements.

The 67 statements were placed on a modified Likert scale with a six-point continuum[9] (strongly agree; agree; sometimes agree, sometimes disagree; do not know; disagree; strongly disagree). The schedule of questions was presented to 180 company representatives, of which 110 belonging to prime contractors were usable.[10] Response alternatives for positively phrased items were weighted: 2;1;0;0;-1;-2. Weights for negatively phrased items (against subcontracting) must be reversed: -2;-1;0;0;1;2. The response judged to be most favorable to subcontracting was consistently assigned the highest scoring weight. A company's score is the sum of the weighted alternatives which it endorses. A high score indicates a positive attitude toward subcontracting.

Coverage

My wife, Miriam, is to be credited with conducting the field work in Israel during the months of July and August of 1969 and with picking up the questionnaires by personal contact, at which time, whenever necessary, assistance was rendered in completing the survey.[11] This retrieval method resulted in an extremely high return; almost all of the surveyed companies cooperated in this venture.[12] There were cases, however, in which some establishments were unwilling or unable to answer certain statements and the tabulations of results take this into consideration.

The 110 respondents are distributed over all of the class sizes, excepting the smallest one (1-9 persons engaged). Firms engaging 50 or more employees were completely covered. The coverage among firms engaging fewer than 50 workers was of necessity much less extensive, since subcontractors are found among those group sizes (see Table 5-1).

TABLE 5-1

The Distribution of Surveyed Firms, by Size of Firm
1969

Group Size (By the number of persons engaged)	Number of Firms Surveyed August 1969	Number of Firms According to the 1968 Diamond[1] Department's Survey
10-19	9	104[2]
20-29	13	47[2]
30-49	28	36[2]
50-74	28	30
75-100	10	18
Over 100	22	11
Total	110	246

(1) Class sizes for the 1968 Survey differ as follows: 31-50, 51-75 and 76-100 instead of 30-49, 50-79 and 75-100. (1968 Statistical Report, Table 22)

(2) Since the 1968 Survey classifies firms in the 10-49 range differently, the present distribution was obtained directly by personal examination of the primary records available in the files in the Diamond Control Department.

The next step was that of grouping the items of the questionnaire into areas on the basis of similarity of content. The analysis suggested that the forces influencing the prime contractor to embark upon a subcontracting program[13] can be classified into four broad categories: flexibility, employment relations, cost, and quality. An attempt to probe into one additional category - entrepreneurship - was abandoned; I met vehement opposition on the part of many company representatives to check statements relating this factor to group ethnicity.[14] This reason, coupled with an additional refinement of the questionnaire, led to further elimination of 19 statements. There thus remained 48 statements and these constitute the final list which was used in the evaluation of the subcontracting system.

The responses were also tabulated by two firm size groups, 60 companies engaging 50 or more employees and 50 companies with fewer than 50 employees.[15] Table 5-2 summarizes the findings for the four forces influencing subcontracting, for both size classes. The means for the four categories are all positive, signifying a favorable view of subcontracting. The means for flexibility and employment relations groupings are higher than those for cost and quality, which would seem to suggest that the former are more important considerations in choosing subcontractors.

Moreover, the smaller firms appear to take a more favorable attitude toward subcontracting than do the larger. The means for all four forces for the size class employing fewer than 50 workers are higher than for that engaging more than 50 workers. Further, since all of the 99 per cent confidence intervals include only positive values, the probability is 99 in 100 that prime contractors in general have favorable

TABLE 5-2

Summary of Mean Scale Responses of Prime Contractors' Attitudes Toward Subcontracting

A. Firm Size Class - Engaging Over 50 Workers

Categories	Mean ($\bar{X}_S$)	Standard Deviation (σ_S)	Standard Error of the Mean ($\sigma_{\bar{x}}$)	99 Per Cent Confidence Limits ($\bar{X}_S \pm 3{,}106\ \sigma_{\bar{x}}$)
Flexibility	0.7139	0.1136	0.0342	0.6077 to 0.8201
Employment Relations	0.6693	0.1044	0.0314	0.5664 to 0.7614
Cost	0.5889	0.1699	0.0512	0.4299 to 0.7479
Quality	0.4945	0.1735	0.0523	0.3321 to 0.6569

B. Firm Size Class - Fewer Than 50 Employees

Flexibility	0.7334	0.1415	0.0426	0.6011 to 0.8657
Employment Relations	0.7317	0.1225	0.0369	0.6171 to 0.8463
Cost	0.6484	0.1345	0.0405	0.5226 to 0.7742
Quality	0.6200	0.1741	0.0524	0.4572 to 0.7828

regard for subcontracting, as this attitude is measured by the above procedure.

Analysis of Variance

To further analyze these findings, analysis of variance[16] procedures will be used to test the significance of the differences among the measured attitudes toward four categories of forces and between the two size classes of firms. The findings are summarized in Table 5-3.

TABLE 5-3

Summary of Computations for Analysis of Variance

Source of Variation	Amount of Variation SS	Degrees of Freedom d.f.	Estimated Variance Mean Sq. MS.	Ratio of Variances	Decision Concerning The Null Hypothesis Ho
Between four areas	0.4215	3	0.1405	6.272	Reject
Between size classes	0.1067	1	0.1067	4.763	Accept
Interaction or Joint effect	0.0346	3	0.0115		
Within areas	2.0024	88	0.0227		
TOTAL	2.5652	95	-		

Since the estimated variance of interaction is smaller than the estimated variance within areas, we pool the variation and the degrees of freedom from these two sources and compute a new estimated variance to be used as the basis for comparison (the denominator for the F test). The numerical value of the estimated error variance is 0.0224.

Testing first the 4 group means, the computed value of F of 6.27 is beyond the 95 and 99 per cent tabled values (for 3 and 91 degrees of

freedom). The difference between the various factors affecting subcontracting decisions, therefore, is found to be significant. As for the classification by plant size, the computed value of F (4.76) is less than either of the two critical values (for 1 and 91 degrees of freedom) at 95 and 99 levels of significance. The mean difference between the two size classes, therefore, is not significant.

General Pattern

We have thus demonstrated that the variation in the strength of attitudes is significant with respect to the four types of operating forces and economic problems faced by diamond establishments. That is to say, these differences cannot be accounted for by random sampling variations in samples drawn from a common population.

Pairwise Comparison

The F-test provides no direct information of the pattern of variation between particular economic forces. To accomplish this a pairwise comparison by means of a "t" test[17] is employed to determine which pairs of forces produce responses reflecting attitudes significantly different from each other. The results evaluated at two levels of significance are summarized in the following table. (Table 5-4)

At the 5 per cent level of significance all the attitudes except those between flexibility and employment relations are significantly different. This is indicated by a single star. For the 1 per cent level of significance one finds that the attitudes between quality and flexibility, quality and employment, cost and employment, and flexibility and cost are significantly different. This is indicated by two stars.

TABLE 5-4

A Pairwise Comparison of Attitudes Toward Four Functions of Subcontracting

	Sums of the Observed Data	Quality 13.3734	Cost 14.8467	Employment Relations 16.8125	Flexibility 17.3665
Quality	13.3734	-			
Cost	14.8467	1.4733(x)	-		
Employment Relations	16.8125	3.4391(x)(x)	1,9658(x)(x)	-	
Flexibility	17.3665	3.9931(x)(x)	2.5198(x)(x)	0.5540	-

For the 0.05 level of significance

$$|X_i - X_j| \geq \sqrt{2nS_E F^1_{91}(0.05)} = \sqrt{2\ 24\ 0.0224\ 3.95} = 1.458$$

For the 0.01 level of significance

$$|X_i - X_j| \geq \sqrt{2nS_E F^1_{91}(0.01)} = \sqrt{2\ 24\ 0.0224\ 6.93} = 1.930$$

X_i, X_j - sum of the observed data
S_E - estimated error variance
n - size of each category

Validation

The foregoing quantitative survey has shown the favorable inclination on the part of prime contractors toward subcontracting in all four of its functions. However, favorable attitudes are significantly more pronounced toward flexibility and employment relations than they are toward cost and quality. These findings were confirmed by a somewhat independent check on the responses to the detailed questions. In a postscript to the questionnaire the companies were asked to respond to two additional questions. To the first one, "What is the biggest advantage found in subcontracting?" almost all of the respondents listed reasons included in the realm of flexibility. To the second question, "What is the biggest disadvantage found in subcontracting?" most of the respondents cited lack of uniformity in diamond fabrication (quality).

Detailed Examination of Attitudes

The previous discussion has provided the necessary background information on the relative importance of the principal forces behind the subcontracting decision. This section considers and evaluates in greater detail attitudes in each of the four areas.

Flexibility

The flexibility section of the questionnaire contains statements relating to external economies, economies of scale, and integration. A major finding, revealed by statements 22 and 41 not readily accepted by industry officials (at least in their official capacity) is the continuously increased role that subcontractors can and do play at all levels of demand and not only during periods of peak product and demand. Responses to statements 22 and 41 enable us to reach this conclusion. The former

reveals that out of 110 companies surveyed only 20 feel that use of a subcontractor is good only at the peak of the season, while the other shows that 91 companies use this method throughout the year.

The establishments use the subcontractor as a means of providing a substitute for expansion of their production facilities (statement 2). What is worthy of note is that the small subcontractor (called in Israel the "Kvutzah" - group) can be housed in almost any kind of structure (statement 10), thus preventing the dilution of the parent company's own capital. Thanks to the presence of these inexpensive facilities, the parent company can take on work that would overbalance its own productive organization.

As expected, 82 prime contractors or over 70 per cent of the respondents benefit from being able to obtain assistance whenever experiencing difficulties in balancing their operations within the establishment (statement 19).

The parent company benefits as well from the subcontractor's utilization of external economies in that it specializes in particular types of rough like fancy whose proportion in the syndicate's boxes assigned to the individual manufacturers is rather miniscule (statement 57).

Advantage is also taken of the subcontractor's specialized know-how in fabricating flawed or hard stones for which piece rates are not generally applicable (statements 11 and 16).

The integrated companies also felt that by entering into affiliation arrangements with subcontractors, they offset a dilution of top management resulting from their increased effort at marketing (statements 26 and 58).

Employment Relations

Another important reason favoring subcontracting is management's solicitude for amicable industrial relations. The most cited source of workers' dissatisfaction and grievances originates in the assignment of flawed or hard rough which leads to a decline in their productivity and earning capacity. This may be primarily reflected in high rates of labor turnover and increased hiring and training costs (statement 60).

To counter and obviate such unfavorable developments, integrated companies establish links with subcontractors, especially when, as in this industry, neither the workers nor the union have a voice in the decision-making process over subcontracting (statements 12 and 61).[18]

The subcontractor is more suited to process irregular rough or even larger stones because of his greater readiness to do away with the piece rate system. Providing daily remuneration for a number of workers in a larger plant may increase rather than diminish frictions within the plant. Ninety-one companies or over 80 per cent of the prime contractors asserted that their workers are pleased when irregular rough is subcontracted (statement 6).

The kvutzah was also found employing, to a greater extent, mechanical dops for processing of small stones. This contributed to a reduction in unit labor cost. Until recently, lack of an acceptable agreement, by both management and workers, in regard to piece rates applicable for workers operating mechanical dops hampered their adoption by the larger plants.[19] The kvutzah, because of its smallness, is able to avoid and evade, to a much larger degree, such collective agreements purporting to embrace all the establishments. In addition, workers manning the subcontractor's plant do not fall behind in their skill in

comparison with those of the parent companies, according to 81 respondents (statement 1).

Cost

The principal factor in the subcontracting decision should be a comparison of the parent company's costs with the subcontracting prices. The real problem, however, is a dependable estimation of these. Less than 50 per cent of the companies (or 53 out of 110) indicated that they were able to obtain accurate cost and price information. And, when investigated, even these were found to be weighed incorrectly, or completely disregarded.

Also, one must face the fact that even if a subcontractor were to be less expensive, the prime contractor is still susceptible to incur two major additional costs, disregarded in the computations, stemming from the possibility of greater wastage of rough during the processing and change of stones.

On the positive side, over 70 company representatives pointed out that subcontractors' savings on labor costs, owing to their greater usage of mechanical dops (statements 66 and 15) coupled with narrow profit margins (statement 53) engendered their belief that in regard to particular types of diamonds (like fancy, flawed or irregular stones), it is less expensive to subcontract them (statement 37).

Quality

A major cause of dissatisfaction is the professed lack of uniform quality and precision one obtains from the subcontractor. In general, however, there was agreement indicated by the responses of 73 companies to statement 62 that the performance of a subcontractor depends very much

on the prime contractor's detailed instructions and pressure applied on the former.

Seventy-seven respondents indicated that the direct and continuous relationship characterized by the absence of frequent frictions which they maintain with the subcontractor are significant manifestations that the quality desired can be maintained in the subcontractor's plant (statements 31 and 9). It was also stressed (by 83 companies) that there are subcontractors who specialize in poor quality work which is destined for the Far Eastern markets. Mr. M. Schnitzer, by far the largest diamond exporter, has argued that only this specialization has enabled him to penetrate into these markets.[20]

Subcontracting and Diversification

In the diamond industry a manufacturer may achieve product diversification, in either or both of two ways. He may operate different divisions fabricating different diamonds in his own plant or he may supplement his plant with that of a subcontractor.[21] These two approaches to diversification[22] are investigated in order to shed additional light on the contracting-out system. As used in this section, diversification[23] refers to both the range of rough diamonds the company uses and the cut being faceted.

Diversification arises primarily in the establishment's attempt to tap more than one market. The predominant portion of the firms producing more than three types of cut indicated that the most important reason for their diversification lies in production of demand-related products, that is, a number of related products which buyers wish to buy from one rather than from several sellers. Only to a very limited degree does diversification serve as a hedge in providing some degree of

TABLE 5-5

Overall Extent of Product Diversification
Within Prime Contractors' Plants, 1969

Product Lines	Number of Firms			
	Rough	Per Cent of Total	Cuts	Per Cent of Total
1	3	3.1	32	32.2
2	23	23.2	20	20.2
3	21	21.2	5	5.1
4	24	24.2	6	6.1
5	13	13.2	9	9.2
Over 5	15	15.1	27	27.2
Total	99	100.0	99	100.0

TABLE 5-6A

Number of Prime Contractors Fabricating Specific Proportions of Rough Within Their Own Plants, 1969

Type of Rough	Portion of Work None	-20%	21-49%	50+ %
Melees	11	1	4	83
Melees - Collection	40	6	11	42
11, 12, 13	23	2	17	57
± 9	23	1	17	58
Blacks - Darks	31	3	12	53
Sizes	53	6	16	24
Smalls	57	9	21	12
Zeigers	4	-	-	95
Cleavages	53	7	19	20
Chips	63	8	17	11
Shapes	62	10	15	12
Sand	88	9	1	1
Kaps	35	22	28	14
Couteds	95	1	-	3

TABLE 5-6B

Number of Prime Contractors Fabricating Specific Proportions of Cuts Within Their Own Plants, 1969

Type of Cut	Portion of Work None	-20%	21-49%	50+ %
Brilliant	11	1	9	78
Achtkant	59	17	15	8
Marquise	82	17	-	-
Baguette	75	22	1	-
Tapers	80	17	2	-
Square	87	12	-	-
Pear	85	12	2	-
Oval	83	13	3	-
Triangles	90	9	-	-

TABLE 5-7

Extent of Product Diversification by Size of Firm[1]

A. According to Types of Rough Diamonds

Group Size (by number of persons engaged)	1	2	3	4	5	Over 5	Total
10-29	2	8	4	4	2	2	22
Per Cent	9	36	18	18	9	9	100
30-49	1	7	3	9	2	2	24
Per Cent	4	29	13	37	8	8	100
50-100	-	6	10	6	7	5	34
Per Cent	-	18	29	18	20	15	100
Over 100	-	2	4	5	2	6	19
Per Cent	-	10	21	26	10	32	100

B. According to Types of Cut Diamonds

Group Size	1	2	3	4	5	Over 5	Total
10-29	10	5	2	1	2	2	22
Per Cent	45	23	9	4	9	9	100
30-49	9	7	1	1	1	5	24
Per Cent	37	29	4	4	4	21	100
50-100	9	8	1	4	5	7	34
Per Cent	26	23	3	12	15	20	100
Over 100	5	-	-	-	1	13	19
Per Cent	26	-	-	-	5	68	100

(1) Details of percentages may not add to totals because of rounding.

insurance against the decline of a single product.

A wider line of products assures a stronger position to the firm in promoting its products. To illustrate, because of time limitation, a large importer will be more inclined to inspect a wider rather than a narrower range of products. Broadly speaking, the greater the number and the wider the variety of diamonds a company is able to offer, the greater its chance of securing good margins. This is due to the fact that the whole product line of the firm may often be regarded as one offer. Thus, the price of a particular polished diamond depends upon the particular length of line to which the item belongs and the latter's price depends upon the overall size and varieties of other lines offered.[24]

The diversification experience of the respondent prime contracting firms[25] is summarized in Table 5-5, which shows that both rough and cut diversification is widespread. Fifty-two per cent of the firms process four or more types of rough diamonds and 28 per cent process five or more types. Forty-two per cent of the firms process four or more types of cut diamonds, and 36 per cent process five or more types. Inspection of Tables 5-6A and 5-6B confirms, in a more detailed way, the widespread diversification prevailing within the prime contractors' plants, even though their emphasis on specific types of rough (like melee's and zeigers) and cuts (like brilliant) is clear.

Efforts to discover whether the extent of diversification was related to firm size are summarized in Table 5-7, which indicates a positive relationship between firm size and product diversification.[26] In the smallest size class (employing between 10 and 29 workers) 9 per cent of the firms process a single type of rough and 45 per cent process

TABLE 5-8A

Number of Prime Contractors Contracting-Out
Specified Proportions of Rough Diamonds,
1969

Type of Rough	Portion of Work Contracted-Out			
	None	-20%	21-49%	50+ %
Melees	89	9	1	-
Melees - Collection	99	-	-	-
11, 12, 13	94	2	3	-
± 9	93	5	1	-
Blacks, Darks	89	2	3	5
Sizes	94	5	-	-
Smalls	79	6	5	9
Zeigers	96	3	-	-
Cleavages	88	2	3	6
Chips	91	4	1	3
Shapes	91	3	1	4
Sand	95	4	-	-
Kaps	76	4	4	15
Coateds	96	3	-	-

TABLE 5-8B

Number of Prime Contractors Contracting-Out
Specified Proportions of Cut-Diamonds,
1969

Type of Cut	Portion of Work Contracted-Out			
	None	-20%	21-49%	50+ %
Brilliant	87	9	3	-
Achtkant	85	7	2	5
Marquise	55	6	13	25
Baguette	44	11	16	28
Tapers	50	8	18	23
Triangles	72	7	11	9
Square	54	16	14	15
Pear	57	8	18	16
Oval	60	6	16	17

a single type of cut. The larger the firm size the greater is the reduction in the percentages of single-rough-and-cut firms. For the largest size class (firms engaging over 100 persons) there is no firm fabricating a single type of rough, and the percentage producing a single type of cut declines sharply to 26. Turning to diversification, one observes that the percentage of firms in the smallest size class handling more than 5 lines is 9 for both rough and cut diamonds. The corresponding percentage figures for firms engaging over 100 workers are 32 and 68, respectively.

Finally, Tables 5-8A and 5-8B describe the relation of subcontracing to diversification in the diamond industry. Prime contractors heavily farm out all types of fancy cuts, kaps and smalls.

Subcontracting and the Price-Cost Relationship[27]

We next turn to an analysis of the contention that subcontractors are responsible for a narrowing of the price-cost margin that, it is claimed, the industry has experienced.

We shall first examine whether, in fact, the price of rough diamonds has increased relative to that of polished goods, thus leading to a profit squeeze for diamond fabricators.

Casual inspection of the average annual price series of the various categories of rough and polished diamonds, plotted on a semilogarithmich chart, shows generally parallel movements for the two types of finished diamonds and for the two most important types of rough diamonds, melees and sizes (Figure 5-1). The chart suggests the possibility of a price squeeze only on account of the generally sharper relative increase in the series of smalls in the period 1957 and 1967 and "other" since

TABLE 5-9

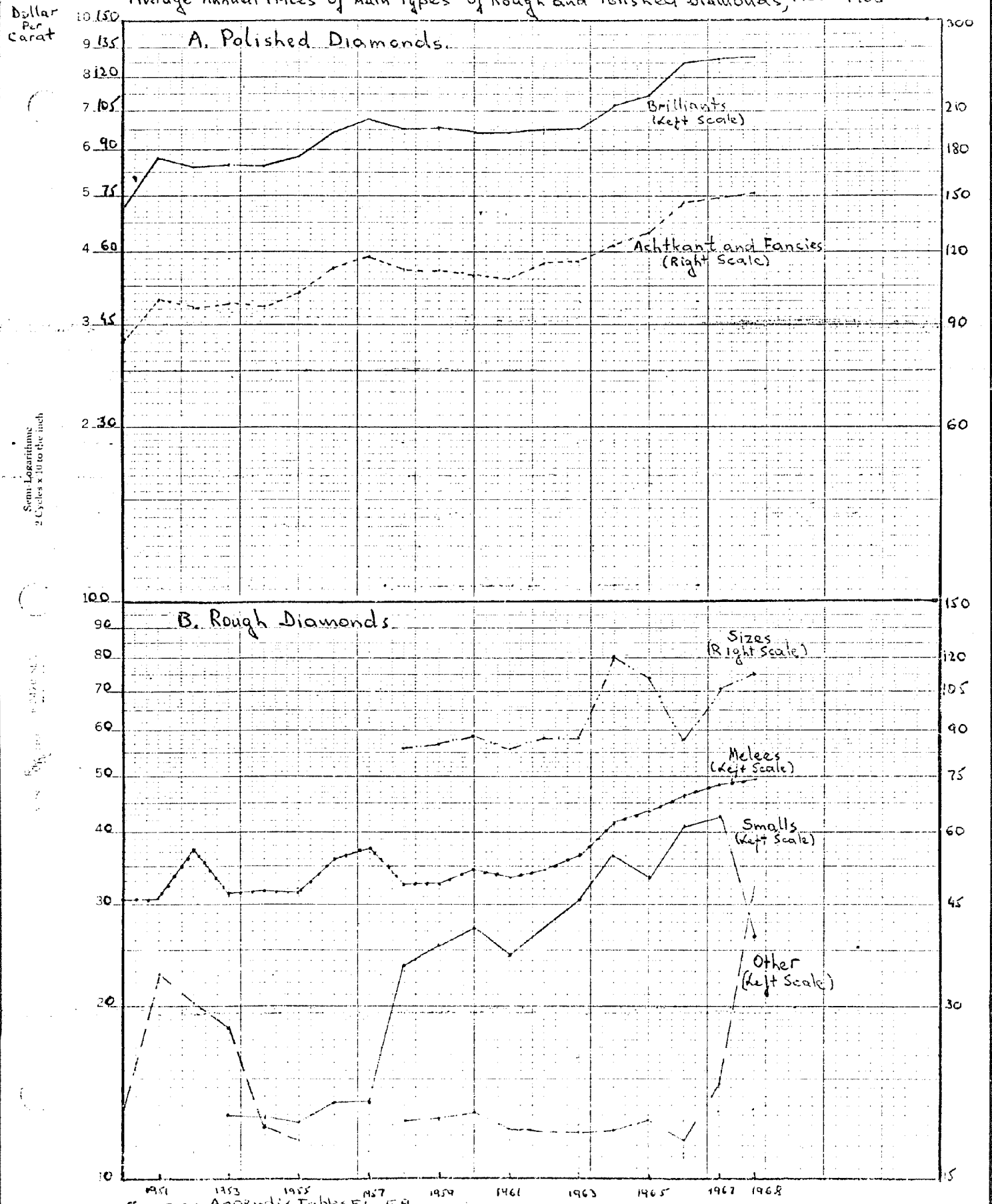
Price Indexes of Rough and Polished Diamonds, 1950-1968

Year	Weighted Aggregative Price Indexes of Rough Diamonds Incorporating: current year (1968) value weights	Weighted Aggregative Price Indexes of Rough Diamonds Incorporating: 1960-1963 value weights	Weighted Aggregative Price Indexes of Polished Diamonds Incorporating: 1960-1963 value weights	Weighted Aggregative Price Indexes of Polished Diamonds Incorporating: 1960 value weights	Weighted Aggregative Price Indexes of Polished Diamonds Incorporating: 1962 value weights
1950	90.81	89.60	74.62	74.56	74.68
1951	94.05	90.89	89.16	89.10	89.25
1952	109.32	107.75	86.22	86.16	86.30
1953	92.43	90.92	87.59	87.54	87.68
1954	92.36	91.56	86.42	86.38	86.52
1955	90.55	90.10	90.45	90.38	90.53
1956	103.29	102.96	100.21	100.18	100.34
1957	108.50	108.08	104.52	104.42	104.62
1958	93.65	93.18	100.88	100.78	101.03
1959	95.10	94.69	100.51	100.41	100.66
1960	100.02	99.62	98.95	98.86	99.09
1961	96.50	96.16	98.50	98.35	98.69
1962	100.00	100.00	100.00	100.00	100.00
1963	104.01	103.98	100.80	100.80	100.79
1964	123.03	124.63	110.35	110.25	110.51
1965	124.67	125.41	114.68	114.61	114.79
1966	124.37	124.28	130.09	130.00	130.20
1967	135.44	134.92	132.01	131.92	132.15
1968	143.67	139.70	133.97	133.86	134.09

Source: Appendix Tables E4-E9.

FIGURE 5-1

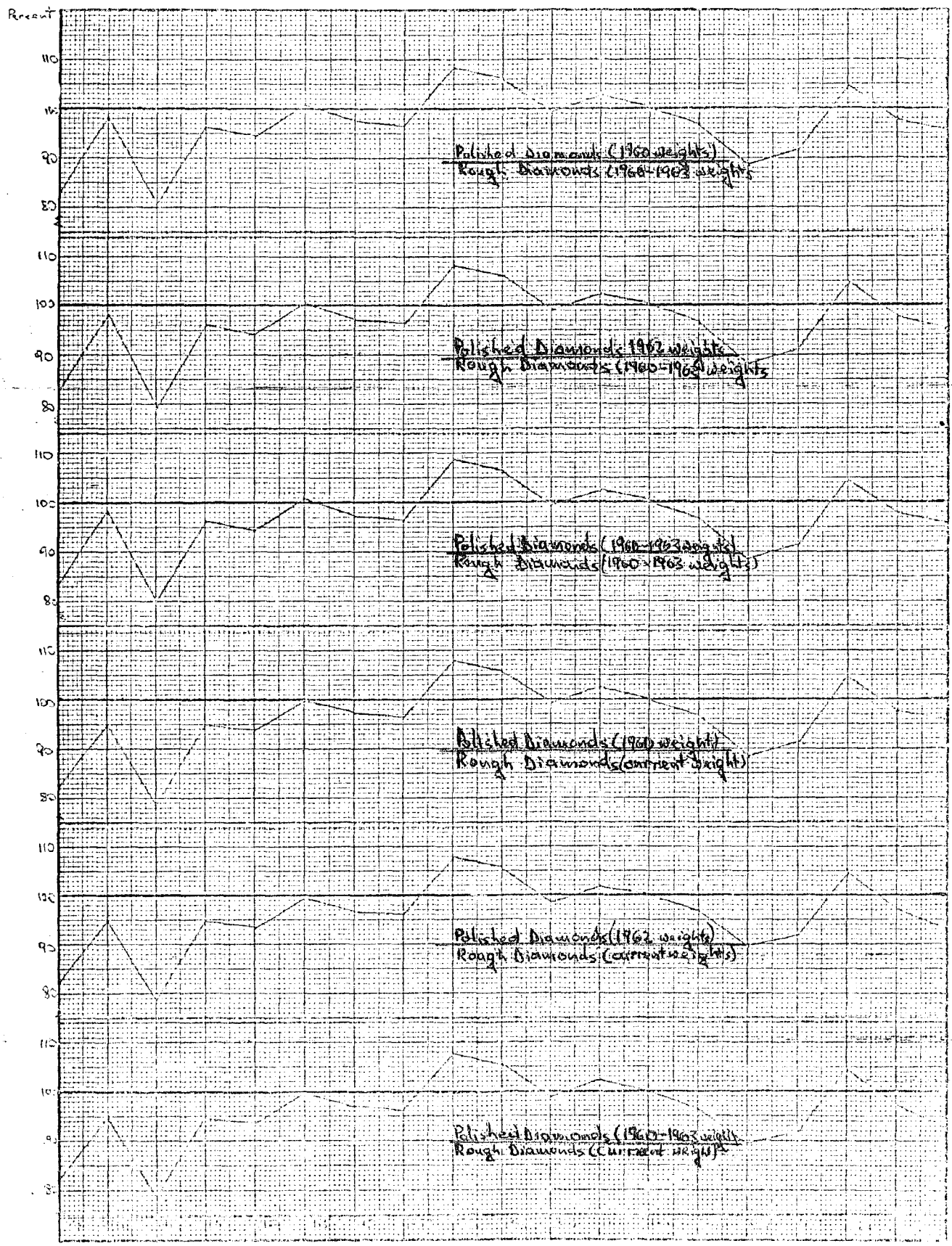
Average Annual Prices of Main Types of Rough and Polished Diamonds, 1950-1968



Source: Appendix Tables E4-E9.

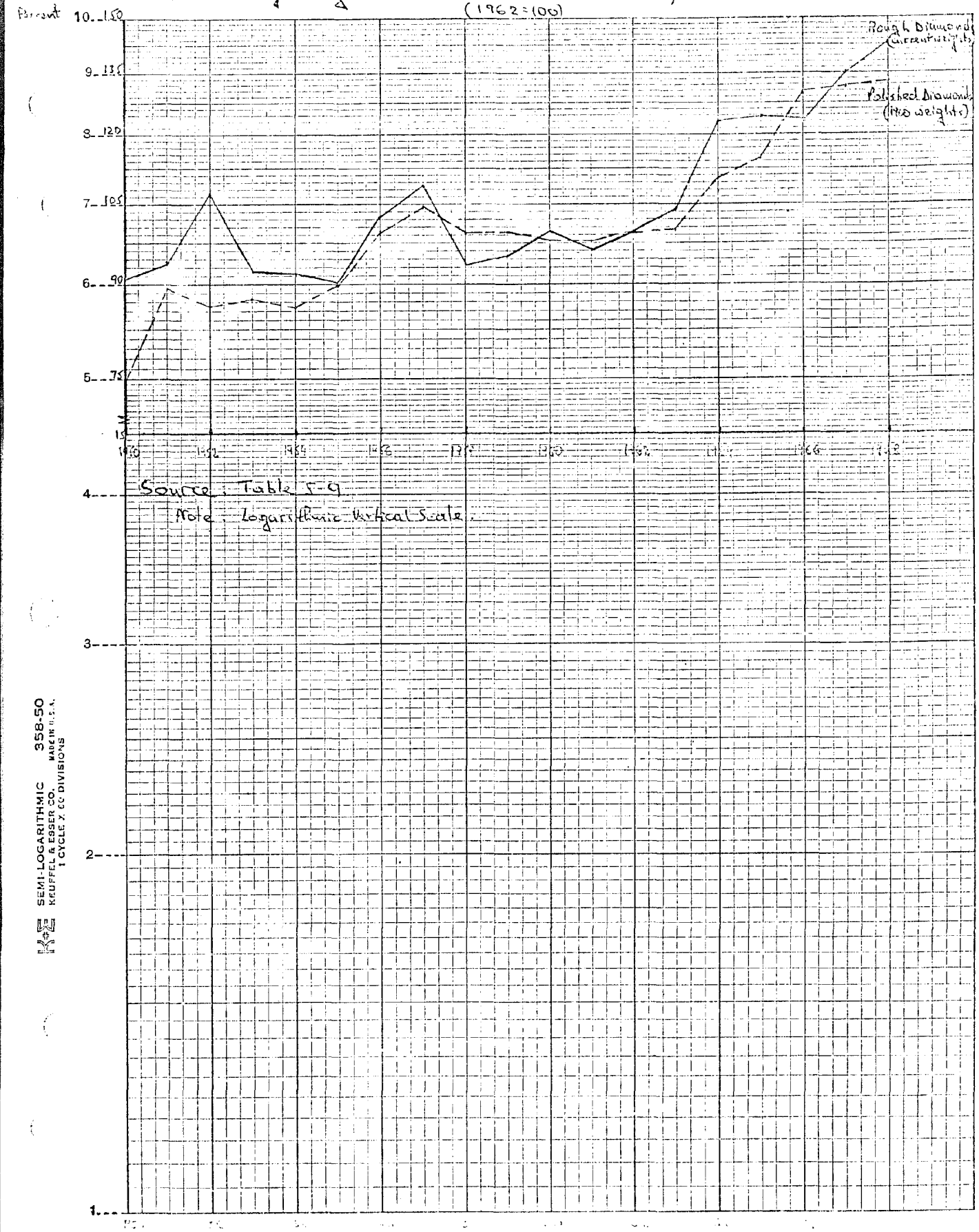
FIGURE 5-2

Annual Ratios of the Price Index of Polished Diamonds to the Price Index of Rough Diamonds
1950-1968



Source: Appendix Table E-10

FIG. 5-3 Price Indexes of Rough and Polished Diamonds, 1950-1968 (1962=100)



1966. However, in no year did the proportion of these two types of rough diamonds (smalls and "other") account for as much as 10 per cent of the total value of rough diamonds imports.

This visual interpretation was checked by more refined statistical techniques. Two weighted aggregative price indexes of rough diamonds and three weighted aggregative price indexes of polished diamonds were constructed for the nineteen-year span 1950 to 1968 incorporating a variety of value weights[28] (Table 5-9).

Figure 5-2 contains annual series of the six possible ratios of the price indexes of polished diamonds to rough diamonds. While chosen to encompass the range of possible bias in both polished and rough diamond indexes, all the series exhibit high agreement. To make the best possible case for a profit squeeze based on the relative growth in the two series, the polished diamond price index containing the greatest upward bias and the rough diamond index with the greatest downward bias were plotted on a semilogarithmic scale. The price index of rough incorporating current value weights with its highest bias and the price index of polished diamonds employing 1960 value weights with its lowest bias are the two series presented in Figure 5-3.

Were a price squeeze the characteristic of the diamond market, the spread between the price indexes of rough and polished diamonds would tend to widen with the rough diamond series increasing more rapidly than the series of polished diamonds. Such does not appear to have been the case. With the exception of the first three years (1950-1953), the spread is extremely narrow and appears to be insignificant for analytical purposes. Also, the indexes move very closely together and have crisscrossed one another six times, twice since 1962.

This finding is further corroborated when the series of annual ratios between the two indexes are computed and a least squares straight line fitted to it. The equation is $Yc = 96.08 + 0.15X$. The positive Origin; 1959. value for the slope coefficient suggests an increase in the price cost margin. However, the slope coefficient is not statistically significant.[29] In other words, we cannot reject the null hypothesis, i.e., that the true value of the regression coefficient in the population from which the sample is drawn is zero. The overall conclusion to be drawn from the preceding discussion is that we have found no evidence to support the validity of the argument that diamond fabricators have faced a secular decline in their profit margins.

We next turn to the question of how subcontracting has been related to the assumed constancy in the price-cost margin. In terms of their effect on the rough and finished diamond markets, their effect probably could not be significant. The amount of rough diamonds bought and polished ones sold by the subcontractors in relation to the total quantities available on the open market is miniscule. This suggests that the subcontractors possess little ability to raise the prices of rough or reduce those of polished diamonds.

The foregoing surveys have established that subcontracting plays an important role in the diamond industry's expansion and diversification. Furthermore, subcontracting in the industry represents high degree of rationalization of production and the extension of the division of labor. The findings of the survey have shown the favorable attitudes of prime contractors toward subcontracting in all the four functional areas examined: flexibility, employment relations, cost and quality.

Viewed in this way, subcontracting can be construed as having led to favorable cost developments and probably has contributed substantially to the avoidance of a price-cost squeeze, with its resultant impairment of the competitive process that might have occurred in the absence of subcontracting.

Conclusion

Experience with subcontracting suggest that it should be accepted as a desirable sector of the diamond fabrication industry, which permits a constructive application of the division of labor between prime and subcontractors. The relationship between the two was found to be, to a very large degree, complementary, generating benefits to the industry as a whole. It was established that prime contractors concentrate on processing of the conventional types of rough and cuts (like melee's, zeigers and brilliants), which easily lend themselves to chain fabrication, while rough and cuts (like smalls, kaps, and fancies) that don't fall in this category are farmed out to subcontractors. The evidence further suggests that subcontracting played an important role in the industry's expansion and in its attempts at enhancing both the range of products and markets.

It was found that, with respect to four critical decisional criteria - flexibility, employment relations, cost and quality, subcontracting was of particular importance. The prime contractors were found to be positively disposed to their subcontractors in all of the four areas explored, with the first two areas considered more critical than the second two. This suggests that the prejudices against subcontracting which have gradually evolved over the last two decades, be laid aside in favor of an unbiased look at this system.

One area which might be explored by industry officials is the

possibility of setting up a contracting program, recently referred to as "Two-Way Contracting."[30] Under this system, each firm, for example, will specialize in one or two types of rough, and contract out other types. Thus, each firm establishes links to bring work in and to job work out simultaneously and continuously. This may increase the efficiency of the industrial units, by lengthening the production runs.

Among the large companies examined (those employing over 50 workers) five were found to fabricate rough belonging to other integrated firms. This suggests that, at present, "two-way" contracting at least has made a beginning in the Israeli diamond industry. However, the writer recognizes that such an arrangement is slow to organize, particularly since diamond producers are fiercely independent and distrustful of each other. This problem, however, is even a factor limiting the present prevailing "one way" contracting system. For example, sizes which are not suited to chain fabrication are rarely jobbed out for fear the subcontractor will change the stones.

NOTES TO CHAPTER 5

[1] A. Ben Moshe, Memorandum Concerning Licenses 1961, 3 pp. (in the files of the Diamond Control Department).

[2] Two types of activities which are often classified in the industry as subcontracting, but which are of much lesser importance are excluded from this study. These include fabrication of diamonds by the subcontractor which are owned by either local and foreign merchants or by foreign manufacturers.

[3] The subcontractor need not always be a smaller firm. In fact, in the diamond industry, smaller firms may farm out work to other small or larger companies.

[4] CBS, 1961 Survey of Employment and Equipment, op. cit., p. X.

[5] The committee headed by Dr. Arnon, Director of the Treasury Department and appointed in 1961 by the then Minister of Commerce and Industry, P. Sapir, was charged with the task of investigating the industry in order to recommend ways and means of diversifying diamond production. Among other things it heard testimonies concerning the subcontracting phenomenon of the industry. The minutes of the advisory committee's sessions weren't made available to me. Canvassing the opinions of those who testified before the committee, it became clear that the Israel Diamond Manufacturers' Association, representing the prime contractors, subscribed to the negative philosophy in regard to subcontracting while the Israel Diamond Exporters' Association and the Small Producers' Organization advanced the positive aspects of subcontracting.

[6] Memorandum Concerning the Organization of the Diamond Industry, (in the files of the Diamond Control Department)(May 14, 1967), 3 pp.

[7] E. Levi, "The Big Enterprise or the Small Enterprise - Which is Preferable for the Diamond Industry" Israel Diamonds (Sept., 1969) pp. 16-18.

[8] Ibid., p. 18.

[9] For a critical appraisal of Likert and other types of scales see: R. Ferber and P. Verdoorn, Research Methods in Economics and Business (New York: Macmillan Co.) 1962, Chapter 6. M. Shaw and J. Wright, Scales for the Measurement of Attitudes (New York: McGraw Hill Book Co.) 1967. H. Upshaw, "Attitude Measurement" in H. Blalock ed. Methodology in Social Research (New York: McGraw Hill Book Co.) 1968. A. Edwards, Techniques of of Attitude Scale Construction (New York: Appleton-Century Crofts, Inc.) 1957.

[10] It was assumed that since prime contractors use subcontractors, they are thoroughly familiar with the problem and consequently their responses were used for its evaluation. The names of the companies by

group size are furnished in Appendix D1.

[11] The interviewer carried letters of introduction from the Deputy Director of the Diamond Control Department, A. Ben Moshe, and the secretaries of the two manufacturing associations. This type of introduction was chosen in order to provide credibility both to the interviewer and to the reasons for the study.

[12] Only one company engaging 60 workers absolutely declined the invitation to participate in the survey. Based on my own and official estimates, the present survey canvassed well over 95 per cent of all prime contractors.

[13] Earlier writers in the procurement field have used the terms "make or buy," or "manufacture or buy" interchangeably with subcontracting. The classic study of this subject is J. W. Culliton's, Make or Buy (Boston: Harvard University Graduate School of Business, 1942). See also A. Oxenfeld and M. Watkins, Make or Buy (New York: McGraw Hill Book Co., Inc., 1956). For other sources on this subject, see the bibliography.

[14] They averred that the nation's unity should be stressed in the present circumstances of continual warfare with the Arabs rather than the group divisions within it.

[15] The division appeared to be significant in view of the previous finding that some, even though negligible, economies of scale exist for plants fabricating melees and engaging 50 or more employees (see Appendix D2).

[16] The assumptions underlying this analysis, the independence of classifications and the homogeneity of variances within the four areas, were tested and found valid (see Appendix D3).

[17] For a comprehensive discussion of the pairwise test, see T. Yamane, Statistics (New York: Harper and Row, Pub., 1967), pp. 690-694.

[18] In the U. S., by contrast, the contracting out of work has become the most important nonwage issue in collective bargaining between industrial management and in-plant unions. Recent decisions of the NLRB and the courts tend to impose powerful limitations upon subcontracting. For a detailed legal analysis of the U. S. experience, see R. Koretz, "How Issues of Subcontracting and Plant Removal Are Handled by the Courts" and W. Feldesman, "How Issues of Subcontracting and Plant Removal are Handled by the NLRB" in Industrial and Labor Relations Review (Jan., 1966), pp. 239-264. See also W. Daykin, "Subcontracting in Industry," Labor Law Journal (March, 1963), pp. 227-237. Additional items appear in the bibliography.

[19] The existence of such an agreement does not preclude, however, the union from raising issues concerning its interpretation. See, for instance, the case of Choczner's plant impeded in its attempts to operate the mechanical dops. Haaretz, The Economic Supplement (April 30, 1968), p. 4.

[20] Interview, Sept., 1967.

[21] In the diamond industry one rarely finds a firm engaged in multiplant operations. In one such case, I. Daskal diversifies its product by operating two geographically distant plants. But even this case is limited in scope, because I. Daskal is only a full owner of one of the two plants. Three similar cases were found among the firms surveyed by me (Genachowsky Bros.; Barik Diamonds Ltd., Nir Diamonds), all of which employed more than 100 workers.

[22] Product differentiation is not explored because it plays such a negligible role in this industry. Out of the five most important differentiating techniques offered by industrial theory: use of brand name advertising, changing physical features of the product, packaging of the product, sales promotion and special services to buyers, only the last one may play some role by means of consignment and extension of easy credit terms.

[23] On the ambiguity inherent in the concept of diversification see E. Penrose, The Theory of the Growth of the Firm (New York: J. Wiley and Sons, 1959), p. 107.

[24] Partially this may arise from the various combinations of diamonds needed for jewelry settings, like necklaces.

[25] The questionnaire on diversification distributed among the 110 prime contractors and used as a basis for the two following tables is furnished in the Appendix D4. Only 99 companies acceded to complete it.

[26] A recent U. S. interindustrial survey has concluded that there is not a clear tendency for diversification to be related positively to firm size. C. McConnel and W. Peterson, "Diversification and Differentiation in Small Manufacturing Firms: An Empirical Study" Quarterly Review of Economics and Business, (Spring, 1964), pp. 23-32. In contrast, a similar study by the Federal Trade Commission of the 1,000 largest manufacturing concerns indicates a positive relationship. Report of the F.T.C. on Industrial Concentration and Product Diversification in the 1000 Largest Manufacturing Companies, 1950 (Washington: U. S. Government Printing Office, 1957), p. 12.

[27] I wish to express my appreciation to Professor B. Okun for his valuable assistance in this section.

[28] The methods of computation are explained in Appendix E.

[29] The standard deviation of the sampling distribution of the slope coefficient is 0.30 and the value of the observed t (0.50) is very much below the 1 and 5 per cent levels of significance. The expected value of t at 1 and 5 per cent levels of significance and 17 degrees of freedom is 2.11 and 2.89, respectively. A variation of this magnitude can, therefore, be attributed to random errors of sampling.

[30] W. Lowry, "Two-Way Contracting," Harvard Business Review (May-June, 1967), pp. 131-137.

CHAPTER 6

GOVERNMENT POLICIES TOWARD THE DIAMOND INDUSTRY

Introduction

Before examining the role of the Israeli government in the diamond industry, it may be useful to review the government's attitude toward the development of the several sectors of the economy during the period under investigation.[1]

In August 1950 a four-year economic forecast[2] outlined the following major objectives designed to facilitate the absorption of large-scale integration.

1) The development of agricultural and industrial capacity.
2) The development of import-substituting and export-oriented industries in order to gain foreign exchange.

Although these objectives have not been altered throughout the period, major significant shifts in emphasis have occurred.

The second half of the 1950's marks the turning point. Hitherto, the government's main efforts were concentrated on supplying the basic

needs of the burgeoning population through expansion of agriculture, construction and infrastructure. As for manufacturing, the Zionist leadership, wedded to an amalgam of socialist and ideological doctrines,[3] continued its traditional pre-independence policies of largely ignoring it.[4] Moreover, when one considers the fact that in the period 1950-1958 the government authorities financed between 50 to 80 per cent of gross capital formation in the country,[8] one would expect the neglect of manufacturing to have adversely affected its growth. This is exactly what happened. The share of manufacturing in the Gross Domestic Product declined from 25 to 22 per cent in that period.[6] The economic development of the country was not impeded in any way by the resulting imbalance, however, because of large amounts of capital imports which ranged between 17 and 21 per cent of the total resources at the disposal of the economy.[7]

As the demographic pressures became less intense toward the latter part of the 1950's, and the prospects for the slackening of foreign assistance increased, attention has been focused by economists within and without the government[8] upon making the state economically more independent.[9]

There was increasing awareness among public officials that accomplishment of this purpose, coupled with the desire to accelerate Israel's rate of growth, must entail a shift in emphasis from agriculture to manufacturing.[10] The desire to disperse the population through a more balanced regional development provided an additional stimulus to manufacturing development, since the main developing regions located in the southern and northern parts of the country (the Negev and Galilee) do not possess arable land.

The diamond industry has regularly appeared as an important component of the programs outlined by the government,[11] which sets its sights

on expanding the industry. The reason for this is to be found in those aspects of the industry said to be its strongest points, namely:

A) The industry, being exclusively export-oriented, is capable of earning hard currency.

B) Fixed investments per employee are small - 600 dollars. In case of a rented structure this figure is only 150 dollars.

C) Transportation costs are negligible.

D) Educational requirements for the technical training of the workers are minimal.

E) Consumption of water and electricity is negligible.

F) The commercial and very often familial and ethnic relations between local producers and marketing channels abroad facilitate access to foreign markets.

In line with the above mentioned objective, many-sided programs of assistance to the diamond industry, some of which were crucial to its growth, were initiated by the government.

These will be dealt with in five main groupings:[12]

a) Raw Material Acquisition.

b) Credit Availability.

c) Research and Innovation.

d) Manpower Recruitment.

e) Developing Areas.

Raw Material Acquisition

After the victorious conclusion of the War of Independence in 1948, the industry began its slow reconstruction, marked by a constant struggle to procure uncut diamonds. Lengthy and only partially successful negotiations with the Diamond Trading Company in 1950, finally

secured a frozen quota of rough, between 5 and 8 million dollars a year, sufficient to provide employment for about 1,500 workers. At that time, this supply constituted nearly 80 per cent of Israel's total value of imported rough. The remaining 20 per cent came from the Syndicate's clients in Belgium and the Netherlands, and involved the payment of a premium for the transfer of the allotment. With the growth of industry, it was realized that its needs for rough could not be fully met by these two channels.

Table 6-1 describes the decreasing role played by the Syndicate as a supplier of rough to the industry, in the period 1950-1959. This was accompanied by a change in the composition of the Syndicate's allotment unfavorable to Israel. The shipment of chips, characterized by a relatively high value added, has been excluded since 1955. The Diamond Trading Company's refusal to apportion a larger share, reflecting an agreement with the Belgian industry[13] and the latter's restrictions on exportation of uncut diamonds, set the stage for the Israeli government to take the initiative in purchasing rough on terms favorable to the local fabricators. As an initial effort, private dealers were urged to join M. Fruchter and J. Nadel, who blazed a trail in Africa for the Israeli industry,[14] in exploring the possibilities of direct purchases from primary sources outside the Syndicate's sphere of control.

Paralleling this development, Pituach, a government-owned corporation, was founded in 1958 to initiate contacts with the newly emerging African nations for the purpose of diamond prospecting and procurement. The principal nations involved included the Ivory Coast, Ghana, Guinea and the Central African Republic where Israel was held in high esteem. Relations were also expanded with independent mining and rough diamond

TABLE 6-1

Israeli Imported Rough Diamonds from the Syndicate and Other Sources,[a] 1950-1968

Year	Gross Imports Total		Gross Imports from the Syndicate			
	Quantity (carats 000)	Value ($000)	Quantity (carats 000)	Per Cent of Total Quantity	Value ($000)	Per Cent of Total Value
1950	349	9,027	269	76.9	6,870	76.1
1951	345	9,769	261	75.6	7,844	81.3
1952	371	9,817	320	86.3	7,587	77.3
1953	447	11,794	239	53.5	6,692	56.8
1954	507	13,793	294	58.0	8,569	62.1
1955	544	16,246	209	38.4	6,935	42.7
1956	640	21,588	153	23.9	5,361	24.8
1957	815	28,812	160	19.6	5,898	20.5
1958	772	25,552	175	22.7	6,509	25.5
1959	1,260	42,434	191	15.2	6,997	16.4
1960	1,442	51,183	261	18.1	10,429	20.4
1961	1,663	57,047	487	29.3	20,053	35.2
1962	2,155	72,434	953	44.2	34,760	48.0
1963	2,940	100,093	1,590	54.1	56,429	56.4
1964	2,999	117,251	1,653	55.1	62,468	53.3
1965	2,708	110,726	1,542	56.9	64,583	58.3
1966	3,124	138,855	1,628	52.1	73,743	53.2
1967	3,089	137,927	1,575	50.9	72,589	52.6
1968	3,877	180,527	1,951	50.3	93,415	51.7

Source: 1960 and 1969 Statistical Report

a. The figures presented in the table are gross figures. Estimates of the net figures, derived by the writer, are presented in Appendix Tables E2 and E3.

TABLE 6-2

Imports of Rough Diamonds by Country of Purchase,[a] Israel, 1958-1961

Country	1958 Value (in $000)	1958 Per Cent of Total Value	1959 Value (in $000)	1959 Per Cent of Total Value	1960 Value (in $000)	1960 Per Cent of Total Value	1961 Value (in $000)	1961 Per Cent of Total Value
England	9,863	38.6	11,542	27.2	15,036	29.4	23,233	40.7
Switzerland	5,979	23.4	12,306	29.0	14,738	28.8	10,537	18.5
Netherlands	5,417	21.2	10,439	24.6	11,057	21.6	7,232	12.7
U. S.	2,811	11.0	5,601	13.2	6,563	12.8	9,655	16.9
Belgium	588	2.3	1,528	3.6	801	1.6	342	0.6
South Africa	358	1.4	552	1.3	460	0.9	522	0.9
Latin America	434	1.7	-	-	-	-	-	-
Western Africa	-	-	170	0.4	2,105	4.1	3,549	6.2
Liberia	-	-	-	-	-	-	1,722	3.0
Other	102	0.4	297	0.7	424	0.8	254	0.5
Total	25,552	100.0	42,435	100.0	51,184	100.0	57,046	100.0

Source: Diamond Control Department, 1960 and 1961 Statistical Report.

Note: a. Discrepancies, due probably to definition of countries, exist in both total carat and value figures in this table and that of general import figures. Due to the Arab boycott, Israel ceased disseminating any information on supplies of rough diamonds by country of purchase.

marketing concerns (like the New York-based Diamond Distributors Inc.). All these strenuous efforts began to bear fruit. As the spheres of Pituach's influence in Africa widened, increased amounts of first-hand rough began to reach Israel. In 1959 the value of uncut diamonds imported from Africa amounted to only 170 thousand dollars, while in 1961, it was well over $5 million (see Table 6-2).

The Syndicate, consisting largely of South African interests, was in a very vulnerable position, especially in African countries, where it operated on contracts limited in their time span. It was probably apprehensive of Israeli activities, because when approached by interested Israeli officials, it readily consented to reopen negotiations in 1960, for the purpose of increasing its supplies to the expanding industry.

While the terms of the 1960 agreement remain secret,[15] the results as far as supplies of rough are concerned, are clear indeed. As revealed by Table 6-1, there has been a steady rise in those supplies since 1961 and in the proportion they account for in the overall imported rough.[16] In 1959, the Syndicate's gross supplies accounted for 16.4 per cent of the total value of imported rough (6.9 million dollars out of a total of 42.4 million dollars), while in 1968 these imports reached 52 per cent of the gross imports of rough valued at 72.6 million dollars. At the present time there are about 50 fabricators and 10 dealers (including Pituach)[17] that have access to Syndicate sights.

In brief, the measures undertaken by the government not only reversed the trend toward declining Syndicate sales to Israel, but as illustrated in Table 6-3 also greatly strengthened the industry's bargaining position vis-a-vis that of the Syndicate. The table also reveals that increased allotments to Israel coincided with declines of those to

TABLE 6-3

Syndicate Sales to Israel and Belgium, 1952-1968
(in Selected Years)

Year	Total Value of Syndicate Sales ($00000)	Syndicate Sales to Israel		Syndicate Sales to Belgium	
		Value ($00000)	Per Cent of Total	Value ($00000)	Per Cent of Total
1952	128.2	7.5	5.9	46.7	36.4
1954	127.7	8.5	6.7	45.6	35.7
1956	141.5	5.3	3.8	55.8	39.4
1958	183.4	6.5	3.5	56.0	30.5
1959	255.0	6.9	2.7	81.2	31.8
1960	251.0	10.4	4.0	76.1	30.3
1962	269.4	34.7	12.9	74.7	27.7
1964	372.9	62.4	16.6	98.5	26.4
1966	479.9	73.7	14.7	118.5	23.8
1968	514.8	93.4	18.0	n.a.	n.a.

Sources: Compiled and computed from unpublished statistics in file of the Diamond Control Department and Hayahalom, (Feb., 1969), p. 39.

n.a. - not available.

Belgium. From 1952 to 1959 Israel witnessed a clear and unbroken loss in its share of total Syndicate sales, declining from 5.9 per cent to 2.7 per cent. However, after the agreement with the Syndicate, its share expanded by 14 percentage points (from 4 per cent in 1960 to 18 per cent in 1968).

Credit Availability

Of equal significance to the industry, even though highly controversial, has been the issue of short-term credit availability. It was already shown that, while the value of fixed equipment is extremely low ($150 per employee), working capital requirements by contrast are very high, amounting to $5,000-$7,000 per worker. This does not include the capital required to stock raw materials and grant credit to overseas buyers.

In the early postwar years the import of rough was financed by acceptance credits put at the disposal of local banks by their foreign correspondents. These were repaid out of the proceeds from the sale of the polished goods, usually after 90 days. However, the meteoric expansion of the industry, its seasonality pattern and keen competition in the major export markets led to longer credit extensions to foreign customers.[18] This in turn generated a severe shortage of capital.

This shortage could not be met by the usual banking sources. Even if this had been possible, however, the interest paid on loans would have threatened if not eliminated the industry's profitability. The government did recognize the problem and formed a special Fund in the Framework of the General Fund for financing exports in which the Bank of Israel and specialist banks[19] participate. Twenty per cent of this fund is provided by the government budget, twenty per cent by Bank of Israel rediscounts, the remainder coming from the specialist bank's resources. One-half of

the latter is subject to liquidity restrictions, the other half exempt from them. The diamond fund, amounting to $70 million,[20] finances up to 80 per cent of the cost of acquiring raw stones and maintaining stocks and up to 90 per cent of the export deliveries, at an interest rate of only 6.2 per cent. The comparatively low interest rate, about half of what would have to be paid in the open market, is granted as a means of increasing the industry's competitiveness in the world markets.[21]

Criticism has been voiced about both the liberality with which these loans were disbursed and the heavily subsidized rates of interest.[22] The channeling of such enormous amounts of monetary assistance to all comers (some of which had no means of their own) on equal terms,[23] in conflict with conventional banking policies, has provided opportunities for abuses and led frequntly to the support of the weakest and most inefficient firms (not necessarily fabricators). To meet the criticism the Diamond Control Department has provided the impetus for revision of a number of policies thought to have resulted in unjustifiably large loans, some of the proceeds from which were suspected of diversion into activities unrelated to diamond production (like real estate). As of February 15, 1970 the entire credit system has been simplified. Now the diamantaires will obtain credit in foreign exchange exclusively, to be redeemed in foreign exchange only, rather than allow conversion to Israeli pounds.

This being said, there is, I believe, a case for examining ways to force the industry to base itself, to a greater extent, upon its own means, by ploughing back more of its earnings for expansion purposes. This can be accomplished, for instance, by periodic inquiries into the industry's financial conditions. Upon finding them propitious, the

margin requirements on acceptance credits might be gradually increased and the total amount of credit available to any importer (or exporter) for a given amount of own means might be consequently reduced.

Research And Innovation

The poor record of innovation, marked by conservatism and absence of interest in the results of research, have been a marked feature of the diamond industry. In a way it is not surprising. A large part of the explanation lies in the structural characteristics of the industry, and in the extreme durability of much of the equipment which it uses.

The industry conforms closely to the classical idea of a competitive industry. Firms are numerous and small, entry into the industry, particularly for the small fabricator, is relatively easy and the degree of concentration as estimated in Chapter 3 is so low as to prevent any firm from influencing diamond prices significantly. Limited resources at the disposal of the firms, their preoccupation with continuous fluctuations in prices and the inability to prevent the rapid diffusion of the benefits of one's own innovative activity almost completely preclude technical development. Moreover, the equipment is highly durable and, with proper maintenance, can be operated with efficiency for many decades. Thus, innovation by equipment suppliers, given the low replacement demand for machinery, has been small.[24]

The industry has been slow to utilize improvements already developed and used elsewhere.[25] To illustrate, the semi-automatic dop in use in the Low Countries for two decades, was largely ignored by the industry until recently.[26]

Industry officials claim that the saving in labor cost resulting from experimentation with the new equipment is small compared with the

losses that can be incurred in commercial transactions through procurement and sale of goods. There is some truth to these allegations, particularly if the time horizon is viewed as a short one.

The rapid expansion of the last twenty years brought with it a virtual world monopoly in the fabrication of melee's. This achievement, however, has created a new problem. It is obvious that unless the industry diversifies into other categories of rough and broadens its base, its expansion will depend solely on the world's demand for melee's.

In its attempts at diversification into small stones, Israel faces a major handicap which lies in the scale of payments for eight-cuts (often called achtkant).[27] Whereas in Belgium, the piecework rate decreases gradually with the size of the stone up to 40 stones to the carat, the Israeli rate is uniform for all eight-cuts below 17 stones to the carat. Thus Israel's labor costs for this category are 20 to 30 per cent higher than in Belgium.[28] As for larger stones (over 1 carat) Israel faces the twin problem of inadequate management and worker knowhow.

The government has attempted to deal with this problem in several ways.[29] First, it developed, in 1967, an elaborate scheme of incentives to promote fabrication of kaps and achtkant. These range from participation in the training of workers (up to IL 750 per absorbed worker), reduction in indirect taxes (up to 20 per cent of the total labor cost - for achtkant fabricators) to the granting of Halperin's dop.[30] For kaps, the government also subsidizes the labor cost incurred during its production to the extent of 12.5 per cent of total labor cost.

Two years earlier, in 1965, on the recommendation of an advisory committee appointed by the then Minister of Commerce and Industry, P. Sapir, the Diamond Institute was established. Widely representative of the

government, industry and its associated professions, and Histadruth, the committee stated that the Institute's terms of reference were to be:

1) To follow up all scientific and technical advances in the diamond industry with a view to promoting Israel's industry.
2) To deal with manpower problems by providing guidance and opportunities for advanced studies to owners and production managers of diamond plants.
3) To collect information on developments in the diamond industry throughout the world, to conduct market research and distribute this information to members of the Institute.
4) To promote the sale of diamonds in general, and particularly those of Israel.[31]

The Institute set up four action committees in charge of the four major fields of activity - technical research, labor training, publicity and export promotion. For the first year of its activity a budget of about $66,000 was placed at the Institute's disposal, half of which was allocated by the government, with the remainder being raised by the industry.

The founding of the Institute, after some intramural fighting among the parties concerned, is by itself a marked success. Somehow the commonality of interests expressed in the possibility of extending the total foreign market were more decisive than the diversity emerging from the varying sizes of the establishments operating in the different segments of the industry.

Under the provision for technical advance an experimental polishing plant was set up in Ramat-Gan under H. Dgani. It closely cooperates with the diamond laboratory established in 1964 at the Haifa Technion,

headed by Dr. I. Yarnitzki. The research facilities and technical assistance have already led to some achievements. It is responsible for introducing a new machine for the cutting of girdles. The usual machine operates on the principle that one diamond rubs against another revolving diamond which produces a round girdle or circumference on the revolving one. The new machine considers the possibility of cutting the diamond by means of a diamond grinding wheel impregnated with diamond powder. The Institute would finance the production of these units and handle their sales to the industry.[32]

The Institute also provides an advisory service accessible to both local and overseas producers. In fact, as of May, 1969, there were more visitors and inquiries from abroad than from Israel itself.[33] The Institute's management decided to make all findings available, within patent limitations, to all diamantaires. This may produce, however, some reluctance on the part of local inventors to come forth with their ideas.

In addition, new ideas originating among workers[34] have been tested and subsequently recommended for use in the industry. A new type of bearing made from special plastic material (instead of wooden or metal parts) which more effectively withstands wear and tear was invented by A. Borochow. A device which clamps onto the girdling machine, and produces automatic vibration of the cutting stick originated with M. Luria who, because of his age (over 50), faced a reduction in productivity when operating with the hand tool. I. Gal-On invented a pedal-operated eye-piece which allows the girdler to inspect the diamond without interrupting work.

The innovative ideas presently pervading the industry involve development of devices which mechanically imitate hand operations. Certain

long-term projects initiated by Dr. Y. Yarnitzki carry with them high hopes for the future. These involve efforts at discovering the best chemical and metallurgical composition of the materials of the scaife and their behavior during polishing.[35] It is hoped that new methods in the future will be innovations involving fully automatic processes rather than mechanical adaptations of existing processes.

The Institute, also concerned with revisions of existing regulations, recommended to the government the free import of certain types of cut diamonds not produced by the local industry, for the purpose of developing Israel into an international commercial diamond center. The regulation prohibiting such importation was subsequently removed by the authorities. The Institute in cooperation with the Tourism Ministry is also instrumental in planning the erection of a new building whose purpose will be to serve as a center for direct retail sale of loose diamonds and jewelry articles to tourists from abroad.

The third and fourth functions include publicity and economic research. The former includes the publication of a trade paper in Hebrew - "Haynahalom" - and a bilingual (English - French) magazine - "Israel Diamonds" - for overseas diamantaires. Exhibitions and fairs are also sponsored. So far, no economic research has emanated from the Institute.

Manpower Recruitment

A major obstacle to the expansion of the diamond industry's productive capacity is the shortage of skilled manpower.[36]

At the outset, it is important to note that, contrary to prevailing beliefs and repeated allegations on the part of both industry and

TABLE 6-4

Average Annual Earnings of Employees - the Diamond Industry and All Manufacturing, 1955-1966

Year	All Manufacturing			Diamond Industry		
	Employed Persons	Wages and Fringe Benefits	Wages and Fringe Benefits per Employee	Employed Persons	Wages and Fringe Benefits	Wages and Fringe Benefits per Employee
1955	90,180	198,061	2,196	2,723	5,973	2,194
1956	91,560	231,197	2,525	3,076	7,448	2,421
1958	115,585	274,487	2,375	3,476	7,820	2,250
1959	125,337	396,653	3,164	4,037	12,220	3,027
1960	136,020	457,350	3,362	5,520	16,843	3,051
1961	151,471	574,442	3,792	6,026	20,593	3,417
1962	156,650	694,335	4,432	6,804	28,914	4,250
1963	165,687	835,131	5,040	8,046	36,096	4,486
1964	177,522	1,003,672	5,654	7,292	36,878	5,057
1965/66	180,045	1,195,100	6,638	7,185	42,700	5,943

Sources: 1955 to 1964 - Compiled and computed from Industry and Craft Surveys (annual), op. cit.

1965/66 - 1967 Statistical Abstract of Israel, op. cit., Tables M/6 and M/7. Data refer to establishments engaging 5 employed persons or more. CBS footnotes the data, stating that the coverage of the diamond branch is incomplete because of its particular state of organization, and estimates concerning the diamond industry are therefore biased downward.

government officials,[37] there is no evidence whatsoever to suggest that the earnings of diamond workers are higher than those in all manufacturing. As Table 6-4 reveals, there are strong indications that the opposite is true. During the period 1955-1966, average annual earnings of diamond workers[38] were consistently lower than those in "all manufacturing."

The same picture emerges from two recent surveys covering a two-year period 1965-1966, conducted by the Central Bureau of Statistics. The data indicate that both the average monthly[39] and daily[40] basic wage of diamond workers as well as their average daily fringe benefits[41] are lower than those in "all manufacturing" which in this study includes mining and quarrying.

One should note, however, that such aggregate figures conceal, among other things, what may be differences in overtime work,[42] function,[43] underreporting of wages, sex and age distributions and quality of labor which may modify comparisons based on overall averages. Unfortunately, such detailed statistical information as to warrant a definite statement concerning comparative wage levels is not available. One can, however, offer some suggestive descriptions of the labor structure of the sectors discussed.

In the case of age distribution, available for 1961 only, Table 6-5 brings out the dependence of the diamond industry on adolescent labor. The percentage of youthful workers (both male and female) between the ages of 14-34 is well over 60 per cent of the diamond labor force, whereas for all manufacturing it accounts for less than 45 per cent of the total. In view of this finding, it might still be possible to speculate that the younger diamond workers obtain higher yearly earnings than their counterparts in all manufacturing.

Tables 6-6 and 6-7 shed some light on the quality dimensions of the labor force. According to the tables, both absenteeism and labor turnover do not appear to be greater in all manufacturing than in the diamond industry. In brief, the additional available information lends no support to the contention that diamond workers' earnings are higher than those in manufacturing in general.

The recruitment and retention of workers is rendered difficult by two additional influences; the first is the dynamic expansion of other industries, especially since about 90 per cent of the diamond industry is concentrated in Tel-Aviv - Netanya areas, where general labor shortages are most severe. The second is the prevailing piece rate remuneration system in the diamond industry.

The extreme division of labor,[44] while beneficial to the young worker from the standpoint of productivity and earnings, also engenders a reduction in his craftsmanship and subsequently a feeling of frustration because of the impossibility of any advancement. This, in turn, leads to a drifting away to other trades by those workers who treasure future financial security.[45] The laurel of distinction in the industry is granted to the young workers who possess the capacity to increase output while the older members, with their strength weakened, are unable to keep up under the strain of the piece rate system.[46]

Since it is difficult to envisage massive substitution of capital for labor in the foreseeable future, the Diamond Institute strenuously undertook to attend to the problem of enrolling manpower sufficient to satisfy the expanding needs of the industry. The drive has taken several directions with greater emphasis on non-monetary considerations.

First, an area in need of research and initiated by the Institute

TABLE 6-5

Employed Persons by Age and Sex in the Diamond Industry and All Manufacturing, 1961

	Percentage of Male Workers		Percentage of Female Workers	
Age/Sex	Diamond Industry	All Manufacturing	Diamond Industry	All Manufacturing
14-17	7.5	6.1	17.0	12.8
18-34	54.5	36.0	61.0	43.1
35-44	25.8	23.4	17.0	19.4
45-54	9.8	21.5	3.0	16.7
55-64	1.8	10.4	2.0	6.5
65 +	0.5	2.6	-	1.3
	100.0	100.0	100.0	100.0
Total Number of Workers	4,625	129,665	500	28,185

Source: CBS, Population and Housing Census, 1961 (Jerusalem: 1963), Table 34.

TABLE 6-6

Employee Absence from Work in the Diamond Industry and All Manufacturing,[a]
April 1, 1959 - March 31, 1960

	Total	Work Disputes	Illness	Accident	Annual Vacation	Army Reserve Service	Family Causes	Other
Diamond Industry	10.72	-	1.97	-	4.73	1.34	0.15	2.53
All Manufacturing	11.12	0.20	3.15	0.86	4.56	1.11	0.12	1.12

Source: Israel Institute of Productivity reproduced by the 1963 Statistical Abstract of Israel, p. 293.

a. The data cover establishments engaging 6 employees or more. The figures are computed as percentages of the possible work time.

TABLE 6-7

Average Monthly Turnover of Employees in the Diamond Industry and All Manufacturing
in Selected Years

	Engagements[a]				Discharges[a]			
	1959	1963	1965	1967	1959	1963	1965	1967
Diamond Industry	3.9	4.6	1.6	3.2	2.2	3.5	3.0	4.5
All Manufacturing	4.5	3.8	3.6	3.1	4.0	3.1	3.5	4.2

Source: CBS, Statistical Abstract of Israel (annual)

a. Engagements and Discharges during the months are computed as a percentage of the number of employees at the beginning of the month.

concerns the worker's mental and physical health. A series of surveys are presently conducted by industrial physicians on cases of workers' mental breakdowns, discernible tensions resulting from the piece rate system, symptoms of disabilities in the joints and deterioration in eyesight. The study will ultimately recommend ways of screening and assigning new applicants to the industry. The diamond laboratory is exploring the possibilities of rehabilitating war invalids through their employment in the diamond industry. It successfully installed a special bench for a worker who lost one hand that will enable the machine to be operated with a foot. In fact, the experiement was so successful that Dr. Y. Yarnitzki ventured to state, "I think we can establish an entire diamond factory for invalid workers exclusively, and what is more, make it operate viably."[47]

A vigorous press and radio campaign highlighted by the slogan, "Polishing and Cutting Diamonds is a Craft," was launched in 1966, endeavoring to modify prevailing negative attitudes among diamond workers and new applicants concerning the trade.

More importantly, the Institute has made energetic efforts to attract juvenile entrants by revolutionizing training methods. These are reflected in the Labor Ministry's declaration of diamond faceting as a branch of technical education and its inclusion in 1969 under the Apprenticeship Law of 1953.[48] This will enable the young recruits, ranging in age from 14 to 18, to learn their trade in a period of two to four years, while at the same time acquiring a general education in a vocational school including theoretical courses about the gemstone. Associated with this development is both the drive to send apprentices only to firms reputed to engage competent foremen and the compensation scheme, financed

by employers and the Labor Ministry, according to which a trainee is guaranteed a minimum daily wage of IL 8 with the possibility of rapid advancement after four months.

This last development signifies a complete break with the past. Before the application of the law to the diamond industry, an apprentice had to pay a fee ranging from IL 300 upwards to his employer for his training. Officials of the Diamond Control Department claimed that considerable success attended these efforts, even prior to the application of the Apprenticeship Law, which resulted in the addition of about 2,000 workers to the diamond industry.[49] At present, however, the drop-out rate remains high. A personal inquiry at the Labor Exchange in Ramat Gan indicated that the percentage of trainees leaving, out of the total number admitted during the single year of 1966-1967, is relatively high, amounting to about 40 per cent (Table 6-8).

TABLE 6-8

The Extent of Dropout Among Recruits During the Training Period, March 31, 1966 - March 31, 1967

	Number of Trainees Admitted	Number of Dropouts		
		During the First Month	During the Training Period	Total
Total	1,866	424	273	697
Per Cent	100.0	22.7	14.6	37.4

Source: The Labor Exchange in Ramat Gan.

The question arises as to whether there are no other means of augmenting the ranks of diamond workers. It is surprising that a cheap means of alleviating the industry's labor supply by overtime work has not been explored. Perusal of articles in trade journals tackling this shortage does not reveal even one reference to this method. In fact, a clause in the collective agreement between the union and the manufacturers association states, "one is to be prevented from working overtime as much as possible."[50]

The advantages of overtime work are obvious. It may grant the industry additional flexibility needed to meet the seasonal and cyclical fluctuations in demand, and contribute to the enrollment and retention of workers via rising earnings. The latter may function well as a monetary incentive, which is particularly important in view of the finding that earnings of diamond workers are lower than those in all manufacturing. The criticisms usually directed against the policy of overtime, which argue that it provides an incentive for the artificial contrivance of overtime work, do not apply to the diamond industry because of its piece rate system.

The objections to overtime which various industry officials expressed do not seem to me to be very persuasive when compared with the advantages. It was argued that sunlight is required for polishing and that a long day imposes a strain upon workers which may reduce standards of performance. The additional pay for working overtime thus may not be worth the effort. Certainly it should be possible at this stage of technological development to devise a high illumination lamp appropriate for diamond faceting (neon lights presently serve this purpose). Certainly some experimentation with overtime work seems reasonable if only to provide

a standard criteria for the granting of loans. Instead it opted for a case-by-case determination of both the amount and the extent of risk it will be ready to assume.[63]

The question arises whether the committee's recommendations set the stage for a major new and successful effort at industrial advance in the sixties. The statistics are not encouraging. As Table 6-9 indicates, the expansion of the program has failed to live up to the high hopes once held for it. Although the number of plants increased somewhat from 1962 to 1968, total employment registered a decline from 865 to 671 workers, though the trend is broken by periodic reverse movements. Moreover, a close examination of the plants reveals constant change of ownership, repetitive though temporary cessation of operations, and extreme under-utilization of capacity. As of mid-1967, only four plants attained their planned size, engaging 60 or more workers.

Obviously, such conditions are not propitious for trainees' absorption or the maintenance of peaceful employment relations. It is not entirely surprising, then, that the plants are embroiled in wildcat strikes and frequent strife between management and workers. This is reflected in the highest dropout rate, among the various areas, 46 per cent (Table 6-10). The traditional urban centers experience a dropout rate in the neighborhood of 30 per cent.

On the positive side, one must not forget that grants expended on training[64] were not completely lost, since many of the trainees leaving developing regions augmented the ranks of diamond manpower in urban centers, reducing labor shortages in the latter.[65] In most instances, the establishment of a diamond plant in the new settlements became the workers' first introduction to an industrial environment, and usually the

a basis for comparison of its cost with the cost of both the training of juvenile entrants and their retention.

Developing Areas[51]

Prompted by the Government's call to disperse both industry and population, a special department for the developing regions of the southern and northern parts of the country (the Negev and Galilee) was set up in 1956. Its purpose was to stimulate and assist in the establishment of industrial projects. The diamond industry, because of its distinctive features, seemed to especially suit developing areas and attempts were initiated to divert it.

The program then activated has been envisaged not only as an effective means by which new sources of employment could be created, but also as a way to restore processing of types of diamonds (kaps, cleavages, and achtkant)[52] which during the Second War were the mainstay of the industry. This, therefore, would contribute to the diversification of the industry's product.

To enable the new plants to implement these objectives, various methods of assistance were devised: loans from the Development Budget were advanced either to construct or to rent facilities to be built by the Housing Department at IL 7 per square meter and IL 1000 for any absorbed employee. The cost of training at a rate of IL 75 per employee, and "subsistence fees" for new entrants, varying with the size of families and paid at declining rates for the six months before the firm would have begun to pay piece-work wages,[53] were treated as grants.

By 1957, the first 8 plants began functioning in Eilat, Kiryat Gat, Rosh Haain, Migdal Haemek, Ofakim, Safad, Ashkelon and Hazor, and

additional ones were nearing completion. However, before long, not only progress in the construction of new plants had fallen behind schedule but many of the existing ones had become financial failures. This occurred despite the stepped up benefits[54] that had been recommended by the various committees[55] appointed to examine the whole gamut of diamond processing in the developing regions.

The reports traced the failure of this program to a combination of factors. Many of the enterprisers who were willing to move to the new settlements were technical men (like foremen) with little or no financial reserves or expertise to administer a factory. This was particularly important where production was based completely on immigrant apprentice labor, whose lack of industrial discipline was notorious. Other inhibiting factors with which the small industrialist has had to contend were: inability to benefit from external economies because of the geographical remoteness from the diamond centers, lack of working capital and the resultant irregular supply of rough, the high wastage rate of both rough and bort due to inexperienced workers, and poor planning and coordination among the government agencies purporting to extend assistance and selection of candidates for ownership.[56]

The ensuing failures, therefore, resulted from either the difficulties experienced in absorbing new workers (the dropout rate being 80 per cent)[57] or financial constrictions. Of 25 plants established, by early 1962, eight had closed down. The 17 remaining plants, designed to employ at least 1,020 workers (a minimum of 60 workers per plant), engaged about 720 (Table 6-9). Many had changed owners more than once. Some companies were on the verge of closing down. The situation reached such a state of deterioration that some reorganization became imperative.

The task of bolstering the plants was assumed by the government-backed Pituach, which became a prime contractor to 7 local companies engaging 265 workers and an owner over 4 other firms employing 100 workers. Pituach was thus left with the responsibility for procurement and marketing of diamonds and financing of all the plants' operations.

These activities aroused concern and apprehension on the part of the local manufacturing association, particularly after Pituach encouraged the establishment of subcontracting links with enterprises in urban centers as well. Industry officials, fearful that a move was under way either to nationalize the industry or to organize a government-backed marketing agency for polished diamonds, issued calls for help from overseas diamond organization. Before long, intensified protests, especially from the United States,[58] were lodged against the Israeli government and Pituach. The escalated denouncements, coupled with mounting losses of about IL 2 million encountered by Pituach[59] in these operations, led to its withdrawal from marketing polished diamonds and the divestiture of the four plants.

In 1960, a new committee was created by the government to explore anew the problems of the industry in the developing regions. Its recommendations, issued[60] after studying its own commissioned research by Y. Klein[61], concerned the up-to-then neglected aspects of regionalization. Among these were location, the selection of entrepreneurs, the drawing up of a blueprint for plants and profitability criteria for these plants. In line with the recommendations of the committee, the government offered a new training loan (replacing all the previous ones) amounting to IL 2500 per worker, for only 60 workers, to be converted into a grant when the worker becomes firmly absorbed.[62] Concerning loans for working capital, the government departed from the committee's recommendation of imposing

TABLE 6-9

Development of the Diamond Industry in the Developing Areas, 1956-1968

Year	Number of Plants	Employment
Dec. 1956	6	100
Apr. 1959	13	472
Dec. 1960	19	735
Dec. 1961	23	687
Feb. 1962	17	723
Dec. 1962	21	865
Dec. 1963	23	940
Dec. 1964	19	664
June 1965	13	545
Dec. 1965	19	609
Oct. 1966	18	681
June 1967	24	794
Nov. 1968	26	671

Source: Compiled from statistics gathered by the Diamond Control Department. In the files of the Department.

TABLE 6-10

The Extent of Dropout Among Recruits in the Diamond Industry During the Training Period By Areas, 1966-1967

Area	Number of Trainees Admitted	The Extent of Dropout: During Experimental Period - First Month: Number	During Experimental Period - First Month: Per Cent of Trainees Admitted	During the Training Period: Number	During the Training Period: Per Cent of Trainees Admitted	Total: Number	Total: Per Cent of Trainees Admitted
Developing Areas	704	187	26.6	135	19.2	322	45.7
Jerusalem	187	47	25.1	22	11.7	69	36.8
Netanya	218	32	14.7	39	17.8	71	32.5
Tel-Aviv	589	129	21.9	62	10.5	191	32.4
Petach-Tikvah Bnei Brak, Ramat Gan	116	21	18.1	15	12.9	36	31.0
Azra-Bazron, Or Yehuda	32	8	25.0	-	-	8	25.0
Total	1,846	424	22.7	273	14.6	697	37.4

Source: Interview with Mr. Jungstern of the Labor Exchange in Ramat Gan.

TABLE 6-11

Number of Establishments and Persons Engaged by the Principal Areas in Israel
1952, 1964 and 1968

Area	1952				1964				1968			
	Number	% of Total	Persons Engaged	% of Total	Number	% of Total	Persons Engaged	% of Total	Number	% of Total	Persons Engaged	% of Total
Tel-Aviv	66	68.6	127	57.9	255	56.2	4,461	50.8	202	45.7	3,878	43.5
Ramat Gan	4	3.9	28	1.3	15	3.3	219	2.5	35	7.9	877	9.8
Bnei-Brak	1	0.9	9	0.4	21	4.6	299	3.4	27	6.1	688	7.7
Petach Tikvah	3	2.9	23	1.0	20	4.4	355	3.8	26	5.9	463	5.2
Netanya	21	20.3	729	33.2	84	18.5	1,989	22.7	99	22.4	1,839	20.6
Jerusalem	7	6.8	114	5.2	29	6.4	564	6.4	21	4.7	468	5.2
Developing Areas	-	-	-	-	28	6.1	895	10.2	26	5.9	671	7.5
Other	1	0.9	20	0.9	2	0.4	11	0.1	6	1.3	36	0.4
Total	103	100.0	2,194	100.0	454	100.0	8,773	100.0	442	100.0	8,920	100.0

Sources: 1952 - Census of Industry.

1964, 1968 - Statistical Report (annual).

only alternative employment could be found in unproductive public works.

The second avowed objective, that of diversification, did not fare better. In late 1966, only 6 plants engaging 246 workers (out of 18 plants employing 681) engaged in the processing of either smalls or kaps.[66]

Real and important as are the present economic problems of the developing regions, they should be seen in perspective. The concept of greater dispersal spelled out by the Ministry of Commerce and Industry in 1956, is a sound one, and should be given attention in the diamond industry. This need not be incompatible with developing ways to restructure the whole system of advancing the industry in these areas.

It seems to me that government officials, by placing an undue emphasis on incentives as a way to rectify the ills of the diamond plants, divert their attention from the basic need to attack the roots of the problem. These are management's financial incompetence and the inability to benefit from external economies so important to production in the urban centers. One possible solution requiring exploration is the extension of the subcontracting system throughout the developing areas. This can be accomplished with the assistance of large establishments in urban centers which should be encouraged to partake in this project.

Concluding Remarks

The several programs of governmental assistance to the diamond industry and their enormous contribution[67] towards its meaningful growth were traced above. In general, they were found to counteract the inherent weaknesses of the industry's atomistic structure. Apart from the government's abortive and short-lived attempt at ownership of diamond plants in developing areas, its influence was exercised on a very unpretentious and

unimposing scale and has been devised and operated as to encourage greater efficiency. Its policies, subject to revision whenever thought to have discouraged growth, have unquestionably been beneficial, even indispensable.

As regards the policy of encouraging the establishment of plants in the developing regions, it is a program in need of complete reevaluation. This is especially so considering the present high level of development of other industries in these localities. Continued evasion of this question means running the risk of squandering scarce resources.

It is high time for the authorities to move, from the sense of high optimism and certitude that permeate their reports on the industry's future in developing areas, to a sense of reality. To illustrate, the December 1966 report of the Diamond Control Department refers to the very high probability of opening new factories and raising the developing areas' employment, in 1967, by an additional 500 workers. Ultimately, it is expected the area will reach the point where it will account for 20 per cent of the total employment in the industry.[68]

The unrealism of this statement is revealed in Table 6-11, which shows that the developing areas' share of total industry plants and employment declined from 6.1 to 5.9 and from 10.2 to 7.5, respectively, between 1964 and 1968. Furthermore, the plants in the developing regions are the only ones whose employment has not increased at the expense of the traditional diamond production centers, Tel-Aviv and Netanya, the two centers' share of industry employment decreasing from 73.5 to 64.1 per cent from 1964 to 1968.

But again, on balance, the net effect of the many-sided governmental actions has been, on one hand, to strengthen the competitive

elements of the industry, increase its effectiveness, and promote its growth. On the other hand, it has left the governing of individual enterprises in the hands of their organizations, to be operated at their own discretion.

E. Staley and R. Morse[69] draw a distinction between a government's "positive" or "developmental" measures, designed to increase an industry's productive efficiency and thus making it more viable, and "negative" or "protective" measures, exerting an opposite effect.

The policies of the Israeli government, with respect to the diamond industry, characterized by the present Director of the Diamond Control Department as "encouragement without interference,"[70] fall predominantly into the first category.

NOTES TO CHAPTER 6

[1] Israeli economic achievements and problems have been profusely examined elsewhere. The latest study on the subject with an extensive bibliography is H. Halevi and R. Klinov-Malul, The Economic Development of Israel (New York: Praeger, 1968).

[2] A. Gaathon, Four Year Development Plan of Israel 1950-1953 (Jerusalem: 1951). Planning in Israel is of an indicative kind, and has been undertaken only in particular branches. In 1962 a comprehensive development plan was drawn, showing the interrelationships between all the branches of the economy, by a newly formed Planning Authority. However, there has been reluctance on the part of policy makers to act upon it.

[3] On the evolution of the Israeli socialism see F. Zweig, The Israeli Worker (New York: 1959), pp. 238-293. See also M. Plunkett, "The Histadrut: The General Federation of Jewish Labor in Israel," Industrial and Labor Relations Review (November, 1958), pp. 155-184.

[4] On a psychological level one can discern in this early socialist-Zionist approach a Freudian reaction to life in the Diaspora. In such a reaction, logical and factual considerations are not decisive, only the need to negate everything in the earlier life. If, in the Diaspora, the Jewish businessmen fulfilled an important role, then, with the reclaiming of the Promised Land, manufacturing enterprises should be relegated to a peripheral position.

[5] D. Patinkin, The Israel Economy: The First Decade, (Jerusalem: Falk Project for Economic Research in Israel, 1960), p. 86. It is worthy of note that the corresponding figures of gross capital formation carried out by government, in 1954, for India, Greece, France, United Kingdom, Burma and Ceylon were 30, 32, 11, 29, 43 and 60 per cent.

[6] E. Kleinman, "The Place of Manufacturing in the Growth of the Israel Economy," The Journal of Development Studies (April, 1967), p. 228. Within the manufacturing sector, production has been predominantly oriented toward the local market.

[7] CBS, Statistical Abstract of Israel, 1968, No. 19, Table F/1. Although the composition of capital inflow has changed over the years, the general tendency has been for about two-thirds of the total to be in the form of unilateral transfers.

[8] It is worth noting that paucity of physical resources and external pressures did not allow the political leadership of Israel to linger along ideological lines, manifested by D. Ben-Gurion, that where Israel is concerned "there is no such science as economics." Economist (May 30, 1953), pp. 605-606.

[9] For an illuminating analysis of this concept, see Patinkin, op. cit., Chapter 5. See also Industrial Planning Bureau Israel's Industrial Future, 1960-1965 (Jerusalem: Ministry of Commerce and Industry,

1960); L. Rosenberg, "Industrial Exports: Israel's Requirement for Self Support", The Middle East Journal (1957), pp. 153-165; M. Kreinin, "Israel's Export Problem and Its Policy Implications," Southern Economic Journal (October, 1958), pp. 202-212.

[10] The rapid growth of agricultural production in the 1950's, due in large part to increased productivity, led to a state of almost complete autarchy and, in many cases, even to considerable surpluses, and the aim of agricultural planning became to redirect resources into "off season" products that would not clash with the seasonal output of the Common Market in order to facilitate their disposal via export markets. See M. Paran, "Agricultural Export Prospects" in Economic Annual ed. by M. Ater (Jerusalem: The Jerusalem Post, 1960), pp. 67-82.

[11] Israel's Industrial Future, op. cit., pp. 228-232; Ministry of Commerce and Industry, Development Plan for the Israeli Industry, 1965-1970 (Jerusalem: 1965), pp. 326-332.

[12] Apart from these programs, the government maintains supervisory controls over the foreign currency transactions of the industry within the framework of its general control over foreign currency.

[13] The Belgian industry has exercised much greater influence on CSO because of that country's control over the Congolese diamond fields which were members of the London based marketing organization.

[14] On the activities of M. Fruchter and J. Nadel in Africa see "Raw Materials for Israel's Diamond Industry," Israel Diamonds (September, 1969), pp. 8-9; "Diamonds From Africa," Israel Diamonds (February, 1970), pp. 24-26.

[15] I was barred from examining the syndicate files in the Diamond Control Department, but according to reliable sources one of the most important clauses of the agreement commits the Israeli government to the procurement of 80 per cent of the allotted Syndicate supplies to the industry in case of a reduction in purchases below that share by the local fabricators and dealers. Another clause supposedly restricts Pituach's activities to areas outside the Syndicate's control. The agreement calso calls for periodic consultations between the two parties.

[16] Appendix Table E2 presents data on imported rough by type of diamond.

[17] As for Pituach's independent procurement actions, they were largely successful. As of 1965 its sales, amounting to well over $14 million, were being shipped to some 100 customers, 50 of them in Israel. Israel Investors Report (November 1, 1965), p. 7.

[18] Orders were being shipped on consignment, rather than on "fix" - payment agreed upon before delivery.

[19] Since diamond financing demands an intimate knowledge of the product by the bank, it is largely the province of the specialist bank. In Israel, the diamond bank par excellence is the Union Bank, a

subsidiary of Bank Leumi, which handles about two-thirds of the financing. The remainder is handled by the Discount and Barclay's banks.

[20] This is about half of the total fund designed to finance exports.

[21] The low interest rate is furnished for all export commodities.

[22] For a scathing and caustic assault on the then prevailing financing procedures which led to numerous defaults and so-called "notorious affairs" see Igal Leviv, "What Happens in the Diamond Kingdom," Shaar (October 9, 12, 13 and 14, 1965). A response to these charges by the then Diamond Control Department Director, G. Lahav, is found in "The Diamond Industry," Shaar (October 27, 1965). For a mild criticism with specific cases of law violations by diamantaires in cooperation with banks and soft handling of these cases by the Diamond Control Department see Comptroller's Office, Credit Procedures in the Diamond Branch (Jerusalem: July 31, 1966), 13 pp.

[23] The credit quota fixed by the Diamond Control Department and apportioned to an individual fabricator, apart from the exporting function, is based on the number of workers in his plant, type and price of the fabricated material. These criteria, however, are not easily ascertainable due to the nature of the product.

[24] There is a case of an unidentified European machinery concern expressing interest in a new polishing machine for achtkant diamonds, capable of replacing 20 workers. However, upon realizing that the total world demand would amount to only a few hundred of these, it cancelled the deal. Since early 1900, over 100 patents concerning diamond production were granted, but their application came to naught. Hayahalom (May, 1968), p. 34.

[25] Attempts to introduce modern production methods whose efficiency has been proven in Europe is thwarted by the conservative attitude of the unions, workers and employers. (Interview with Mr. Halperin, an inventor of the first prototype of the semi-automatic dop in 1950 - Tel-Aviv: October, 1967).

[26] This is especially deplorable in view of the fact that the new dop facilitates training of workers and increases their productivity (the workers usually man 4-5 such dops simultaneously). It is estimated that as of 1968 only 450 polishers, dispersed among 60 polishing plants, use Halperin's dop. Some producers claimed that it is difficult to employ the new dop without a concurrent loss of quality. But in view of the quality of some of the best goods recently faceted by the dop, this seems to be an invalid objection. M. Baskin, "The Dop of Halperin - Key to Diversification," Hayahalom (September, 1967), pp. 34-35. See also "The Automatic Dop," Hayahalom (November, 1967), p. 12.

[27] An additional obstacle which is more of a nuisance may very well loom in the near future. It arises from the Syndicate's decision to cease allocation of smalls effective August, 1969. The smalls reaching

Israel will have to originate either in Pituach or open market operations. It should be mentioned that the Syndicate's control over smalls is much less effective than is the case in regard to other rough.

[28] Diamond Control Department, Memorandum to the Minister of the Treasury Concerning Polishing of Diamonds in Belgium and Israel (Tel-Aviv: June 5, 1966), 2 pp.

[29] It is perhaps symptomatic of the outlook of diamantaires as a whole that their chief manufacturer's association, the I.D.M.A., did not initiate or organize, much less finance, any research into the problem of new tools or labor training for the purpose of remedying existing deficiencies.

[30] "Incentives for Achtkant and Kaps," Hayahalom (July, 1967), p. 14. To avoid abuses, the government limits these incentives to plants whose minimal size is 8 employees and which would have to expand, in the next 8 months, to reach a working force of at least 20 and 40 employees for kaps and achtkant production, respectively. The trade paper reports in the same issue on the immediate successes resulting from the government action. Five old plants employing over 250 workers switched to achtkant production and five new plants engaging 150 trainees intend to do so.

[31] "The Diamond Institute," The Israel Year Book (Jerusalem: Israel Yearbook Publications, 1965), p. 276.

[32] Israel Diamonds (May, 1969), p. 22.

[33] Hayahalom (May, 1969), p. 8.

[34] Inventors are frequently awarded cash prizes for their contributions.

[35] For a brief review of the laboratory's future programs, see Y. Yarnitzki, "The Laboratory's Activities at the Technion," Hayahalom (July, 1967), pp. 22-23.

[36] Skill, in the context of the diamond industry, is in almost all instances one acquired on the job rather than through formal training. The predominant portion of the diamond labor force is found at the lowest level at which workers engage in specialized tasks - cementing and diamond faceting. At the other extreme are craftsmen versed in diamond gemmology, and foremen knowledgeable in supervising the various operations within the divisions of the plant. At the highest level of management one finds the owner-manager competent in coordinating the activities of the whole diamond plant. It takes about two years for the skills concentrated at the lower level of the spectrum to be acquired, which relatively speaking is a rather lengthy period. Managerial talents to be acquired take, usually, longer periods of time.

[37] See, for instance, B. Lieberman, Diamond Control Department, Memorandum on the Number of Diamond Workers and Their Wages (Tel-Aviv: May 5, 1962), 2 pp. The memo is a rather mild restatement of the

accepted conception in the general public. The economist of the department, while denying the legendary stories surrounding wages of diamond workers, still claims they are higher in comparison with other industries. Also, Yediot (Oct., 1959), p. 2, and particularly Yediot (Jan., 1965), p. 6.

38 The earnings of a diamond worker consist of a basic piece rate which generally remains stable and to which a cost of living allowance of 47.8 per cent and fringe benefits amounting to 37 per cent of the payroll (fixed in accordance with the cost of living index, labor regulations and negotiated between the Diamond Manufacturers' Association and the Histadrut) are added. Fringe benefits include an old pension, severance pay in case of dismissal, paid annual holidays (from 14 to 28 days according to period of employment), sick fund and recuperation fund. The piece rates for average performance from the quality standpoint are founded upon a) shape of rough, b) operation, and c) various size groups of stones. Piece rates are identical for stone sizes within each group but might differ from group to group for the same operation and shape of stones. Higher quality fabrication results in higher remuneration of about 5-10 per cent.

39 CBS, Employment and Wages of Employees From the National Insurance Institute Data 1965-1966 (Jerusalem: 1968), Table 15.

40 CBS, Survey of Labor Cost in Industry 1966 (Jerusalem: 1969), Table 1.

41 Ibid., Tables 1 and 4.

42 A 1952 wage survey reveals that diamond male workers aged 18 and over obtain the highest weekly and the next to highest hourly wages among 10 industries (in the same age and sex groups) examined. CBS, Statistics of Wages in Industry - August 1952 (Jerusalem: October, 1953), p. 20. However, the sample was so tiny (about 30 workers) and so unrepresentative in its coverage of the various firm size classes as to cast doubt on the findings. A similar study encompassing piece rate workers in manufacturing during October, 1953, and November 1954, has shown that diamond workers classified by age and sex receive both hourly and weekly wages below the average of the former (in the same age and sex categories). CBS, Statistics of Wages of Workers and Clerks 1953-1954 (Jerusalem: 1955), Tables 9 and 36.

43 A 1966 survey sponsored by the Diamond Manufacturers Association covering 7 establishments (each employing more than 50 workers) fabricating melee's and engaging 383 workers has shown that among the three main functions, sawers obtain, on average, the highest basic wages per hour (IL 3.28), followed by girdlers (IL 2.91) and polishers. In regard to the last group those faceting the top main facets are the highest paid (IL 2.63), followed by those engaged in top and bottom brillianteering (IL 2.46), top corner facets (IL 2.19), bottom corner facets (IL 2.16) and bottom main facets (IL 2.12). N. Arania, Sample Investigation of the Workers' Basic Wages in the Diamond Industry - March - April 1966 (Tel-Aviv: January 29, 1967), 5 pp. In the files of the Diamond Manufacturers' Association. A similar survey conducted by the Diamond Control

Department in 1962 and encompassing 173 establishments and 4,815 employees found the girdlers to be the highest paid group on an annual basis followed by sawers and polishers. B. Lieberman, Memorandum on the Number of Diamond Workers and Their Wages, op. cit., p. 1.

[44] The section system is a partial adaptation of mass production techniques to diamond fabrication. Relatively quickly trained apprentices of fewer and lesser professional skills than necessary for gem expertise can perform the faceting tasks which are subdivided into their single steps. The repetitiveness of the task increases the productivity of the workers.

[45] According to a high official in the labor exchange, the security factor is a reason for not directing Ashkenazi applicants to the diamond industry in recent years. (Interview with Mr. Jungstern, August, 1967).

[46] For a view of several older workers and their younger counterparts on the diamond trade see E. Levi, "What do the Workers Think?" Hayahalom (March, 1968), pp. 4-10. The workers regard the trade as a source of income only rather than as a craft.

[47] Israel Diamonds (September, 1969), p. 29.

[48] The law presently embraces 44 trades with about 20,000 apprentices. Hayahalom (November, 1968), p. 44.

[49] Israel Diamonds (October, 1968), p. 23.

[50] The Israel Manufacturers' Association, The Collective Agreement for the Diamond Industry (October 18, 1959), p. 4. There have been no changes in the clauses of the agreement during the eleven years of its existence. Insertion of such a clause in 1959 was probably justified on grounds of job shortages. However, the present tightness in the labor market obviates the need for the continued enforcement of this condition.

[51] The discussion will not deal with the Government's attempt to construct a Diamond Center in Jerusalem, which functioned for only about 3 years (1961-1964) before closing down. Many of the establishments, then, moved to Makor Baruch - a suburb of Jerusalem.

[52] These are stones, the value added of which reaches 40-50 per cent as compared with 20-25 per cent for melee's. In addition, their price is low in relation to sales turnover.

[53] The fixed piece rates for the developing areas were lowered by 10-15 per cent from those prevailing in the urban centers for the purpose of increasing the industry's ability to compete with the Belgian small stones.

[54] In 1960, training grants for the plant owner stood at IL 375 per employee after one year of employment. To compensate the plant for increased wastage of both rough and bort a nonrecurrent graduated grant of up to IL 1568 per worker was provided. Also, a premium of IL 1.20

for every $1.00 value added was granted instead of the customary IL 0.85.

[55] J. Rakower - Lipshutz Co., An Inquiry Into the Profitability of Diamond Plants in Developing Areas (unpublished, Tel-Aviv: June 18, 1957), 4 pp. The Sela's Committee to Examine Claims by Diamond Plants in Developing Areas (unpublished, Tel-Aviv: October 2, 1958), 4 pp. The two reports are in the files of the Diamond Control Department.

[56] To illustrate, at Beersheba three plants planned to absort 70 workers. Each was established, despite shortages of qualified personnel. The first plant, set up in March, 1956, closed temporarily in September, 1957, one reason being shortage of labor. The other two opened in July and December, 1959, extremely undermanned, employing 15 and 10 workers, respectively, by early 1960. At the end of 1962, the first plant was employing 60 operatives, the other two closed down in 1961. (Report of the Government Comptroller on the Diversion of the Diamond Industry to Developing Areas) (Jerusalem: 1963), 4 pp. Between 1962 and 1969, the plant changed owners thrice, and as of Jan., 1970, two subcontracting plants, employing some 30 workers each, have been established. A. Ben Mosche, "Diamond Polishing Continues in the Negev Capital," Israel Diamonds (February, 1970), p. 27. In addition, the remuneration for public type works initiated by the various localities was not much lower than that earned by the new entrants working under harsher conditions in the diamond plants. No wonder, then, that the workers opted for the former.

[57] Memorandum Concerning the Diamond Industry in Developing Regions (January 14, 1965). In the files of the Diamond Control Department.

[58] See, for instance, D. Dealers Club Inc., Memorandum to A. Manor - Economic Minister (New York: January 13, 1963). P. Sapir, the then Minister of Commerce and Industry, in response to the above complaints offered to sell Pituach or any of the functioning enterprises in developing areas. He reiterated that the government assumed this task only in order "to fill an existing vacuum." (Letter of P. Sapir to J. Sigman, President of the Diamond Dealers Club, dated February 13, 1963.)

[59] Interview with the Director General of Pituach, P. Maoz, July, 1967.

[60] Report of the Hatzor's Committee to Examine Diamond Plants in Developing Areas. (Unpublished, Tel-Aviv: July 5, 1961), 22 pp.

[61] Y. Klein, Survey of Diamond Plants in the Developing Areas (Tel-Aviv: Ministry of Commerce and Industry, Diamond Control Department, April, 1961), 87 pp.

[62] This constriction was advanced in order to thwart many of the owners in developing areas in their, successful in the past, attempts to convert their plants into quickie "training schools" for the mere purpose of repeatedly garnering training grants. Some flexibility, however, was added to the new "success indicator," in specific cases.

[63] Generally, the government assumes 50 per cent of the risk for loans obtained by the plants from banks.

[64] By 1966, these amounted to IL 2.5 million according to the Diamong Control Department estimate.

[65] According to the Diamond Control Department over 1,000 craftsmen who received training in Developing Regions were working in the urban center by 1963. Memorandum Concerning the Diamond Branch in Developing Areas (January 10, 1964), 3 pp. In the files of the Diamond Control Department.

[66] Two additional establishments fabricated both melee's and smalls. Memorandum from the Diamond Control Department to Pituach Concerning Supply of Rough to Developing Areas (October 30, 1966), 2 pp.

[67] It is worth remarking that the Israeli government also attempted, in 1960, to constitute a joint committee with Belgium to market polished diamonds of the two countries. However, they have been utterly incapable of agreeing to act concertedly in their common interest and the negotiations ended in failure.

[68] Diamond Control Department, The Diamond Industry (Tel-Aviv: December, 1966), 3 pp.

[69] E. Staley and R. Morse, Modern Small Industry for Developing Countries (New York: McGraw Hill Book Co., 1965), pp. 317-318.

[70] A. Ben Zeev, "Encouragement Without Interference," Israel Diamonds (October, 1968), p. 17.

CHAPTER 7

THE DIAMOND MANUFACTURING INDUSTRY AND WORKABLE COMPETITION

This chapter evaluates the generally recognized dimensions of both market structure and performance in order to form a judgment about the workability of competition in the Israeli diamond industry. The concept of workable competition has been referred to as a "plausible aphorism that there can be too much competition as well as too little."[1] This emphasis is important in light of the persistent view held by some industry officials that the term "excessive" competition aptly describes the diamond industry.

The public interest lies primarily in economic performance, by which is meant the "economic results that flow from the industry as an aggregate of firms."[2] The economic characteristics of the diamond industry as they have been described in the previous chapters diverge from either of the two polar limits, pure competition and pure monopoly, for which economic theory provides a definite set of performance criteria. Moreover, whereas, in the past, the mainstream of economic

thinking has been committed to perfect competition as the optimal condition,[3] persistent voices have been raised concerning not only its unattainability but also its undesirability. Thus, J. Schumpeter argued that it is big business rather than perfect competition that is essential to a good performance and progress.[4]

It is not entirely surprising, therefore, that many economists have attempted to define a more realistic standard of economic performance - workable or effective competition[5] - which will take into account lesser degrees of "perfection" and dynamic considerations which render application of the perfect competition model so difficult. However, since a universally acceptable set of workability criteria completely devoid of value judgements has yet to be developed, the treatment and appraisal of various industries is admittedly subjective. Some economists, in order to narrow the subjective factor, have attempted to define workable conditions mainly in terms of the more precise and more ascertainable structural characteristics of a particular market.[6] This has been done on the ground, as Professor G. Stigler has put it, that "an industry which does not have a competitive structure will not have competitive behavior."[7]

In recent years a multitude of performance tests have been developed in economic literature.[8] Basically, I use Prof. J. Bain's provisions regarded by Clodius and Mueller[9] as representing the present general consensus of scholars. These are efficiency of production, level of profits and technological progressiveness.

From the structural standpoint, the evidence presented in the preceding chapters strongly indicates the diamond industry's qualification as a workably competitive industry since 1949. The industry closely

approximates the theoretical model of perfect competition. Firms are numerous and fiendlishly independent at both the production and marketing levels, no one of whom produces or markets more than a negligible fraction of the total output and therefore cannot materially influence prices. Only about eight per cent of diamond employment in 1969 was controlled by the four largest firms - one of the lowest concentration ratios of any industry in the economy. There is complete absence of product differentiation based upon brand names, trade marks and selling expenditures. With an exceedingly low level of concentration, low entry barriers and minimal economies of scale, it is not surprising that entry and exit rates are relatively high. Shortage of rough diamonds and of working capital on the part of a prospective entrant may be circumvented by means of establishing subcontracting links with producers or dealers. Thus, the structural characteristics for the existence of atomistic competition have been present.

One might question, however, whether structural conditions are sufficient in themselves to generate desirable performance, or whether it requires more than this to secure a positive thrust forcing an industry to move rapidly forward.

Views expressed by some leading scholars of industrial organization, reflecting the current economic thinking, suggest that structure can no longer be regarded as fully determining performance,[10] and that even imperfect structures (including oligopolies) may lead to results expected of competitive markets.[11] Accordingly, conclusions arrived at separately on the basis of performance and structure might differ one from the other. Thus, Victor Fuchs in his study of the American fur industry[12] has shown that its atomistic structure, operating within a less competitive economy, was actually detrimental to the industry's

market performance, contributing to its relative stagnation.

The Israeli diamond industry has not met the same fate despite its atomistic structure. Rather, it registered strong over-all performance. In large measure this was attributable to governmental assistance programs which provided an environment conducive to competitive behavior, yet one which contained critical "monopolistic" elements.

Since the diamond industry seems to have had a history in which there has been a sufficiently buoyant demand to allow a rapid expansion, attention by the authorities has been mainly confined to those limiting factors which curtailed its ability to supply the finished product.

In the first place, the government displayed vigor and imagination in seizing opportunities on the African continent, by establishing crucial contacts with independent diamond mining centers, in the late fifties, and thus pressuring the London-based Diamond Trading Co. to provide Israeli producers and dealers with wider access to the required raw materials.

Second, the government provided generous credits at relatively low interest rates that made possible for the industry to compete successfuly with its international rivals. It recognized the large amounts of working capital required, slowness of building up capital from retained earnings after taxation, and the fact that all diamond producers are proprietorships, partnerships or small family-held corporations. All these factors place the industry at a great disadvantage relative to other larger industries in short-term export financing.

Other serious impediments to the accelerated development of the industry have not escaped the attention of the authorities. They were instrumental in setting up the Diamond Institute for the purpose

of promoting intra-industry cooperation in respect to innovation, the supply of manpower and export promotion.

In brief, government actions were wisely conceived in the spirit of fostering change rather than of sheltering existing producers. They furnished a positive directing force which the industry, given its atomistic structure, would have been unable to provide by itself. In other words, pernicious excessive competition[13] which could have easily developed was avoided, thanks to specific actions initiated by the government.

We should not neglect to mention the other factors, besides government, which caused the diamond industry to advance so rapidly. Among these are the vitality of the young workers operating efficiently within a chain system. Also important are the pressures of competition which contributed to a high degree of technical economies in the use of labor and equipment within the plant. Not to be overlooked is the innovative organization of production facilities among plants by means of subcontracting, with a consequence of greater diversification of output, and retention of economies of specialization.

Insofar as the industry's profits and prices are concerned, the competitive structure of the industry has led to expected results. There are some indications that whereas profits measured as a rate of return on sales are below those of other industries, when profits are measured as a rate of return on owner's investment they probably are on a par with the latter. Prices of polished diamonds were found to be responsive to market conditions abroad.

Opportunities to increase productivity have been provided by the invention of new methods of production. Despite the limited scope

for innovative activity, given the basic character of diamond fabrication, the groundwork for technical reorganization has been laid by the government's establishment of the diamond laboratory and pilot plant with the active help of Technion's scientists. Some results have already been realized and hopefully full advantage will be taken of these opportunities in future years.

Against this background one might ask whether present organizational arrangements might not be further modified to the advantage of the industry. J. Markham offers the following test of overall performance: "An industry may be judged to be workably competitive when, after the structural characteristics of its market and the dynamic forces that shaped them have been thoroughly examined, there is no clearly indicated change that can be effected through public policy measures which would result in greater social gains than social losses."[14]

The accumulated evidence of preceding chapters points to the ratification of the present market structure. Entry is free from technological restraints. The endless variety of diamonds complicates any attempt at standardization. Stones can be changed and smuggled easily. Cooperation among international polishing centers is nonexistent. All these factors suggest that an alternative structure, such as a cartel[15] or government ownership, would not result in greater social gains than social losses.

In view of the evidence presented and the conclusion that no alternative structural form would seem to offer the possibility of an improved performance, it follows that the diamond industry is workably competitive.

NOTES TO CHAPTER 7

[1] R. Lanzillotti, The Hard-Surface Floor Covering Industry (Pullman: State College of Washington Press, 1955), p. 362.

[2] R. Clodius and W. Mueller, "Market Structure Analysis as an Orientation for Research in Agricultural Economics," Journal of Farm Economics (August, 1961), p. 517.

[3] P. Baran, "National Economic Planning" in B. Haley, ed., A Survey of Contemporary Economics, op. cit., pp. 355-356. It is of interest to note that E. Mason feels that public policy toward competition has been colored by the "illusion that at some not too remote period the economy was competitive." E. Mason, Economic Concentration and the Monopoly Problem (Cambridge: Harvard University Press, 1957), p. 54.

[4] J. Schumpeter, Capitalism, Socialism and Democracy (New York: Harper and Row Pub. Inc., 1950), p. 82.

[5] The term "workable competition" was first coined by John M. Clark in his article "Toward a Concept of Workable Competition," American Economic Review (June, 1940), pp. 241-256. For other important contributions to this concept, see G. Stigler, "The Extent and Bases of Monopoly," American Economic Review (June 1942), p. 2; E. Mason, "The Current Status of the Monopoly Problem in the United States," Harvard Law Review, (1949), pp. 1265-1285; C. Edwards, Maintaining Competition (New York: McGraw Hill Book Co., 1949), pp. 9-10; J. Bain, "Workable Competition in Oligopoly" American Economic Review (May, 1950), pp. 35-47; J. Markham, "An Alternative Approach to the Concept of Workable Competition," American Economic Review (June, 1950), pp. 349-361.

[6] C. Edwards, op. cit., pp. 9-10; G. Stigler, op. cit., p. 2.

[7] G. Stigler, "The Case Against Big Business," Fortune (May, 1952), reprinted in E. Mansfield, ed., Monopoly Power and Economic Performance (New York: W. W. Norton and Co., Inc., 1968), p. 12.

[8] For a comprehensive review of structure and performance tests, see S. Sosnick, "A Critique of Concepts of Workable Competition," Quarterly Journal of Economics (August, 1958), pp. 380-423, and "Operational Criteria for Evaluating Market Performance" in P. Farris (ed.), Market Structure Research, Theory and Practice in Agricultural Economics (Ames: Iowa State University Press, 1964), pp. 81-125.

[9] Clodius and Mueller, op. cit., p. 517.

[10] "These analyses (of necessary structural characteristics) provide valuable narratives which describe the nature of competition within particular industries, but tell little about results. The extent

to which actual results deviate from those of perfect competition may not be directly related to the number of noncompetitive practices that can be listed, since the effects of one practice might offset those of another, and the same practice can cause quite different circumstances." J. Henderson, The Efficiency of the Coal Industry (Cambridge: Harvard University Press, 1958), p. 4. See also P. Farris, op. cit., p. 73.

[11] E. Mason, Economic Concentration and the Monopoly Problem, op. cit., p. 179. Several studies have substantiated this proposition. See, for instance, J. Markham, Competition in the Rayon Industry (Cambridge: Harvard University Press, 1952); D. Hamilton, Competition in Oil (Cambridge: Harvard University Press, 1958).

[12] V. Fuchs, The Economics of the Fur Industry (New York: Columbia University Press, 1957), p. 99.

[13] Despite some claims to the contrary as reflected in the article "Diamond Industry," 1964 Israel Year Book (Jerusalem: 1965), p. 322, the diamond industry does not reveal the presence, in one form or another, of any of the several basic effects of what may be classified as destructive or excessive competition. These are: (a) Selling prices are persistently driven down to abnormally low levels (over a long period of time of one or two decades). (b) The depressed prices lead to chronically subnormal rates of return which are too low to cover interest costs of invested capital. (c) Subnormal returns to the productive factors. (d) Redundant productive factors are slow in leaving the industry. J. Bain, Industrial Organization, op. cit., pp. 472-474.

[14] J. Markham, "An Alternative Approach to the Concept of Workable Competition," op. cit., p. 361.

[15] Existence of a cartel in Israel particularly when its operations are oriented toward export markets is legally feasible. It is noteworthy that Israel as well as Belgium have separately and at one time, in the early 1960's, cooperatively toyed with the idea of establishing an international marketing cartel for polished diamonds. Such a market organization was advocated, for the first time, in a series of articles appearing in the monthly issues of 1938-1939 Diamant. See also S. Yuval, Memorandum Concerning the Market Regulation of Polished Diamonds (Tel-Aviv: December, 1963), 9 pp. In the files of the Diamond Control Department.

APPENDIX D1

The Covering Letter to the Questionnaire

LONG ISLAND UNIVERSITY
THE BROOKLYN CENTER
ZECKENDORF CAMPUS
BROOKLYN, NEW YORK 11201

DEPARTMENT OF ECONOMICS

New York, January 5, 1969

To the Prime Contractor

Gentlemen:

Although there are numerous demands upon your time, will you take a few minutes for a task which may illuminate some of the economic issues facing the industry.

The enclosed questionnaires are part of a much broader study concerning the Israeli Diamond Industry and written for the Graduate Division of the City University of New York. The value of this study will be greatly increased if respondents provide

1) a candid answer to every statement

2) prompt consideration.

Individual replies will be kept absolutely confidential and will be used for statistical analysis only.

Many thanks for your cooperation. Your time and contribution are truly appreciated.

Sincerely yours,

M. Szenberg

P. S. Since I am sending this request to only a select group of establishments, your help is doubly important.

APPENDIX D1

The Names of the Surveyed Prime Contractors

1) Firms employing 10-19 workers

Itzhak Brothers
Kahane, Gavriel
Motjowitz-Alster
Zeri Diamonds
Cojiov
Cohen, Joseph
Herbst, Joshua
Hozendiok and Kuviow
Bareket

2) Firms employing 20-29 workers

Weiss, David
Giuri, David
Moscovitz-Schwartz
Fridman-Zoltan
Dankner, Itzhak
Werdi, Mordchai
Aharonson, Charles
Gal Diamonds
Havardi, Moshe
Fruchter, Gurtler
Sinai, Moshe
Randal and Sons
Zohar Diamonds

3) Firms employing 30-49 workers

Kiriat Canz Diamonds
Galia Diamonds
Green, Haim
Elizur, Michael
Paz Diamonds
Kish Zwi
Hen Diamonds
Lagziel, Daniel
Sarpaz
Eshel-Bruner
Israel Diamonds
Dredikman, Zwi
Ram Diamonds
Lerner Maks
Levavi Brothers

APPENDIX D1 (Continued)

The Names of the Surveyed Prime Contractors

5) Firms employing 75-99 workers

Katzaur and Shenhav
Almog Diamonds, Ltd.
Keren Or Diamonds, Ltd.
Israel Tarshish Co., Ltd.
Galili Diamonds
Boimer-Ginzburg
Schwartz, Aharon
Steinmetz, Reuven
Lan Diamonds (Israel), Ltd.
Refaeli-Hershkovitz

6) Firms employing 100 or more workers

Genachowsky, Nahum
O. F. Birnbach & I. Sussman
Daskal Diamonds
Orah, Ltd.
Goldman & Co.
Amanta Diamonds, Ltd.
Schechter Diamonds
Yuval Meirov
Choczner, Efraim
Moldawsky Bros., Ltd.
Lustig Bros., Ltd.
Daskal, Schmuel
Barik Diamonds
Goldfinger and Fluk, Ltd.
Ashdod Diamonds, Ltd.
Weinstein, Schlomo and Sons
T'helet Diamonds, Ltd.
Cohen and Sons (Orion)
Nir Diamonds, Ltd.
Tel-Aviv Diamonds, Ltd.
Gornstein, Ali
Elhanan Diamonds

APPENDIX D1 (Continued)

The Names of the Surveyed Prime Contractors

3) Firms employing 30-49 workers (continued)

Aviv Diamonds
Reichbard, Arieh
Bruner Diamonds
Herbst and Rabin
Yablonka, Ben Zion
Tamir
Zarkor Diamonds
Safiroin
Zadikov and Pinczo
Nog Diamonds
Davidowitz, Zeev
Eshel, Zwi
Schwu

4) Firms employing 50-74 workers

Weinblum, Mendel
Baguette
Paldico
Daskal, Israel
Barmatz, Natan
Schifman
Perl and Fishbein
Swibel, David
Goldberg and Son
Aluma Diamonds
Fast, D and Mitrani, A.
Glick Efroit Diamonds
Igud Zefat Diamonds
Ekron Ltd.
Hakochav Ltd.
Tiv Diamonds
Even Or
Katz Brothers
Paruz Diamonds
Roth, Eliezer
Ernster, Moshe
Spitz
Even Sappire
Rozen, Haim
Cohen, Avraham
Gertler, Meir
Greifman, David and Moshe
Gwirtzman

APPENDIX D2

Responses to Statements Concerning the Flexibility Attitudes of Subcontracting[1]

A - Firms Employing 50 or More Employees
B - Firms Employing Fewer than 50 Employees

	Statements[a]		Strongly Agree	Agree	Sometimes Agree Sometimes Disagree	Don't Know No Answer	Disagree	Strongly Disagree
2.	I use a subcontractor whenever shortage of physical facilities is experienced.	A	5	35	7	4	8	1
		B	1	30	3	1	13	2
10.	A subcontractor can be housed in almost any structure.	A	8	42	2	1	7	0
		B	3	35	2	2	7	1
11.	It is good to use a subcontractor when there is a need to fabricate irregular rough.	A	3	46	3	1	5	2
		B	7	30	7	2	3	1
16.	Some of the subcontractors specialize in low quality work.	A	4	37	10	3	6	0
		B	4	38	3	0	4	1
19.	Difficulties encountered in balancing operations of workers leads to sub-contracting.	A	12	31	3	0	13	1
		B	5	36	6	1	2	0
22.	x Use of a subcontractor is good only at the peak of the season.	A	1	10	5	5	33	6
		B	4	5	4	1	29	7
24.	x It is easy for us to recruit skilled workers when in need.	A	3	5	14	2	28	8
		B	1	5	6	2	24	12
26.	I use a subcontractor because marketing of diamonds requires my attention.	A	13	35	1	1	8	2
		B	8	34	1	0	5	2
29.	Our factory attempts to concentrate on a small number of types of rough.	A	4	47	2	0	5	2
		B	7	33	3	1	5	1
41.	I use a subcontractor throughout the year.	A	8	44	0	0	8	0
		B	7	32	2	4	3	2
57.	I use a subcontractor whenever I possess small amounts of a particular type of rough.	A	5	38	7	4	5	1
		B	6	26	8	4	5	1
58.	Much managerial time is saved by using a subcontractor.	A	8	38	4	3	7	0
		B	4	33	6	4	2	1

a. The statements are numbered in accordance with their appearance in the questionnaire.

1. The statements in the questionnaire were preceded by the following paragraph: Will you please indicate your opinion on each of the accompanying statements. Underneath each statement you will find six alternative reactions. Underscore whichever alternative gives the most correct picture of your own view.

x These are negatively phrased statements.

Responses to Statements Concerning the Employment Relations Attitudes of Subcontracting

A - Firms Employing 50 or More Employees
B - Firms Employing Fewer than 50 Employees

Statements		Strongly Agree	Agree	Sometimes Agree Sometimes Disagree	Don't Know No Answer	Disagree	Strongly Disagree
1. [x]The workers in a subcontractor's plant are not skilled craftsmen.	A	1	4	8	7	35	5
	B	1	5	3	0	38	3
5. [x]There are frequent industrial strifes within a subcontractor's plants.	A	0	11	3	10	26	10
	B	0	3	1	9	32	5
6. My workers are pleased when I subcontract irregular rough.	A	4	48	1	0	5	2
	B	6	33	4	1	5	1
12. [x]Workers in our plants have a voice in determinging what rough will be subcontracted.	A	0	12	1	3	37	7
	B	0	5	5	1	31	8
18. [x]There are workers who keep two positions; one with an integrated plant and another with a subcontractor.	A	2	7	1	7	37	6
	B	2	5	3	11	24	5
24. [x]It is easy for us to recruit skilled workers when in need.	A	3	5	14	2	28	8
	B	1	5	6	2	24	12
39. [x]Whenever there is a reduction in the amount of work in your plant, many skilled workers leave and establish themselves as subcontractors.	A	1	7	3	8	37	4
	B	2	4	3	12	23	6
44. We are interested to maintain a stable work force in our factory.	A	8	40	1	5	6	0
	B	7	29	3	7	4	0
59. It is much easier to lay off in-plant workers than those of a subcontractor.	A	0	5	10	6	28	11
	B	0	2	2	12	25	9
60. Using a subcontractor saves me money because it makes unnecessary a training program for workers to polish irregular rough or fancy.	A	12	31	1	2	13	1
	B	5	36	3	1	4	1
61. The local union has little or no say in cases of subcontracting.	A	8	41	5	0	5	1
	B	4	40	0	1	5	0
63. [x]The number of workers leaving your plant during the year in order to join a subcontractor is considerable.	A	0	11	4	9	31	5
	B	3	5	4	2	34	2

Responses to Statements Concerning the Cost Attitudes of Subcontracting

A - Firms Employing 50 or More Employees
B - Firms Employing Fewer than 50 Employees

	Statements		Strongly Agree	Agree	Sometimes Agree Sometimes Disagree	Don't Know No Answer	Disagree	Strongly Disagree
11.	It is good to use a subcontractor when there is a need to fabricate irregular rough.	A	3	46	3	1	5	2
		B	7	30	7	2	3	1
15.	*Overall the subcontractor's workers obtain higher wages.	A	2	10	7	5	34	2
		B	3	5	3	12	23	4
17.	I can prove with actual cost figures that use of subcontractors saves money.	A	2	21	3	19	15	0
		B	1	30	0	10	7	2
37.	Production costs of a subcontractor are lower than those in your plant for particular types of diamonds like fancies.	A	8	28	14	2	5	3
		B	6	27	5	4	6	2
49.	The subcontractor uses the mechanical dop, to a greater extent, in the fabrication of smalls.	A	9	27	5	4	14	1
		B	5	35	0	1	8	1
53.	The profit rate of a subcontractor is rather low.	A	5	35	9	6	4	1
		B	5	32	8	1	4	0
56.	Profits can be increased by concentrating on marketing diamonds abroad.	A	3	48	1	1	5	2
		B	8	26	9	1	6	0
57.	I use a subcontractor whenever I possess small amounts of a particular type of rough.	A	5	38	7	4	5	1
		B	6	26	8	4	5	1
58.	Much managerial time is saved by using a subcontractor.	A	8	38	4	3	7	0
		B	4	33	6	4	2	1
59.	*It is much easier to lay off in-plant workers than those of a subcontractor.	A	0	5	10	6	28	11
		B	0	2	2	12	25	9
60.	Using a subcontractor saves me money because it makes unnecessary a training program for workers to polish irregular rough or fancy.	A	12	31	1	2	13	1
		B	5	36	3	1	4	1
66.	Labor cost at the subcontractor's plant are lower because of his greater usage of a mechanical dop.	A	5	31	9	5	9	1
		B	3	32	1	4	8	2

Responses to Statements Concerning the Product Quality Attitudes of Subcontracting

A - Firms Employing 50 or More Employees
B - Firms Employing Fewer than 50 Employees

	Statements		Strongly Agree	Agree	Sometimes Agree Sometimes Disagree	Don't Know No Answer	Disagree	Strongly Disagree
1.	×The workers in a subcontractor's plant are not skilled craftsmen.	A	1	4	8	7	35	5
		B	1	5	3	0	38	3
9.	I have frequent frictions with the subcontractor.	A	1	10	3	2	37	7
		B	2	5	4	2	31	6
13.	×The quality of the subcontractor's work is poor.	A	2	9	21	8	19	1
		B	3	8	10	2	26	1
14.	The foremen in the subcontractor's plant are not as good as those in the prime contractor's plant.	A	1	13	18	5	21	2
		B	2	5	4	7	29	3
16.	Some of the subcontractors specialize in low quality work.	A	4	37	10	3	6	0
		B	4	38	3	0	4	1
20.	×Parcels of diamonds which are subcontracted are frequently returned for improvements.	A	1	9	12	2	31	5
		B	3	6	6	1	29	5
23.	The workers in a subcontractor's plant require less supervision than those in your plant.	A	10	27	8	4	10	1
		B	6	35	1	1	5	2
31.	I use the same subcontractor for lengthy periods of time.	A	2	35	9	3	8	3
		B	5	35	2	1	6	1
48.	The subcontractor excells in a greater percentage recovery of rough during fabrication.	A	4	33	7	4	9	3
		B	6	17	12	3	9	3
49.	The subcontractor uses the mechanical dop, to a greater extent, in the fabrication of smalls.	A	9	27	5	4	14	1
		B	5	35	0	1	8	1
62.	The performance of a subcontractor depends greatly on the owners' detailed instructions.	A	5	37	5	4	8	1
		B	8	23	8	4	6	1
65.	In general, a subcontractor does not resist polishing irregular diamonds.	A	6	36	7	3	6	2
		B	4	38	2	0	5	1

APPENDIX D3

The Homogeneity Test

The important assumption underlying the analysis of variance, the homogeneity of variances within the areas, is examined by means of Hartley's test - the Maximum F ratio.[1]

The following table classifies the data according to two criteria of classification: the four groups of factors influencing management and the 12 items in each area in regard to subcontracting and plant size.

	Variances			
Plant Size	Flexibility	Employment Relations	Cost	Quality
Plants Employing over 50 Employees	0.0129	0.0109	0.0289	0.0301
Plants Employing Fewer than 50 Employees	0.0201	0.0150	0.0181	0.0303

For the size class of plants engaging 50 or more persons, the largest of the variance ratios among the four variances is:

$$F\ max = \frac{\sigma^2\ quality}{\sigma^2\ employment} = \frac{0.0301}{0.019} = 2.76$$

Similarly for the size class engaging fewer than 50 persons, the largest F ratio among the four variances is:

$$F\ max = \frac{\sigma^2\ quality}{\sigma^2\ employment} = \frac{0.0303}{0.0150} = 2.02$$

The tabled values for 4 groups and 11 degrees of freedom at 0.05 and 0.01 levels of significance are:

$$P\ (F\ max > 5.30) = 0.05$$
$$P\ (F\ max > 7.80) = 0.01$$

Since the observed values of 2.76 and 2.02 are not greater than either of the tabled values, the null hypothesis of variance homogeneity among the four groups is sustained.

The Independence Test

Another important assumption underlying the analysis of variance, the independence of classifications, is examined by means of a chi-square test.

The following contingency table classifies the means of the four groups of factors influencing management in regard to subcontracting by plant size. The expected values based upon the hypothesis of independence

	Means				
Plant Size	Flexibility	Employment Relations	Cost	Quality	Totals
Plants Employing over 50 Employees	0.733 (0.760)	0.732 (0.736)	0.648 (0.650)	0.620 (0.585)	2.733
Plants Employing Fewer than 50 Employees	0.714 (0.686)	0.669 (0.664)	0.589 (0.586)	0.494 (0.528)	2.466
Totals	1.447	1.401	1.237	1.114	5.199

are shown in parentheses. The differences between expected and actual values, each squared and divided by the expected value, give the value of chi-square for that cell; the summation of the eight values gives the total value of chi-square. It is 0.006 which for 3 degrees of freedom gives a probability greater than 0.99. The observed results are extremely close to those to be expected on the hypothesis of independence and there is no evidence of any real association between plant size and the four groups of factors.

APPENDIX D4

Questionnaire Concerning Product Diversification

Underneath each statement you will find 4 alternatives: None; Up to 20 per cent; 21-49 per cent; over 50 per cent. Will you please underline whichever alternative represents the current state of affairs with respect to the proportion of rough and cuts fabricated in your plant and those contracted out.

Your responses will remain quite anonymous.

1) What is the portion of the specific type of rough out of the total value of rough?

A. fabricated in your plant

B. contracted out to other plants.

Type of Rough		None	Up to 20%	21-49%	Over 50%
Melee's	A				
	B				
Melee's-Collection	A				
	B				
11, 12, 13	A				
	B				
± 9	A				
	B				
Blacks, Darks	A				
	B				
Sizes	A				
	B				
Smalls	A				
	B				
Zeigers	A				
	B				
Cleavages	A				
	B				
Chips	A				
	B				

Type of Rough		None	Up to 20%	21-49%	Over 50%
Shapes	A				
	B				
Sands	A				
	B				
Kaps	A				
	B				
Coateds	A				
	B				

2. What is the portion of the specific type of cuts out of the total value of faceted diamonds?

   A. fabricated in your plant

   B. contracted out to other plants.

Type of Cut		None	Up to 20%	21-49%	Over 50%
Brilliant	A				
	B				
Achtkant	A				
	B				
Marquise	A				
	B				
Baguette	A				
	B				
Tapers	A				
	B				
Square	A				
	B				
Pear	A				
	B				
Oval	A				
	B				
Triangles	A				
	B				

APPENDIX E

Construction of Price Indexes of Rough and Polished Diamonds

The task of this section is to develop and explain the method of deriving the price indexes of uncut and polished diamonds. No such indexes have ever been compiled in any country.[1]

Unlike other extractive industries, there are no posted prices for uncut diamonds. The problem is compounded by the essential heterogeneity of products, and market imperfections created on the supply side by the operation of the Diamond Trading Company. As far as polished diamonds are concerned, the institutional mechanism for price determination is hindered by the complete absence of price quotations. Hence, prices are determined by individual bargaining between buyers and sellers, and consequently it is not uncommon to find identical grades sold at the same time (in the bourse) at prices varying in the limits of four to five per cent.[2]

The raw material of the two series which cover the period from 1950 to 1968 have been collected from monthly and annual reports of the Diamond Department of the Ministry of Industry and Commerce and unpublished data as were found in the files of the department.[3]

A) The Price Index of Rough Diamonds

There are two main sources which supply the Israeli diamond manufacturing industry:

1) The Diamond Trading Company, which furnishes nearly sixty per cent of the total value of imported rough in recent years.

2) Outside sources, which consist of:

a) supplies of the Diamond Trading Company to other centers that reach Israel through intermediaries.

b) "open goods" which are mainly purchased in Africa through the government agency - Pituach, and private importers. This channel has been operating since 1958. (Appendix Table E1) The supplies originating directly in the Syndicate are subdivided by quantity and value into four principal categories: melees, sizes, smalls, and others. (Appendix Table E2) As for the outside supplies, this subdivision is available only for the years 1964 to 1968. Since the outside supplies for the period of 1950 to 1958 consisted predominantly of second-hand uncut diamonds originating initially in the Syndicate, it is assumed that the share of each individual category from that source was identical to that reaching Israel directly from the London-based company.

If this assumption is valid, one would expect the average prices of the two series to move in the same direction.[4] Application of this test reveals such correspondence except in the first year.

Insofar as the period from 1959 to 1968 is concerned, the four groups that comprise the series are estimated by using the average value and quantity for the years 1964 to 1968. (Appendix Table E3)

Once the series are combined according to the four respective categories, the task of index construction, the weighted aggregative price index, commences. For precision and more reliable evaluation of

the results, two indexes are derived incorporating current year (1968) value[5] weights and average value weights of the years 1960-1963, years for which an exact value subdivision of polished diamonds into the two categories exists. The method of calculation is presented in Appendix Tables E4-E7.

B) The Price Index of Polished Diamonds

The export series comprises two categories: brilliants and "other" (consisting of fancies and achtkants). This subdivision, however, is available only for the years 1960 to 1963. As a makeshift, the problem was solved by using the averages of both quantity and value of the product for this period and generalizing over the other years. This introduces a possible source of error, but a very miniscule one, because the industry preeminently engages in the fabrication of brilliants.[6]

Again, for reliability, three price indexes are derived employing average value weights of the years 1960 to 1963, 1960 value weights representing the year with the lowest value weight for brilliant and 1962 value weights representing the year with the highest weight for brilliants. The construction of the weighted aggregative price index for polished diamonds is presented in Appendix Tables E8 and E9.

NOTES TO APPENDIX E

[1] The Israeli Central Bureau of Statistics had recently begun construction of a price index of rough diamonds that extends back to 1966.

[2] Interview with the Director of the bourse, N. Cohen.

[3] The operation of the Arab boycott offices in Africa has led the Diamond Department to cease disseminating the names of countries from which the uncut imported diamonds originate.

[4] This test has been suggested by Dr. Lipsey of the National Bureau of Economic Research.

[5] Value is a better measure of the "quantity" of diamonds than is the number of carats. To illustrate, the value of a 2 carat diamond is more than twice that of a 1 carat diamond.

[6] This has been corroborated by leading American importers like Zales Jewellers Corporation and Winston Co., Inc.

APPENDIX TABLE A1

Israel's Net Exports of Polished Diamonds To Main Trading Areas, 1956-1968

Area / Years	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Grand Total	25,980	35,321	33,782	46,688	56,318	65,287	82,346	104,017	118,206	131,761	164,663	157,923	194,863
North America Total	14,477	15,721	14,222	19,261	19,393	23,356	31,819	32,558	38,889	44,982	53,692	58,651	75,039
United States	13,333	14,568	13,152	18,065	18,377	22,187	28,143	30,813	37,327	43,408	51,506	56,476	71,616
Canada	1,144	1,153	1,070	1,256	1,016	1,161	1,668	1,715	1,553	1,836	2,186	2,175	3,423
Common Market Total	5,261	7,317	6,903	9,598	16,325	17,774	21,440	28,119	35,076	36,536	48,355	39,594	50,035
Belgium	4,385	6,195	3,811	6,380	9,378	9,955	10,087	13,925	13,716	10,102	17,337	13,787	20,697
France	458	612	861	516	571	1,195	1,376	2,135	3,344	3,301	4,738	4,903	5,353
Germany	46	141	395	816	1,501	2,754	4,270	4,251	6,954	8,771	10,763	5,888	9,847
Italy	–	7	25	18	35	62	136	172	93	767	945	611	842
Netherlands	372	362	1,111	1,868	4,840	3,898	5,571	9,536	10,966	13,581	15,272	15,100	13,396
E.F.T.A. Total	2,435	6,445	6,514	8,899	10,038	11,639	16,343	22,466	20,332	21,512	24,934	21,774	24,760
Austria	–	–	–	7	68	71	144	163	155	334	472	586	420
Denmark	–	5	28	42	39	27	103	111	161	103	147	230	197
Finland	171	142	–	18	61	33	116	45	68	79	63	20	22
Sweden	33	25	19	28	16	63	127	195	190	185	154	201	246
Switzerland	1,574	4948	5,109	6,036	6,494	7,750	11,958	16,360	14,902	16,192	18,319	14,802	17,804
United Kingdom	657	1,325	1,358	2,768	3,360	3,688	3,815	5,592	4,856	4,619	5,771	5,433	6,141
Asia Total	2,216	2,744	4,072	5,185	7,035	9,133	9,864	15,643	17,474	21,348	28,408	28,012	33,925
Hong-Kong	2,011	2,491	3449	4,603	6,308	7,110	7,036	9,777	9,160	11,821	14,527	13,403	16,569
Malaysia-Singapore	205	453	623	582	600	1,400	1,196	1,884	2,263	2,485	3,033	3,870	3,344
Japan					127	623	1,642	3,982	6,051	7,542	10,868	10,819	14,072
Australia	16	47	44	105	302	182	359	409	418	494	741	1,056	1,028
Rest of the World	1,578	2,747	2928	3,037	3,225	3,214	4,552	4,822	6026	7,151	8,513	8,756	10032

Source: D.C.D., Statistical Report (annual); Statistical Abstract of Israel (annual).

APPENDIX TABLE A 2

Percentage Distribution of Diamond Exports By Main Trading Areas.
(percent)

Area / Years	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Grand Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
North America Total	55.7	44.6	41.8	48.5	34.4	35.7	36.2	31.3	32.9	33.5	32.6	37.1	38.5
United States	51.3	41.4	38.7	39.8	32.6	33.9	34.2	29.6	31.6	32.1	31.2	35.7	36.7
Canada	4.4	3.2	3.1	2.7	1.8	1.8	2.0	1.7	1.3	1.4	1.3	1.4	1.8
Common Market Total	20.2	20.8	18.9	20.6	28.9	27.2	26.0	27.0	29.7	27.7	29.4	25.1	34.8
Belgium	16.8	17.6	11.9	13.7	16.6	15.2	12.2	11.6	11.6	7.7	10.5	8.7	10.6
France	1.7	1.7	2.5	1.1	1.0	1.7	1.7	2.0	2.8	2.5	2.9	2.7	2.7
Germany	0.2	0.4	1.2	1.7	2.7	4.2	5.2	4.1	5.9	8.7	6.5	3.7	5.1
Italy	–	0.09	0.1	0.8	0.1	0.1	0.2	0.2	0.1	0.6	0.2	0.4	0.4
Netherlands	1.4	1.0	3.3	4.0	8.6	5.9	6.8	9.2	9.3	10.3	9.3	9.6	6.8
EFTA Total	9.4	18.3	19.2	19.1	17.8	17.8	19.8	21.6	17.2	16.3	15.1	13.8	12.7
Austria	–	–	–	0.01	0.1	0.1	0.2	0.2	0.1	0.2	0.3	0.4	0.2
Denmark	–	0.01	0.1	0.1	0.1	0.04	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Finland	0.7	0.4	–	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.01	0.01
Sweden	0.1	0.1	0.1	0.1	0.03	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1
Switzerland	6.1	14.0	15.0	12.9	11.5	11.8	14.5	15.7	12.6	12.3	11.1	9.4	9.1
United Kingdom	2.5	3.8	3.7	3.9	5.9	5.6	4.7	5.4	4.1	3.5	3.5	3.7	3.2
Asia Total	8.5	8.4	11.9	11.9	12.5	13.9	11.8	15.0	14.7	16.6	17.3	17.8	17.4
Hong-Kong	7.7	7.1	10.1	9.8	11.2	10.9	8.5	9.4	7.7	7.9	8.8	8.5	8.6
Malaysia-Singapore	0.8	1.3	1.8	1.3	1.1	2.1	1.4	1.8	1.9	1.9	1.8	2.5	1.7
Japan	–	–	–	–	0.2	0.9	1.9	3.8	5.1	5.7	6.6	6.8	7.2
Australia	0.1	0.1	0.1	0.2	0.5	0.3	0.4	0.4	0.3	0.4	0.4	0.7	0.5
Rest of the World.	6.1	7.8	8.6	6.5	5.7	4.9	5.5	4.6	5.1	5.4	5.2	5.5	5.1

Source: Appendix Table A1

APPENDIX TABLE A3

Changes in the Value of Exports of Polished Diamonds From the Preceding Year
(- means negative change - $000)

Area / Year	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Grand Total	9238	-1231	12706	9630	8167	17055	31677	14189	13555	32869	-6740	36880
North America Total	1244	-1499	5631	- 468	3157	6462	2746	6322	5340	9472	4959	16382
United States	1235	-1416	5453	- 228	3812	5954	2700	6484	5081	9098	4970	15134
Canada	9	- 83	186	- 240	145	508	46	- 169	259	374	- 11	1248
Common Market Total	2056	-1114	3375	6727	1449	3666	6679	6957	1460	11819	-8761	28235
Belgium	1810	-2384	2569	2998	577	132	1938	1691	3668	7229	-3550	6910
France	154	249	- 345	55	534	271	759	1209	- 35	1498	- 530	1045
Germany	95	254	421	685	1253	1516	- 19	2706	1814	1999	-4875	3959
Italy	-	18	- 7	17	27	74	36	- 79	674	522	366	231
Netherlands	-10	749	757	2972	942	1673	3965	1430	2615	1691	- 172	-1714
EFTA Total	4010	69	2385	1139	1594	4711	6123	-2134	1180	3422	3160	9986
Austria	—	—	-	61	3	73	19	- 8	179	138	116	- 168
Denmark	-	23	14	- 3	- 12	76	8	50	- 58	44	83	- 103
Finland	- 29	- 142	18	43	- 28	83	- 71	23	11	- 11	- 48	2
Sweden	- 8	- 6	9	- 12	47	64	68	- 5	- 5	- 31	47	45
Switzerland	3374	161	927	458	1256	4208	4469	-1458	1890	2127	- 3517	3002
United Kingdom	668	33	1410	592	328	207	1697	- 736	- 237	1155	159	208
Asia Total	728	1128	1113	1850	2098	731	5779	1831	4374	6580	- 336	5833
Hong-Kong	480	958	1154	1705	802	- 84	2751	- 617	2661	2706	-1124	3106
Malaysia-Singapore	248	170	- 41	18	800	- 204	688	379	222	548	837	- 526
Japan	-	—	—	—	496	1019	2340	2069	1491	3326	- 49	3253
Astralia	31	- 3	61	197	- 120	177	50	9	76	247	315	- 28
Rest of the World.	1169	181	109	188	- 11	1338	270	1904	1125	1362	243	1276

Source: Appendix Table A1

APPENDIX TABLE A4

Export Value Index of Polished Diamonds, 1956-1968

1962 = 100

Area / Year	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Grand Total	31.6	42.8	41.3	56.7	68.4	79.3	100.0	126.3	143.6	158.8	199.9	191.8	236.6
North America Total	48.6	52.7	47.7	66.6	65.1	78.3	100.0	109.4	130.4	148.3	180.1	196.7	251.7
United States	47.4	51.8	46.7	66.1	65.3	78.8	100.0	101.6	132.6	150.7	183.0	200.7	254.4
Canada	68.5	69.1	64.1	75.3	60.9	69.6	100.0	102.8	93.0	108.6	130.9	130.3	205.1
Common Market Total	24.5	34.1	28.9	44.8	76.1	82.9	100.0	131.2	163.6	170.4	225.5	184.7	316.7
Belgium	43.5	61.4	37.8	63.2	92.9	98.7	100.0	119.2	135.9	100.2	171.9	136.7	205.2
France	33.3	44.5	62.6	37.5	41.5	80.3	100.0	155.2	243.0	240.5	344.4	305.8	381.8
Germany	1.1	3.3	9.3	19.1	35.2	64.5	100.0	99.6	168.9	205.4	252.1	137.9	230.6
Italy	—	5.1	18.4	13.3	25.7	45.6	100.0	126.5	68.4	56.9	180.1	419.3	619.1
Netherlands	6.7	6.5	19.9	33.5	86.9	69.9	100.0	171.2	196.8	243.8	274.1	271.0	246.3
EFTA Total	14.9	39.4	39.8	54.5	61.4	71.2	100.0	137.5	134.4	131.6	152.6	152.6	151.5
Austria	—	—	—	4.9	47.2	49.3	100.0	113.2	107.6	231.9	327.8	468.4	291.7
Denmark	—	4.9	27.2	46.8	37.9	26.2	100.0	167.8	156.3	100.0	142.7	223.3	123.3
Finland	147.4	122.4	—	15.5	53.6	28.4	100.0	38.8	58.6	68.1	58.6	17.2	18.9
Sweden	25.9	11.7	14.9	22.0	12.6	49.6	100.0	153.5	149.6	145.7	191.3	158.3	193.7
Switzerland	13.2	41.4	42.7	50.5	54.3	64.8	100.0	136.8	124.6	135.4	153.2	123.8	148.9
United Kingdom	16.8	31.0	34.9	71.1	86.3	94.7	100.0	143.6	124.9	118.6	148.2	152.3	157.7
Asia Total	29.5	29.8	41.3	52.6	71.3	92.6	100.0	158.6	177.1	221.5	288.2	284.8	343.9
Hong Kong	28.6	35.5	49.1	65.5	89.8	101.2	100.0	139.0	130.4	168.2	206.8	190.8	234.9
Malaysia-Singapore	17.1	37.9	52.1	48.7	50.2	117.1	100.0	157.5	189.2	207.8	253.6	323.6	279.6
Japan	—	—	—	—	7.7	37.9	100.0	242.5	368.5	459.3	661.9	658.9	852.0
Australia	4.5	13.1	12.3	29.2	84.1	50.7	100.0	113.9	116.4	137.6	206.4	294.2	286.4
Rest of the World.	34.7	60.3	64.3	66.7	70.8	70.6	100.0	105.9	132.4	157.1	187.0	192.4	220.4

Source: Appendix Table A1

APPENDIX TABLE B 1

Distribution of Establishments and Employment For All Manufacturing And Selected Industries By Size Class, 1965.

Size Group	Textile				Food Products[a]				All Manufacturing			
	Establishments		Employment		Establishments		Employment		Establishments		Employment	
	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total
1-4	443	44.0	1,030	3.9	1,127	53.8	2,730	8.9	16,963	69.5	33,837	15.5
5-9	208	20.7	1,337	5.1	466	21.3	3,072	10.0	3,806	15.6	24,264	11.1
10-29	188	19.0	3,198	12.2	329	15.7	5,136	16.8	2,433	10.0	39,218	18.0
30-49	70	6.6	2,644	10.0	60	2.9	2,216	7.2	538	2.2	20,263	9.3
50-99	38	3.8	2,613	9.9	56	2.7	3,900	12.7	370	1.5	25,001	11.4
100-299	38	3.8	6,049	23.0	44	2.1	8,188	26.6	220	0.9	36,645	16.8
300 and over	22	2.1	9,407	35.8	12	1.5	5,405	17.8	73	0.3	39,211	18.0
Total	1,007	100.0	26,278	100.0	2,049	100.0	30,587	100.0	24,403	100.0	218,531	100.0

Source: 1965 Census of Industry and Crafts.

a. including beverages and tobacco.

Employment by Eight Leading Diamond Cutting Establishments

Rank	Firm	Employment	Share of Employment (in %)	Cumulative Share of Employment (in %)
	APPENDIX TABLE B2 1961			
1	Lustig Bros. Ltd.	137	2.3	2.3
2	Orion Ltd.	131	2.2	4.5
3	Barik Diamonds Ltd.	121	2.1	6.7
4	Goldman	102	1.7	8.5
5	Choczner Efraim	101	1.7	10.2
6	Paldico Ltd.	96	1.6	11.8
7	Schechter Diamonds Ltd.	90	1.5	13.4
8	Weinstein S. and Sons	87	1.5	14.9
	APPENDIX TABLE B3 1965			
1	Lustig Bros. Ltd.	177	2.3	2.3
2	Choczner Efraim	130	1.6	3.9
3	Barik Diamonds Ltd.	119	1.5	5.4
4	Schechter Diamonds Ltd.	112	1.4	6.9
5	Winkler	92	1.2	8.0
6	Hagalil Diamonds	84	1.0	9.1
7	Weinstein S. and Sons	84	1.0	10.2
8	Igud Zfat Diamonds	81	1.0	11.3
	APPENDIX TABLE B4 1969			
1	Daskal Schmuel	240	2.3	2.3
2	Lustig Bros. Ltd.	220	2.1	4.4
3	Goldfinger and Fluk Ltd.	200	1.9	6.3
4	Barik Diamonds Ltd.	200	1.9	8.2
5	Moldawsky Bros. Ltd.	180	1.7	9.9
6	Elhanan Diamonds	160	1.5	11.4
7	O. F. Birnbach & I. Sussman	150	1.4	12.8
8	Choczner Efraim	140	1.3	14.1

Sources: B2 - Developed and compiled from the files of the Diamond Control Department.
B3 - Compiled from the files of the Diamond Control Department.
B4 - Developed from the writer's survey.

Export of Polished Diamonds by Eight Leading Exporters

Rank	Firm	Amount Exported (in $)	Share of Total Amount Exported (in %)	Cumulative Share of Amount Exported (in %)
	APPENDIX TABLE B5 1961			
1	M. Schnitzer & Gruenstein[a]	5,077,903	9.3	9.3
2	Keren Or Diamonds Ltd.	3,732,553	6.8	16.1
3	Lustig Bros. Ltd.	3,382,975	6.2	22.4
4	Moldawsky Bros. Ltd.	3,298,285	6.0	28.5
5	Tel-Aviv Diamonds, Ltd.	1,984,796	3.6	32.1
6	Genachowsky Nahum	1,943,217	3.5	35.6
7	Beka	1,689,196	3.1	38.7
8	Schechter Diamonds Ltd.	1,642,158	3.0	41.7
	APPENDIX TABLE B6 1965			
1	M. Schnitzer & Gruenstein[a]	12,067,935	9.1	9.1
2	Keren Or Diamonds	5,567,787	4.2	13.3
3	Paz Diamonds	5,535,756	4.2	17.5
4	Lustig Bros. Ltd.	4,804,326	3.6	21.1
5	Zales Jewellers[a]	4,220,782	3.2	24.3
6	Schechter Diamonds Ltd.	4,035,676	3.1	27.4
7	Steinmetz R. Ltd.	3,625,930	2.8	30.2
8	Moldawsky Bros. Ltd.	3,606,768	2.7	32.9
	APPENDIX TABLE B7 1968			
1	M. Schnitzer & Gruenstein[a]	14,025,637	8.6	8.6
2	Paz Diamonds	11,237,699	6.9	15.5
3	Steinmetz Reuven	7,539,720	4.6	20.2
4	Moldawsky Bros. Ltd.	7,358,959	4.5	24.7
5	Lustig Bros. Ltd.	7,182,783	4.4	29.2
6	Zales Jewellers[a]	5,330,704	3.2	32.4
7	Schechter Diamonds Ltd.	4,799,281	2.9	35.4
8	Genachowsky Nahum	4,608,766	2.8	38.3

Sources: B5 - Compiled from the 1961 Certified Exporters list of the Diamond Industry.
B6 - Compiled and computed from the 1965 List of Exporters of the Diamond Industry.
B7 - Compiled from the 1968 Certified Exporters list of the Diamond Industry.

a. Single function exporters.

APPENDIX TABLE C1

Distribution of the Diamond Industry's Sawing Segment Employment by Plant Size

	1961			1968		
Size Class	Number of Plants	Employment	Per Cent of Total Employment	Number of Plants	Employment	Per Cent of Total Employment
1 - 4	13	27	14.8	38	103	19.1
5 - 10	11	71	38.8	22	206	38.2
10 and over	6	85	46.4	14	231	42.7
Total	30	183	100.0	74	540	100.0

Source: 1961 Survey of Employment, op. cit.; 1968 Statistical Report, op. cit.

Note: Size classes for 1961 sawing plants differ as follows: 1-5, 6-10, 11 and more instead of 1-4, 5-9 and 10 and over.

APPENDIX TABLE C2

Scaife and Bort Expenditures, 1966
(in Israeli Pounds)

A skilled employee uses on average 5 scaife per month while for an apprentice the figure is 7 scaifes.

The preparation (labor) cost of a scaife is 3 pounds and its depreciation is about 0.75. Each requires 1 carat of bort whose cost is 7 pounds. However, to discourage the worker from using excessive amounts of bort, he shares in the expenses by contributing 1.50 pounds for every scaife used. Thus the total expense involved is about 10 pounds. A plant employing 48 polishers will thus have to spend 480 pounds for scaifes and bort. In addition, the amount of bort consumed depends on the size of stones.

To summarize the preceding analysis, the expenses of a manufacturer regarding scaife and bort are presented in the two following tables.

1 carat bort	7.600
scaife preparation	3.000
depreciation	0.750
	11.350
employee's share	1.500
	9.850

Expenditures of Bort and Scaife by Size of Stones
(In Prutot; 100 Prutot = 1 Israeli Pound; 3 Israeli Pounds = 1 Dollar)

Size Number of Sawn Stones in a Carat	Bort and Scaife Expenses for a Stone	Size Number of Sawn Stones in a Carat	Bort and Scaife Expenses for a Stone
Brilliant Cut		12.01-15	240
1.01 and over	700	15.01-20	230
1-1.5	660	20.01-25	200
1.51-2	660	25.01 and smaller	200
2.01-2.5	400		
2.51-3.5	380	Achtkant - 8/8	
3.51-4.75	355	12.01-15	120
4.76-6	340	15.01-20	110
6.01-7.25	320	20.01-25	105
7.26-8.25	285	25.01 and smaller	105
8.26-10	265		
10.01-12	255		

Source: Compiled from documents in the file of the Diamond Control Department.

APPENDIX TABLE C3

Monthly Average Physical Productivity of an Employee by Type of Rough

Type of Rough	Monthly Average Physical Productivity (in Polished Carats)
a) Sawed brilliant	
11, 12, 13 [a]	30 - 32
± 9 [a]	12 - 14
blacks, darks	17 - 21
small brilliant (9-13 in a carat)	6
sawed 8/8	8 - 10
b) Kaps brilliant	
1 - 2 in a carat	12 - 14
4 - 6 in a carat	5 - 6
7 - 10 in a carat	4 - 5

Source: Compiled from documents in the files of the Diamond Control Department.

a. refer to original melee's.

APPENDIX TABLE E 1

Israeli Imported Rough Diamonds by Sources of Supply. 1950 - 1968

Years	Gross Import carats	Gross Import value (in $ 000)	Syndicate carats	Syndicate value (in $ 000)	Outside Supplies carats	Outside Supplies value (in $ 000)	Returned Goods carats	Returned Goods value (in $ 000)
1950	349,100	9,017	262,654	6,870	86,446	2,157		
1951	344,700	9,769	260,622	7,844	84,078	1,935		
1952	370,800	9,817	340,329	7,588	30,472	2,229		
1953	446,600	11,794	331,000	6,693	207,598	5,101		
1954	507,100	13,793	384,190	8,569	218,910	5,224		
1955	543,900	16,246	209,083	6,935	334,807	9,311		
1956	639,800	21,588	152,845	5,361	486,955	16,227		
1957	814,600	28,814	159,782	5,898	654,818	22,914		
1958	772,470	25,559	175,362	6,509	597,108	19,043	24,470	986
1959	1,259,900	48,434	191,102	6,997	1,068,794	35,437	41,184	945
1960	1,441,613	51,183	260,600	10,429	1,181,013	40,754	69,830	2,024
1961	1,662,637	57,047	486,897	20,053	1,175,740	36,994	118,084	3,658
1962	2,154,656	72,434	959,553	34,760	1,195,103	37,674	209,236	4,458
1963	2,937,681	100,093	1,530,011	56,429	1,349,157	43,664	358,921	7,085
1964	3,998,767	117,251	1,659,856	62,469	1,345,917	54,782	418,664	15,025
1965	2,767,749	116,726	1,548,358	64,583	1,165,447	46,143	488,313	14,070
1966	3,124,518	138,855	1,628,383	73,743	1,416,135	65,112	415,618	13,990
1967	3,088,226	137,927	1,575,387	72,587	1,510,679	65,338	313,826	12,446
1968	3,877,365	180,527	1,950,686	93,415	1,926,721	87,112	395,358	18,477

Source: Diamond Control Department, Statistical Report

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APPENDIX TABLE E-2

Imports of Rough Diamonds from the Syndicate, by Categories
1950-1968

Year	Melees carats	Melees value	Sizes carats	Sizes value	Smalls carats	Smalls value	Other carats	Other value
1950	173,919	5,317,265	–	–	–	–	94,742	1,553,336
1951	176,936	5,881,338	–	–	–	–	83,686	4,014,499
1952	119,467	3,973,734	–	–	–	–	206,861	3,643,789
1953	156,664	5,216,971	–	–	324,975	563,962	49,363	883,923
1954	209,847	7,178,162	–	–	43,175	731,124	41,161	651,667
1955	188,301	6,581,265	–	–	18,150	363,974	2,812	41,795
1956	134,140	5,029,354	–	–	18,705	331,780	–	–
1957	140,988	5,547,446	–	–	19,500	356,616	–	–
1958	153,245	5,849,250	3,677	324,975	18,814	324,975	–	–
1959	168,766	6,481,465	782	87,863	21,205	393,988	–	–
1960	231,891	9,842,244	1,299	170,243	18,713	366,374	–	–
1961	456,573	18,[illegible],356	3,825	558,931	25,257	497,049	–	–
1962	886,907	31,636,327	12,357	1,365,952	16,159	346,488	96,003	1,254,287
1963	1,961,045	65,206,118	7,937	955,226	7,937	285,007	311,993	4,275,196
1964	1,181,983	51,[illegible],[illegible]	51,438	4,9[illegible],[illegible]	8,243	310,467	237,327	5,104,078
1965	1,[illegible],[illegible]	54,[illegible],[illegible]	467,034	5,965,[illegible]	9,224	856,923	242,911	3,545,543
1966	1,406,[illegible]	[illegible],[illegible],[illegible]	71,465	4,[illegible],[illegible]	8,121	343,574	138,384	954,126
1967	1,281,[illegible]	46,[illegible],[illegible]	3,144	433,448	9,433	361,390	278,277	5,247,314
1968	1,788,[illegible]	69,[illegible],[illegible]	11,485	1,840,463	23,366	464,763	124,640	6,497,383

Source: 1961 and 1968 Statistical Reports

The series have adjusted to account for the returned goods. It is assumed (following D.C.D.) that 1 percent of the quantity and 2.5 percent of the total value of all returned goods originate in the Diamond Trading Company. For the period 1950-1958 figures for returned goods aren't available.

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APPENDIX TABLE E-3

Import of Rough Diamonds from Outside Sources by categories, 1950 - 1968

Year	Melees quantity	Melees value (in $)	Sizes quantity	Sizes value (in $)	Smalls quantity	Smalls value (in $)	Other quantity	Other value (in $)
1950	52,073	1,668,281	—	—	—	—	38,937	487,413
1951	57,072	1,429,388	—	—	—	—	31,062	425,780
1952	12,846	1,168,140	—	—	—	—	31,645	1,061,135
1953	136,060	3,993,558	—	—	28,649	487,034	43,077	613,365
1954	151,869	4,377,846	—	—	31,297	456,329	29,807	337,026
1955	301,326	8,845,101	—	—	29,128	401,668	4,436	55,862
1956	427,546	15,210,719	—	—	57,409	1,006,065	—	—
1957	574,930	21,538,916	—	—	79,888	1,374,834	—	—
1958	451,842	13,663,736	43,114	3,527,930	18,315	541,322	61,510	933,314
1959	848,071	25,906,615	77,106	6,513,439	39,898	1,009,960	110,005	1,725,793
1960	873,909	28,387,476	83,396	7,321,553	35,583	1,124,640	118,979	1,939,035
1961	832,294	24,472,773	79,417	6,318,787	33,824	961,549	113,309	1,671,637
1962	787,485	24,315,725	75,112	6,998,316	34,060	966,417	107,241	1,666,314
1963	859,588	26,965,704	82,021	6,746,960	34,996	1,065,136	117,018	1,853,891
1964	733,333	22,763,668	57,377	8,157,059	22,634	823,133	117,980	3,361,048
1965	573,731	23,647,816	55,039	7,279,324	23,666	849,524	59,357	658,349
1966	870,563	32,144,708	92,349	9,998,748	29,069	1,236,988	91,381	4,151,523
1967	388,728	35,744,347	89,761	8,513,425	47,980	2,074,903	183,242	3,670,983
1968	795,383	37,734,275	128,964	14,036,694	35,312	1,105,553	575,753	16,030,513

Source: Appendix Table E-2.

The series have been adjusted to account for the returned goods. It is assumed that 99% of the quantity and 97.5% of total value of returned goods originate in outside sources. For the period 1950 - 1958, figures for returned goods are not available.

APPENDIX TABLE E-4

Construction of the Price Index of Rough Diamonds, 1950-1968

a. Melees

Year	quantity in carats	value in $	average price	current year (1968) value weights	av. prices weighted by 1968 value weights	average 1960-1968 value weights	av. prices weighted by 1960-68 value weights
1950	285,985	6,996,486	30.91	0.76	23.49	0.81	25.04
1951	934,008	7,258,727	30.99	0.76	23.55	0.81	25.10
1952	138,993	5,141,874	37.18	0.76	28.26	0.81	30.11
1953	398,724	9,215,449	31.58	0.76	24.00	0.81	25.58
1954	361,716	11,222,954	31.94	0.76	24.27	0.81	25.87
1955	489,607	15,434,352	31.59	0.76	23.96	0.81	25.53
1956	561,686	20,236,153	36.05	0.76	27.39	0.81	29.20
1957	715,318	27,686,360	37.87	0.76	28.78	0.81	30.67
1958	606,087	19,513,286	32.24	0.76	24.50	0.81	26.11
1959	976,837	31,757,050	32.51	0.76	24.71	0.81	26.33
1960	1,113,890	38,221,770	34.32	0.76	26.08	0.81	27.80
1961	1,288,867	43,316,609	33.65	0.76	25.57	0.81	27.26
1962	1,613,782	56,089,458	34.75	0.76	26.41	0.81	28.15
1963	2,130,637	77,706,842	36.64	0.76	27.85	0.81	29.68
1964	1,935,368	80,598,140	41.86	0.76	31.81	0.81	33.91
1965	1,764,496	72,169,816	43.50	0.76	33.06	0.81	35.24
1966	2,977,143	166,034,708	46.56	0.76	35.39	0.81	37.71
1967	2,176,[illegible]	93,424	48.48	0.76	36.84	0.81	39.27
1968	2,584,3[illegible]	127,942,487	49.41	0.76	37.61	0.81	40.09

APPENDIX TABLE E-5

Construction of the Price Index of Rough Diamonds, 1950-1968

b. Sizes

Year	quantity	value in $	average price	current year 1968 value weights	av. prices weighted by current year value weights	average 1960-63 value weights	av. prices weighted by 1960-63 value weights
1950	—	—	—	—	—	—	—
1951	—	—	—	—	—	—	—
1952	—	—	—	—	—	—	—
1953	—	—	—	—	—	—	—
1954	—	—	—	—	—	—	—
1955	—	—	—	—	—	—	—
1956	—	—	—	—	—	—	—
1957	—	—	—	—	—	—	—
1958	46,791	3,852,905	82.34	0.09	7.41	0.12	9.88
1959	77,888	6,611,362	84.88	0.09	7.64	0.12	10.19
1960	84,695	7,499,766	88.55	0.09	7.97	0.12	10.63
1961	83,302	6,877,726	82.56	0.09	7.43	0.12	9.91
1962	87,499	7,684,848	87.82	0.09	7.90	0.12	10.53
1963	89,958	7,903,246	87.85	0.09	7.91	0.12	10.54
1964	108,815	13,064,438	120.06	0.09	10.81	0.12	14.41
1965	118,073	13,194,886	111.75	0.09	10.06	0.12	13.41
1966	164,314	14,985,004	86.93	0.09	7.82	0.12	10.43
1967	83905	8,946,013	106.62	0.09	9.59	0.12	12.79
1968	140,454	15,867,162	112.97	0.09	10.17	0.12	13.56

APPENDIX TABLE E-6

Construction of the Price Index of Rough Diamonds, 1950-1968

C. Smalls

Year	quantity	value in $1	average price	current year 1963 value weights	av. prices weighted by 1963 value weights	average 1960-1963 value weights	av. prices weighted by 1960-63 value weights
1950	—	—	—	—	—	—	—
1951	—	—	—	—	—	—	—
1952	—	—	—	—	—	—	—
1953	61,624	998,243	16.10	0.01	0.16	0.02	0.33
1954	74,472	1,189,446	15.97	0.01	0.16	0.02	0.32
1955	47,278	713,647	15.09	0.01	0.15	0.02	0.30
1956	78,114	1,337,845	17.12	0.01	0.17	0.02	0.34
1957	99,388	1,725,440	17.36	0.01	0.17	0.02	0.34
1958	36,609	866,257	23.66	0.01	0.24	0.02	0.47
1959	54,103	1,314,949	25.78	0.01	0.26	0.02	0.52
1960	54,296	1,491,014	27.48	0.01	0.27	0.02	0.55
1961	59,141	1,466,578	24.71	0.01	0.25	0.02	0.50
1962	48,219	1,312,925	27.22	0.01	0.27	0.02	0.54
1963	42,933	1,289,743	30.06	0.01	0.30	0.02	0.60
1964	30,877	1,133,600	36.71	0.01	0.37	0.02	0.73
1965	32,890	1,106,447	33.64	0.01	0.34	0.02	0.67
1966	37,190	1,530,537	41.15	0.01	0.41	0.02	0.82
1967	56,713	2,436,923	42.95	0.01	0.43	0.02	0.86
1968	58,672	1,570,316	26.76	0.01	0.27	0.02	0.54

APPENDIX TABLE E-7

Construction of the Price Index of Rough Diamonds, 1950-1968

d. Other

Year	quantity (in carats)	value (in $)	average price	current year (1963) value weights	av. prices weighted by 1963 value weights	average 1960-63 value weights	av. prices weighted by 1960-63 value weights
1950	123,139	2,040,713	16.57	0.14	2.32	0.05	0.83
1951	119,692	3,516,279	29.73	0.14	3.18	0.05	1.14
1952	239,506	4,674,924	20.10	0.14	2.81	0.05	1.00
1953	98,440	1,556,618	16.83	0.14	2.36	0.05	0.84
1954	70,968	1,048,443	14.77	0.14	2.07	0.05	0.74
1955	7,298	97,602	13.37	0.14	1.87	0.05	0.67
1956	—	—	—	—	—	—	—
1957	—	—	—	—	—	—	—
1958	61,510	933,314	15.17	0.14	2.12	0.05	0.76
1959	110,005	1,725,793	15.68	0.14	2.19	0.05	0.78
1960	118,979	1,937,035	16.29	0.14	2.28	0.05	0.81
1961	113,304	1,671,637	14.75	0.14	2.06	0.05	0.74
1962	203,205	2,912,661	14.37	0.14	2.01	0.05	0.72
1963	428,311	6,112,967	14.27	0.14	2.00	0.05	0.71
1964	515,247	7,473,396	14.50	0.14	2.03	0.05	0.73
1965	272,233	4,203,762	15.44	0.14	2.16	0.05	0.77
1966	230,365	3,113,155	13.51	0.14	1.89	0.05	0.68
1967	461,519	8,918,377	19.32	0.14	2.70	0.05	0.97
1968	628,393	22,587,946	35.26	0.14	4.52	0.05	1.61

APPENDIX TABLE E-8

Construction of the Price Index of Polished Diamonds, 1950-1968

a. Brilliants

Year	quantity in carats	value in $	average price	1950-63 value weights	av. prices weighted by 1950-63 value weights	1960 value weights	av. prices weighted by 1960 value weights	1962 value weights	av. prices weighted by 1962 value weights
1950	111,143	8,105,715	72.92	0.92	67.09	0.89	65.41	0.95	69.31
1951	123,023	10,713,631	87.14	0.92	80.17	0.89	78.16	0.95	83.05
1952	105,150	10,545,237	84.26	0.92	77.52	0.89	75.58	0.95	80.30
1953	136,067	11,695,555	85.61	0.92	78.76	0.89	76.79	0.95	81.53
1954	170,943	14,448,877	84.48	0.92	77.70	0.89	75.78	0.95	80.51
1955	214,551	18,966,747	88.40	0.92	81.33	0.89	79.29	0.95	84.24
1956	243,985	23,964,338	97.97	0.92	90.13	0.89	87.88	0.95	93.37
1957	317,145	34,403,465	108.15	0.92	99.98	0.89	91.60	0.95	97.35
1958	307,464	30,355,598	98.72	0.92	90.82	0.89	88.55	0.95	94.02
1959	423,215	41,635,149	98.35	0.92	90.48	0.89	88.22	0.95	93.73
1960	522,030	50,541,286	96.81	0.92	89.07	0.89	86.84	0.95	92.16
1961	608,800	58,773,643	96.53	0.92	88.81	0.89	86.59	0.95	91.99
1962	804,678	78,460,758	97.51	0.92	89.71	0.89	87.47	0.95	92.83
1963	987,597	97,048,154	98.26	0.92	90.40	0.89	88.14	0.95	93.64
1964	1,008,958	108,267,493	107.39	0.92	99.35	0.89	96.87	0.95	103.01
1965	1,081,474	121,949,947	112.78	0.92	103.11	0.89	100.54	0.95	106.81
1966	1,191,486	151,351,785	127.04	0.92	116.97	0.89	114.04	0.95	121.16
1967	1,136,029	145,988,731	128.56	0.92	118.70	0.89	115.73	0.95	122.96
1968	1,368,843	178,917,955	130.72	0.92	120.45	0.89	117.43	0.95	124.77

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APPENDIX TABLE E-9.

Construction of the Price Index of Polished Diamonds, 1950-1968

b. Achtkants and Fancies

Year	quantity (in carats)	value (in $)	average price	weights 1950-1963 value weights	av. prices weighted by 1950-63 value weights	1960 value weights	av. prices weighted by 1960 value weights	1962 value weights	av. prices weighted by 1962 value weights
1950	8,360	704,845	84.35	0.08	6.74	0.11	8.68	0.05	3.96
1951	9,260	932,929	100.67	0.08	8.05	0.11	10.37	0.05	4.73
1952	9,430	916,981	97.34	0.08	7.79	0.11	10.03	0.05	4.58
1953	10,283	1,017,005	98.90	0.08	7.91	0.11	10.19	0.05	4.65
1954	12,867	1,255,903	97.60	0.08	7.81	0.11	10.05	0.05	4.59
1955	16,149	1,649,285	102.13	0.08	8.17	0.11	10.52	0.05	4.80
1956	18,365	2,078,637	113.18	0.08	9.05	0.11	11.66	0.05	5.32
1957	23,275	2,747,615	118.01	0.08	9.44	0.11	12.16	0.05	5.55
1958	23,143	2,603,772	112.50	0.08	9.00	0.11	11.59	0.05	5.29
1959	31,855	3,570,453	112.08	0.08	8.97	0.11	11.55	0.05	5.27
1960	52,262	5,777,334	110.54	0.08	8.84	0.11	11.39	0.05	5.20
1961	60,218	6,511,015	108.12	0.08	8.65	0.11	11.14	0.05	5.08
1962	33,530	3,865,967	115.31	0.08	9.23	0.11	11.89	0.05	5.42
1963	59,696	6,969,161	116.74	0.08	9.34	0.11	12.02	0.05	5.49
1964	75,875	9,338,248	123.07	0.08	9.85	0.11	12.68	0.05	5.78
1965	81,408	10,540,986	129.49	0.08	10.36	0.11	13.34	0.05	6.09
1966	87,652	13,173,030	146.88	0.08	11.75	0.11	15.13	0.05	6.90
1967	84,759	12,633,801	149.05	0.08	11.92	0.11	15.35	0.05	7.01
1968	103,032	15,584,170	151.35	0.08	12.10	0.11	15.58	0.05	7.11

APPENDIX TABLE E-10

Annual Ratios of the Price Indexes of Polished Diamonds to the Price Indexes of Rough Diamonds, 1950-1962.
(1962=100)

Year	(1)	(2)	(3)	(4)	(5)	(6)
1950	82.17	82.10	82.53	83.28	83.21	83.34
1951	94.80	94.73	94.84	98.09	98.03	98.19
1952	72.86	73.81	72.94	80.01	79.96	80.09
1953	94.76	94.70	94.86	96.33	96.28	96.43
1954	93.56	93.52	93.67	94.28	94.24	94.49
1955	99.88	99.81	99.97	100.38	100.31	100.47
1956	97.01	96.98	97.14	97.32	97.29	97.45
1957	96.33	96.33	96.83	96.70	96.61	96.71
1958	107.72	107.61	107.88	108.96	108.15	108.42
1959	105.68	105.58	105.84	106.14	106.04	106.30
1960	99.93	98.84	99.07	99.32	99.23	99.46
1961	102.07	101.91	102.36	102.43	102.27	102.63
1962	100.00	100.00	100.00	100.00	100.00	100.00
1963	96.91	96.91	96.93	96.94	96.94	96.93
1964	88.01	88.61	88.67	88.54	88.46	88.67
1965	91.98	91.93	91.53	91.44	91.38	91.53
1966	104.59	104.53	104.76	104.67	104.60	104.76
1967	97.46	97.40	97.94	97.84	97.77	97.94
1968	93.84	93.17	95.98	95.81	95.81	95.98

Notes:
(1) Index of Polished Diamonds, 1960-1963 weights
Index of Rough Diamonds, 1963 weights
(2) Index of Polished Diamonds, 1962 weights
Index of Rough Diamonds, 1962 weights
(3) Index Polished Diamonds 1960 weights
Index Rough Diamonds 1963 weights
(4) Index Polished Diamonds, 1960-1963 weights
Index Rough Diamonds, 1960-1963 weights
(5) Index Polished Diamonds, 1962 weights
Index Rough Diamonds, 1960-1963 weights
(6) Index Polished Diamonds, 1960 weights
Index Rough Diamonds 1960-1963 weights

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