OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

D03806

Distr.
LIMITED

ID/WG.113/14
9 August 1972

ENGLISH
ORIGINAL: SPANISH

United Nations Industrial Development Organization

Regional Seminar on Machine Tools
for Countries in Latin America

Buenos Aires, Argentina
16 - 25 October 1972

Sao Paulo, Brazil
26 - 27 October 1972

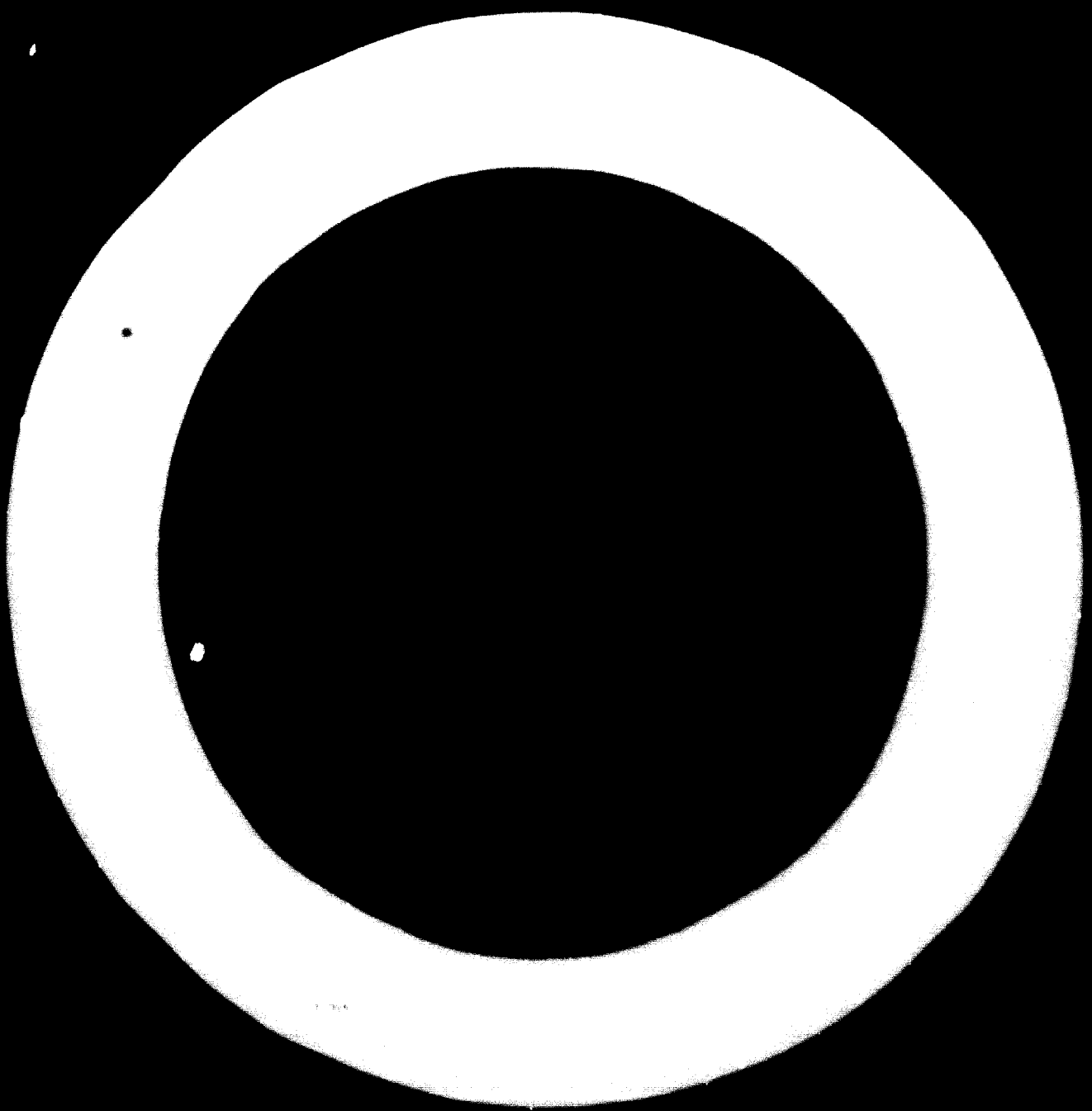
REPORT ON THE SITUATION IN THE MACHINE TOOL INDUSTRY IN ECUADOR 1/

by

H.N. Huilcarema
Industrial Engineer
National Office for Planning
Quito, Ecuador

1/ The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the Secretariat of UNIDO. This document has been reproduced without formal editing.

id.72-4717



I. GENERAL COMMENTS

Situation in the metalwor' ng and mechanical engineering sector of the country

The productio' and use of machine too s are closely tie' tc the development of the metalworking and mechanical engineering sector, and it is therefore advisable to give some background on this industrial branch in the country.

In the production sector, two areas will be discussed, namely handwork and small-scale industry and manufacturing industry.

(i) Small-scale industry

This is regarded as covering enterprises which employ less than 10 persons and have a fixed capital (excluding ground and buildings) of no more than 500,000 sucres (US$20,000).

In the metalworking sector (ISIC, major groups 35-38), in 1972 there are 58 establishments covered by the Law for the Development of Small-Scale Industry and Handworking, which employ an average of nine persons apiece; the data for these establishments concerning employment, production and fixed capital appear in annex 1.

It should be pointed out that there are a large number of small-scale industrial enterprises in the country which are not covered by the industrial development law and are therefore not registered.

The establishments in major group 35 engage in the production of a variety of parts, the maintenance of machinery and equipment, light iron work and sheet metal work in general. Some of them produce agricultural and carpentry machinery to order or on a very small scale.

In this small-scale industry sector, as regards machine tools, there is production of punching machines, small shearing machines, sawing machines, drilling machines and rebuilt lathes, primarily in Quito, Guayaquil, Cuenca and Ambato.

Visits made show that 50 per cent of these workshops have an average of three small or medium-sized fixed machine tools, the remainder being portable.

The workshops in major groups 36 and 37 manufacture parts and repair machinery and equipment.

Maintenance and repair of motor vehicles in general account for 95 per cent of the work in major group 38.

(ii) Manufacturing industry

As regards metalworking and mechanical engineering (M/M) in the manufacturing industry, as of 1969, there were 71 establishments registered, with an average of 42 employees apiece. The value of the production of these enterprises was 416 million sucres; adding to this the figure for imports, and deducting that for exports, it can be concluded that the value of metalworking and mechanical engineering products available in the country (in 1969) was 2,102.8 million sucres.

Annexes 2, 3, 4 and 5 give data concerning personnel and establishments, values of production, industrial costs and investment in fixed capital, classified by industrial branch (major groups 35-38), comparing the metalworking and mechanical engineering industry as a whole with manufacturing industry as a whole.

II. SITUATION IN ECUADOR IN THE MACHINE TOOL SECTOR

2.1 The pool of machine tools

The size of the pool of machine tools was determined on the basis of the figures given in the country's foreign trade yearbooks, since 99 per cent of the machine tools for metalworking in the country are imported.

The basic data used were the weight (in tonnes) and the value (in dollars, cif) for a series of imports from 1960 to 1969, classified by type of machine, as shown in annex 6.

This table shows that, in the 1960s, Ecuador imported a total of 2,469.8 tonnes of machine tools (including parts and also some components) with a value of US$5,907,300. The average value per kilogramme of machine tool was, therefore, $2.39. This average value per unit of weight fluctuated between a maximum of US$3/kg in 1963 and a minimum US$2/kg in 1966. By type of machine, drilling and milling machines had the highest average value, while planing machines had the lowest one (US$1.53/kg), as can be seen from the following table:

MACHINE TOOLS

1960-1969

Type of machine tool	Cumulative total value (Thousands of US$, cif)	Cumulative total weight (tonnes)	Average (US$/kg)
Grinding machines	68.4	29.6	2.31
Planing machines	80.9	52.9	1.53
Milling machines	207.7	82.7	2.51
Drilling machines	228.4	77.2	2.96
Lathes	869.0	440.8	1.97
Sewing machines	34.1	14.8	2.30
Presses and hammers	479.3	263.1	1.82
GRAND TOTAL	5,907.3	2,469.8	2.39

To determine the number of machine tools by using the data in question, a brief survey was made of merchants and distributors of machine tools, several industrial enterprises and some small-scale enterprises (in Quito), and the average weight and value per machine tool determined.

To ascertain the total size of the pool of machine tools (for production and maintenance) the figures for imports were used primarily, and a projection made up to 1980, taking into account the production of the metalworking and mechanical engineering sector for this period.

Annex 7 shows only the total number of machine tools, and does not break them down by type of machine since the statistics (annex 6) do not indicate the real distribution. For example, the "other machine tools" heading accounts for around 50 per cent of the total weight of machine tools imported.

The size of the pool broken down by type of machine tool and by branch of activity (production and maintenance) will have to be determined by means of a survey of plants; this task will be undertaken later, primarily to assess the problems of under-utilization and idle capacity of machine tools in general.

A new enterprise engaging in the industrial production of machine tools could undertake to manufacture universal machine tools such as shearing machines, etc.; presses; lathes and millers, in that order. Its production process would be based on the founding and machining of parts and components, and it would purchase forgings and electrical equipment and components from other auxiliary enterprises.

An enterprise of this type could nicely take advantage of the benefits afforded by the industrial development law under category "A", in other words, above all 100 per cent exemption from duties on the import of machinery and equipment and up to 65 per cent exemption for the import of raw materials.

III. CO-OPERATION AND TECHNICAL ASSISTANCE

One of the factors hindering the country's industrial development lies in the operational weaknesses of industrial enterprises and the lack of technical services. The shortcomings of industrial enterprises in the fields of technology, enterprise management and information have an unfavourable effect on industrial productivity. In the field of technical services, there are a number of organizations supporting industry whose activities are somewhat uncoordinated, and there is no integrated system of technical assistance at the plant level.

More specifically, in the metalworking field (as in the other branches), there is a paucity of entrepreneurs or executives with specialized vocational training and knowledge and/or experience in the specific branch.

It should be added that Ecuador's participation in the sub-regional market presents a challenge for local industry since other countries started their industrial development processes sooner.

Since the country is aware of these factors, it is implementing, through the United Nations Development Programme (UNDP), project DP/ECU/71/533 for technical advisory services to industry, with a duration of three years and a possibility of extension to five years.

The long-range objective of the project is to stimulate the country's industrial development by planning and establishing an effective system to:

(1) Provide extension services or direct assistance to industry;

(2) Advise, reinforce and co-ordinate national technical assistance services in the industrial field.

As an immediate objective, it is proposed to set up an integrated system of technical assistance to industry comprising the following:

- Industrial engineering services,
- Production engineering services,
- Quality control services,
- Information services,
- Enterprise administration and management services,
- Co-operation with financial organisations in the effective utilization of their investment and credit resources,
- Assistance to industry in the implementation of new industrial activities, particularly those assigned to Ecuador under Andean Group arrangements.

As part of the production engineering, it is planned to give technical assistance to industry to ensure transfer of know-how comprising production methods, selection of processes, selection of equipment and machinery, selection of raw materials, quality control and testing in the plant.

One of the sectoral branches to be dealt with will be the metalworking and mechanical engineering industry, under which the selection, production, utilisation and maintenance of machine tools will also be considered.

It is hoped that the project concerned will result in a national technical advice and industrial extension service which will grow through an increase in its own capacity and the co-operation of national organisations working in this field.

IV. TECHNICAL ASPECTS

As shown by the statistics given in the annexes, there is no industrial-scale production of machine tools.

In small-scale industry, there is some production of light machine tools (shearing, sawing, drilling and punching machines) for the use of the industry itself or as an experimental line.

In addition, sawing machines and small lathes are produced in technical training establishments, primarily by copying models, for vocational training purposes.

In both cases, the precision achieved is quite fair.

There is also a group of metalworking and mechanical engineering enterprises which rebuild and maintain machinery in general, including machine tools.

In addition, the maintenance shops belonging to enterprises undertake this type of work efficiently because it is a specific responsibility.

Since any machine tool production undertaken should start off with a market of its own which would support it, an exhaustive analysis must first be made of the actual utilization and diversity of the pool of machine tools. Visits to industrial enterprises, primarily in major group 35, indicate a high rate of idle capacity and under-utilization of machine tools.

With regard to machines operating without stock removal, it is estimated that the idle capacity may be around 50 per cent.

Idle capacity can be caused by the following:

- Unplanned expansion;
- Confidence that an expansion or diversification of production will result in full utilisation of machine capacity;
- Purchase of machinery without rational planning;
- Failure to utilise machine capacity available in other enterprises.

The causes of under-utilization which can be ascertained are the following:

- Failure to be aware of the range of uses and applications of machine tools;
- Use of universal machine tools for specific operations;
- Lack of knowledge of industrial engineering, production engineering and the strength of materials, with reference to production processes in the metal-working industries.

ANNEX 1

SMALL-SCALE INDUSTRIAL ENTERPRISES BENEFITING FROM THE LAW FOR THE DEVELOPMENT OF SMALL-SCALE INDUSTRY

(Ecuador, 1972)

ISIC 1/	No. of establishments	Persons employed	No. of persons per establishment	Value of production (Thousands of sucres)	Fixed capital 2/ (Thousands of sucres)
35	27	227	8	39,836.0	3,132.3
36	5	39	8	5,113.9	[illegible] 7
37	7	56	8	18,054.[illegible]	[illegible]
38	19	199	10	16,473.7	1,[illegible]
TOTAL:	58	521	9	74,478.5	[illegible]

1/ ISIC: 35 = Metal products
36 = Machinery, except electrical machinery
37 = Electrical machinery
38 = Transport equipment

2/ Excluding ground and buildings.

SOURCE: Ministry of Production

PREPARED BY: The National Office for Planning and Co-ordination.

ANNEX 2

PERSONNEL AND ESTABLISHMENTS (Ecuador, 1[illegible])

ISIC	Personnel employed No.	%	Establishments No.	%	Persons/establishment
35	1,766	5[illegible].8	45	63.4	[illegible]
36	97	3.3	2	2.8	48
37	733	24.8	16	22.5	46
38	355	12.0	8	11.3	44
M/M industry */	2,951	100	71	100	4[illegible]
%		(6.6)		(8.4)	
TOTAL M.I. */	44,821	(100)	846	(100)	

*/ M/M = Metalworking and mechanical engineering; M.I. = Manufacturing industry

SOURCE: Industrial statistics.

PREPARED BY: The National Office for Planning, Industries Section.

ANNEX 3

PRODUCTION (Ecuador 1969)

(Thousands of sucres, 1969)

ISIC	Gross value of production (1)		Imports, cif (2)		Exports, fob (3)		Available (1 + 2 - 3)	
	Value	%	Value	%			Value	%
35	240,254	57.7	186,094	11.0	18	85.7	426,330	20.3
36	1,618	0.4	653,229	38.7	3	14.3	654,844	31.1
37	131,849	31.7	316,647	18.8	-	-	448,496	21.3
38	42,412	10.2	531,326	31.5	-	-	573,738	27.3
M/M */ Industry	416,133	100	1,687,296	100	21	100	2,102,808	100
(%)		(5.1)		(42.9)		(0.005)		(18.1)
TOTAL M.I. */	8,099,817	(100)	3,929,741	(100)	428,161	(100)	11,601,398	(100)

*/ M/M = Metalworking and mechanical engineering; M.I. = Manufacturing industry.

SOURCES: Industrial surveys.

PREPARED BY: The National Office for Planning, Industries Section.

ANNEX 4

INDUSTRIAL COSTS, 1969

(Thousands of sucres, 1969)

ISIC	Wages and salaries	Welfare benefits	Raw materials Domestic	Raw materials Foreign	Electric energy purchased	Fuels and lubricants	Other costs	Total industrial costs
35	31,502	7,302	[illegible]	118,557	1,557	1,463	[illegible]	[illegible]
36	554	53	37[illegible]	101	21	[illegible]	345	1,[illegible]
37	15,230	4,442	[illegible],080	54,170	960	393	[illegible],753	1[illegible]
38	5,329	1,201	[illegible],331	17,329	262	2[illegible]	3,645	[illegible]
M/M */ industry	52,655	13,018	23,259	190,327	2,840	1,934	80 [illegible]1	[illegible]4,5[illegible]4
%	14.5	3.6	6.[illegible]	52.2	0.8	0.5	22.0	100
(%):	(6.4)	(4.7)	(1.1)	(8.6)	(3.5)	(1.5)	(5.3)	([illegible])
TOTAL M.I. */	826,306 (100)	275,[illegible]89	[illegible],080,347 (100)	2,225,217 (100)	80,946 (100)	129,294 (100)	1,511,535 (100)	7,1[illegible],[illegible]26 ([illegible]00)

*/ M/M = Metalworking and mechanical engineering; M.I. = Manufacturing industry.

SOURCE: Industrial statistics.

PREPARED BY: The National Office for Planning and Co-ordination, Industries Section.

ANNEX 5

FIXED CAPITAL

ISIC	Millions of sucres, 1969 31 December 1969	%	PERCENTAGE BREAKDOWN, 1968 Buildings	Ground	Machinery	Office equipment	Vehicles	Other
35	22.8	100	19.7	8.2	58.3	4.2	3.9	5.6
36	2.4	100	13.5	-	70.9	0.7	13.3	1.7
37	77.5	100	33.8	5.5	48.5	4.8	3.4	3.9
38	32.0	100	30.0	17.3	36.3	4.6	3.7	8.1
M/M */ industry	334.7	(9.1)						
TOTAL M.I. */	3,691.1	(100)						

*/ M/M = Metalworking and mechanical engineering; M.I. = manufacturing industry.

SOURCE: Industrial statistics.

PREPARED BY: The National Office for Planning, Industries Section.

ANNEX 6

IMPORT OF MACHINE TOOLS (1960-19[illegible])

T = tonnes
V = cif value, thousands of US$

Nabalalc (LAFTA customs nomenclature)	Name of machine tool	1960		1961		1962		1963		1964		1965		1966		1967		1968		1969	
		T	V	T	V	T	V	T	V	T	V	T	V	T	V	T	V	T	V	T	V
84.45.1.	Grinding machines	2.6	6.1	2.0	4.9	1.4	4.3	1.4	2.1	13.6	26.2	2.0	9.2	2.4	4.8	0.5	1.8	0.4	[illegible]	[illegible]	[illegible]
84.45.2.	Planing and shaping machines	0.9	1.9	0.8	1.5	0.5	1.3	0.6	1.3	4.8	7.7	1.9	3.0	6.9	10.4	11.2	18.6	18.2	[illegible]	7.1	[illegible]
84.45.3.	Milling (copying) machines	2.7	12.8	2.1	10.4	1.5	9.2	4.5	8.6	11.6	52.5	4.5	7.8	24.9	40.3	1.6	16.1	12.8	20.7	[illegible]	[illegible]
84.45.5.	Drilling and boring machines, etc.	1.7	6.8	1.3	5.5	0.9	4.8	3.3	21.9	6.4	10.3	12.1	27.0	7.4	25.9	9.0	17.2	28.6	30.0	[illegible]	[illegible]
84.45.6.	Lathes	14.4	41.2	11.1	33.4	8.0	29.4	24.1	66.2	60.1	128.5	61.4	113.9	31.2	43.6	60.1	123.4	74.0	102.6	[illegible]	[illegible]
84.45.7.	Sawing machines	0.4	1.1	0.3	0.9	0.2	0.8	0.7	1.3	1.5	3.7	2.0	3.9	2.1	3.7	2.1	5.6	3.1	10.9	[illegible]	[illegible]
84.45.9.*/	Other machine tools	52.0	97.1	40.3	78.5	29.1	69.1	46.5	145.3	136.1	289.8	116.5	239.5	143.7	414.1	142.7	442.1	139.7	391.5	[illegible]	[illegible]
	Sub-total S_1	74.7	166.9	57.9	135.1	41.6	118.9	81.1	245.9	234.1	518.7	200.4	404.3	218.6	542.8	230.2	624.8	276.8	643.9	[illegible]	[illegible]
84.45.4	Presses and hammers	1.9	9.9	1.5	8.0	25.8	62.0	5.0	13.3	6.2	33.4	35.5	56.6	85.4	104.7	50.6	85.9	27.3	[illegible]	[illegible]	[illegible]
	Total machine tools, S_2	76.6	176.8	59.4	143.1	67.4	180.9	86.1	259.2	240.3	552.1	235.9	460.9	304.0	518.8	280.8	710.7	304.0	686.8	[illegible]	[illegible]
84.48.0.01	Components and parts of the machinery under heading 84.45	26.1	48.5	20.2	39.3	14.5	34.6	23.3	72.7	71.5	162.0	89.6	188.4	75.2	225.8	74.3	241.8	91.0	279.3	[illegible]	[illegible]
	GRAND TOTAL	102.7	225.3	79.6	182.4	81.9	215.5	109.4	331.9	311.8	714.1	325.5	649.3	379.2	744.6	355.1	951.9	395.0	967.6	[illegible]	[illegible]
	V_u = Dollars / kg	2.19		2.29		2.63		3.03		2.29		1.99		1.96		2.68		2.45		[illegible]	

Notes: */ It is estimated that one-third of the total of the "other machine tools" item corresponds in fact to components and parts of the machinery under heading 84.45, and has been transferred to 84.48.0.01.

*/ The "other machine tools" heading includes non-universal machine tools (used for a specific function, for example, in the transfer machine industry), and also shearing, bending, broaching, drilling, punching and other unspecified machines.

SOURCE: Foreign trade yearbooks.

PREPARED BY: The National Office for Planning, Industries Section.

ANNEX 7

DEMAND FOR MACHINE TOOLS
(Units)

Year	Imports (a)		Production (b)		Exports (c)		Domestic demand (a+b-c)	Cumulative total pool of machine tools (Dec.)
Before 1960	487						487	
1960	57						57	544
1961	47						47	
1962	47						47	
1963	63	487					63	
1964	173						173	
1965	157						157	1,031
1966	186						186	
1967	183						183	
1968	203	952		20			203	
1969	179		10				189	
1970	201		10				211	2,003
1971	251		10				261	
1972	283		20				303	
1973	318	1,612	20	200			338	
1974	357		50				407	
1975	403		100				503	3,815
1976	544		150		5		689	
1977	646		150		10		786	
1978	769	3,906	200	900	15	110	954	
1979	907		200		30		1,077	
1980	1,040		200		50		1,190	8,511

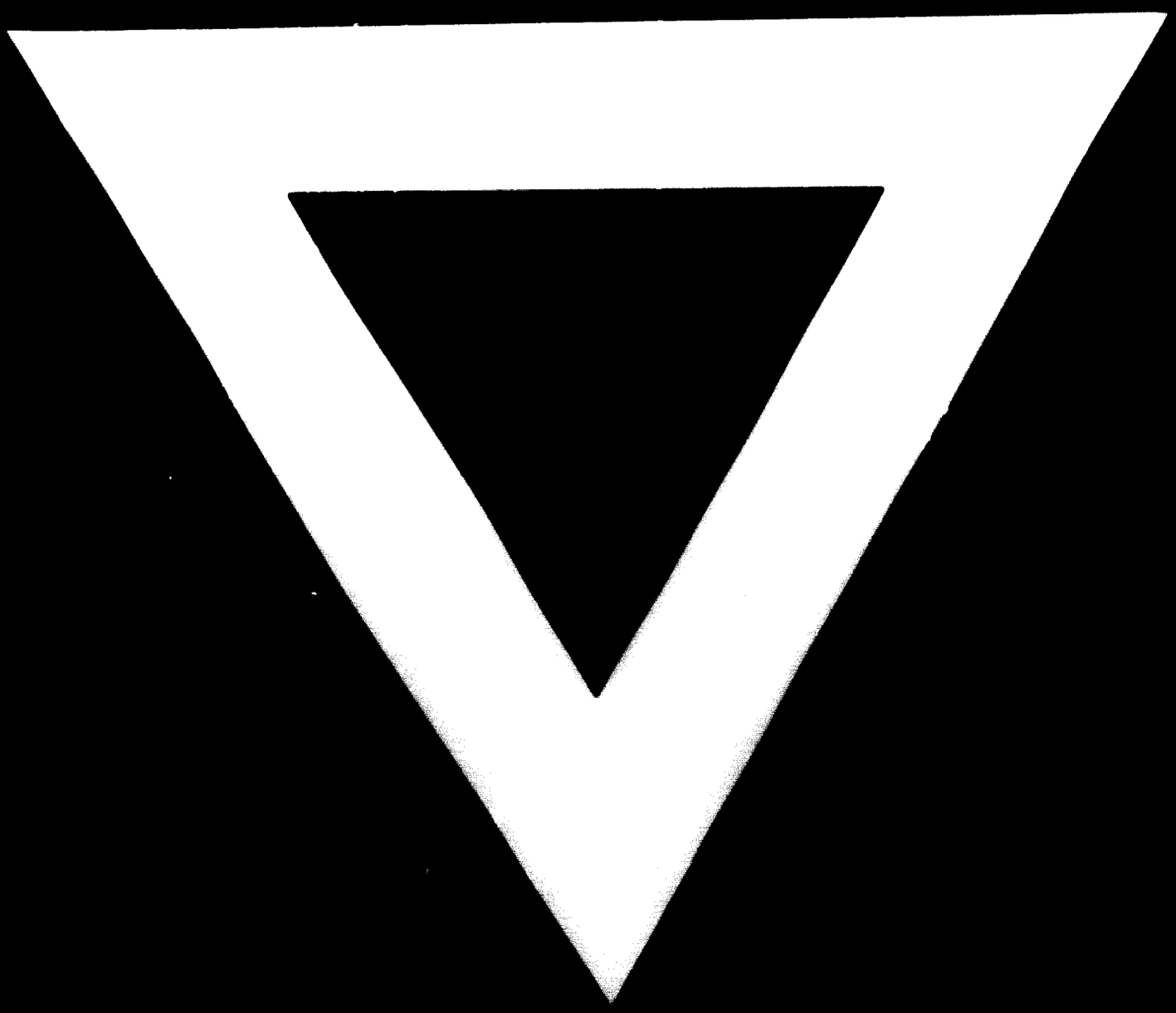
(a) 1960 - 1970: Estimate of the number of machine tools based on weight and cif value of imports into the country (annex 1).

1971 - 1980: Projections based on the trend in imports of machine tools and metalworking and mechanical engineering production.

(b) Up to 1975, the manufacture of a few light machine tools to be used by factories and technical schools themselves is assumed.

By 1976, it is assumed that machine tools will be produced by an enterprise which will draw 50 per cent of its revenues from them

(c) Some type of export is also foreseen.



IG. 7. 74