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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

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FUTURE STRUCTURAL CHANGES IN THE INDUSTRY OF BELGIUM*

Prepared by the
Global and Conceptual Studies Section
International Centre for Industrial Studies

UNIDO Working Papers on Structural Changes
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FOREWORD

This study was undertaken in the framework of UNIDO's research programme on industrial redeployment and structural adjustment. It constitutes a part of a series of country studies designed to analyze past changes in the industrial structure of individual developed countries and to obtain a first overview of likely future developments.

It is believed that by initiating and carrying out these studies and ensuring a broad dissemination of the reports, UNIDO may contribute to reducing uncertainties and highlighting pertinent trends of development prospects and the adjustment process, thereby creating a basis for an adjustment policy that would be anticipatory in nature. Concomitantly, the results would seem to be of direct relevance for the international debate on the future restructuring of world industrial production and trade, and for the conception of suitable policies and forms of industrial co-operation between the developed and the developing countries.

It is foreseen that additional studies be undertaken for attaining, on the one hand, a greater country average and, on the other, more disaggregated findings. Moreover, a regular updating and revision of the findings would appear necessary in order to arrive - in an interactive process - at a gradually clearer picture and more accurate assessment of prospective changes. To this end a close dialogue with the various actors in the restructuring process and with researchers is sought. Comments and suggestions to the approach and findings of this and other reports in this series are therefore welcomed.

In consultation with an informal International Working Group on Restructuring, UNIDO is co-ordinating and consolidating the individual country studies. It will be attempted to review the development pattern of developed countries in the light of the changing international division of labour and in particular of the industrialization prospects and priorities of the developing countries. The findings will be regularly published and distributed.

This study on structural change in Belgium was prepared by P.K.M. Tharakan, M. Vandoorne and L. Dejonckheere of the Centre for Development Studies, University of Antwerp, as UNIDO consultants in co-operation with the UNIDO Secretariat's International Centre for Industrial Studies.

This report on the findings is divided into three chapters. The objective of the work, reported on in Chapter I, was to make a tentative identification of the industries for which Belgium has comparative advantages and disadvantages - actual or potential - vis-à-vis the developing countries. This exercise enabled a choice of industries for which projections of output and employment should be carried out for the year 1985. In Chapter II, projections of the probable 1985 levels of output and employment for four categories of Belgian industries (classified according to their degree of comparative advantage and disadvantage vis-à-vis the developing world) are presented. After a discussion of alternative methodological approaches, a general description is given of the variables used, and the results of the regression analyses are presented and evaluated. In Chapter III, projections of the 1985 levels of output and employment for each of the industrial sectors are presented.

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The neo-classical model of comparative advantage has recently undergone many revisions.[1] In order to explain adequately the commodity composition of international trade, the main thrust of this trend was to show empirically that both "new" production factors and "demand-related variables" have to be added to the neo-classical factors. On the production side, the additional variables which have been introduced include human capital,[2] natural resource content,[3] and technological lead.[4] On the demand side the stress has been mainly on preference similarity[5] or the availability of differentiated or

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1/ G.C. Hufbauer, "The Impact of National Characteristics and Technology on The Commodity Composition of Trade in Manufactured Products", in R. Vernon (editor), The Technology Factor in International Trade, New York, 1970, pp. 145-231; R. Stern, "Testing Trade Theories", in P.B. Kenen (editor), International Trade and Finance - Frontiers for Research, Cambridge, 1975.

2/ W.W. Leontief, "Factor Proportions and the Structure of American Trade: Further Theoretical and Empirical Analysis", Review of Economics and Statistics, November 1956, pp. 386-407; D.B. Keesing, "Labour Skills and the Structure of Trade in Manufactures", in P.B. Kenen and R. Lawrence (editors), The Open Economy: Essays on International Trade and Finance, New York, 1968, pp. 3 - 18; H. Waehrer, "Wage Rates, Labour Skills and the United States Foreign Trade", in P.B. Kenen and R. Lawrence (editors), op.cit., pp. 19-39; K.W. Roskamp and G.C. McMeekin, "Factor Proportions, Human Capital and Foreign Trade: The Case of West Germany Reconsidered", Quarterly Journal of Economics, February 1968; G.C. Hufbauer, ibid.

3/ W.W. Leontief, ibid.; J. Vanek, "The Natural Resource Content of Foreign Trade, 1870-1955, and the Relative Abundance of Natural Resources in the United States", Review of Economics and Statistics, May 1959; S. Naya, "Natural Resources, Factor Mix and Factor Reversals in International Trade", American Economic Review, May 1967.

4/ M.V. Posner, "International Trade and Technical Change", Oxford Economic Papers, October 1961, pp. 323-341; W. Gruber, D. Mehta, and R. Vernon, "The Research and Development Factor in International Trade and International Investment of United States Industries", Journal of Political Economy, February 1967, pp. 20-37; G.C. Hufbauer, Synthetic Materials and the Theory of International Trade, London, 1966; W. Gruber and R. Vernon, "The Technology Factor in a World Trade Matrix", in R. Vernon (editor), op.cit.; S. Hirsch, "Capital or Technology? Confronting the Neo-Factor Proportions and Neo-Technology Accounts of International Trade", Weltwirtschaftliches Archiv, Band 110, 1974.

5/ S.R. Linder, An Essay on Trade and Transformation, Uppsala, 1961, especially Chapter 3.

varied products.[1] The importance of these two factors is believed to be empirically confirmed by the increasing intra-industry trade flows between high-income countries.[2] In a few studies exports and foreign investments have been oonsidered as separate stages in the same dynamic process by which firms that have introduced demand-induced new products try to retain their monopolistic advantage by expanding to foreign markets. Vernon[3] argued that the comparative advantage of the developing countries could also be found in the exports of standardized manufactured products, some of which might well be capital-intensive. On the basis of the results of a study of Belgium's trade with her European Economic Community partners, Jacques Drèze[4] argued that the interaction between economies of scale and product differentiation, which is characteristic of particular national markets has an important impact on the determination of the commodity composition of trade between countries. A recent investigation by Tharakan et.al. [5] of the penetration of manufactures from the developing countries into European markets confirms that, in addition to the factor proportions, product differentiation and standardization are of some importance in explaining the market share obtained by the

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1/ T.S. Barker, The Variety Hypothesis as an Explanation of International Trade (mimeographed), Institute for International Economic Studies, Stockholm, No. 41, November 1974; R.H. Snape, Trade Policy and Product Variety (mimeographed), Institute for International Economic Studies, University of Stockholm, Seminar Paper No. 42, December 1974.

2/ B. Balassa, "Tariff Reductions and Trade in Manufactures among the Industrial Countries", American Economic Review, June 1966, pp. 466-473; H.G. Grubel, "Intra-Industry Specialisation and the Pattern of Trade", Canadian Journal of Economics and Political Science, August 1967, pp. 374-388; H.G. Grubel, "The Theory of Intra-Industry Trade", in I.A. McDougall and R.H. Snape (editors), Studies in International Economics, Amsterdam, 1970, pp. 35-51; H.G. Grubel and P.J. Lloyd, "The Empirical Measurement of Intra-Industry Trade", The Economic Record, December 1971, pp. 494-517; H.G. Grubel and P.J. Lloyd, Inter-Industry Trade: The Theory and Measurement of International Trade in Differentiated Products, London, 1975.

3/ R. Vernon, "International Investment and International Trade in Product Cycle", Quarterly Journal of Eoonomics, May 1966, pp. 190-207.

4/ J. Drèze, "Quelques réflexions sereins sur l'adaptation de l'industrie belge au Marché Commun", Comptes rendus des travaux de la Société royale d'économie politique de Belgique, No. 275, December 1960; J. Drèze, "Les exportations intra-C.E.E. en 1958 et la position belge", Recherches économiques de Louvain, 1961, pp. 717 f.

5/ P.K.M. Tharakan, with L.G. Soete and J.A. Busschaert, "Hechscher-Ohlin and Chamberlain Determinants of Comparative Advantage", European Economic Review, August 1978, No. 2.

developing countries in high-income countries. The special relevance of the Drèze and Tharakan studies for the current investigation is that the structure of Belgium's trade in manufactures appears to share one characteristic with that of the developing countries: both tend to specialize in standardized products which makes it possible for them to reap the economies of scale which are not provided by their limited national markets. Consequently, in determining the comparative advantage and disadvantage of Belgium vis-à-vis the developing world, the impact of standardization appears to be largely neutralized.

The empirical demonstration of the relevance of a certain set of variables for explaining the commodity composition of trade between countries is one thing; but the derivation of a consistent model of their welfare implications is quite another. Further, while the weight which national planners and policy makers would be willing to give a particular determinant need not correspond to the welfare maximization criteria of the neo-classical model, neither is it certain that it will correspond to that of a new, modified model. These considerations, as well as the principal characteristics of the Belgian economy (high physical and human capital endowment, low natural resource availability) have induced concentration on the following variables: capital stock per worker, the value added per worker (as a proxy for capital-intensity - with a distinction being made between total value added and non-wage value added) and natural resource product requirements.

Capital Stock per Worker

At the very core of the neo-classical theory of comparative advantages is the proposition that the comparative advantage of a country is a function of the correspondence between the national pattern of factor endowment and the factor-intensities of production processes. The traditional measure of factor-intensity has been capital stock per worker. In a recent study an attempt was made to calculate the physical capital per person for a sample of 43 Belgian industries.[1/] Balance sheet information of individual firms - mainly the differences in the depreciation and asset valuation practices of the firms, varying proportion of land in the fixed assets, differences in the sample size in the different industries, etc. - was used. The measurement of physical capital stock intensities

1/ P.K.M. Tharakan, J.A. Busschaert, W.M. Schoofs, and A. Vaes, Measurements of Factor-Intensities and Natural Resource Content (mimeographed), Centre for Development Studies, Antwerp, 1976.

obtained through this exercise included 34 of the products which will be analyzed in the present study. While the estimates generally corresponded to a priori notions concerning the pattern of factor-intensities, in a number of cases strong deviations in the capital-intensity of particular firms from industrial averages were noticed. The Spearman rank correlation co-efficient between these estimates and the rankings of industries based on the value added per employee (the "flow" estimates of capital-intensity presented in the following section) was 0.56. Explanations for most of these deviations were found, but nevertheless there is a danger that where the number of firms in the sample was small, the deviations strongly distorted the average. The candidates for such distortions in the original sample of 43 industries covered were footwear, biscuits, chocolates and sugar goods, cotton spinning, cereals, printing, brochage and binding, printing of newspapers and periodicals, and coal mining. The firms which showed strong deviations from the industrial average were left out and new averages for these eight industrial branches were calculated. (The Spearman rank correlation co-efficient rose to 0.71.)

It is clear, however, that changes in factor-intensities can be useful first indicators in exploring the possible shifts in comparative advantages. Estimates of capital-intensity for fifteen industrial sectors in Belgium for a period of 16 years (from 1955 to 1970) are available,[1] but unfortunately they are at a highly aggregated level. Nevertheless, some of the industries for which estimates of capital intensity were estimated reappear in this study. In any case, even aggregated estimates give some general indications of possible shifts. Table 1 shows the rankings of the fifteen sectors according to the capital stock per worker in 1959 and in 1970. As can be seen from this table, these rankings have shown a remarkable stability over the period covered; changes were marginal. Iron and steel rose from fifth place to fourth, while glass, cement and asbestos fell from fourth to fifth place. Textiles fell from eighth to ninth place while rubber rose from eighth to ninth. Paper and cardboard rose from eleventh to tenth place, while the **metalworking** industry fell from tenth to eleventh place. This apparent stability at highly aggregated levels does not, of course, say anything about the possible shifts within particular sub-sectors or branches.

1/ J. Van den Broeck, De Substitutie-Elasticiteit in de Secundaire Sector van België, Werknota 74/3, RUCA, Antwerp 1974.

Table 1. Shifts of factor-intensity rankings in selected Belgian sectors, 1959-1970

Sector	Rank in 1959	Rank in 1965	Rank in 1970
Energy	1		1
Petroleum refining, coke, gas	2		2
Chemicals	3		3
Iron and steel	4		4
Glass, cement, asbestos	5		5
Food, beverages, tobacco	6		6
Non-ferrous metals	7		7
Rubber	8		8
Textiles	9		9
Paper and cardboard	10		10
Metalworking industry	11		11
Clay and ceramics	12		12
Wood sawmills and transformation of wood	13		13
Construction	14		14
Clothing and leather products	15		15

Source: J. Van den Broeck, De Substitutie-Elasticiteit in de Secundaire Sector van België, Werknota 74/3, RUCA, Antwerpen.

Value Added per Worker

Given some of the shortcomings inherent in the capital stock estimates, it was found useful to estimate the capital-intensity of a sample of Belgian industries using the "flow concept" popularized by Lary.[1] Lary used the value added per employee in manufacture as a proxy for the flows of both human and physical capital. According to the flow concept, capital intensity was measured for 69 Belgian industries.[2] The non-wage value added (which Lary considered to be a good proxy for physical capital) was separated from the total value added in manufacture. Measurements of both the "non-wage value added" and total value added for the sample of products onsidered in this study are presented in Table 2, columns 1 and 2. (The Spearman rank correlation between these two measures for the original sample of 69 industries was as high as 0.97.) In spite of this degree of similarity, there were some important deviations between the two sets of rankings. The most striking examples of industries having lower rankings on the basis of non-wage value added than in the estimates of total value added, and thus implying a higher skilled labour content than the average, were: clay working, sugar refining, dairy products, glass manufacturing, spinning or carding wool and the chicory industry. The most important examples of the opposite case - where the skilled labour content is relatively low - were: jam, candied fruits, etc., chocolate and sugar goods, tobacco manufactures, sawing mills, and the sorting of rags and textile waste.

Estimates of "non-wage value added" were also used for an extensive, multi-country test of the possibility of factory-intensity reversals.[3] The results

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1/ H.B. Lary, Imports of Manufactures from Less Developed Countries, N.B.E.R., New York and London, 1968.

2/ Capital intensity according to the flow concept was calculated for each one of these industries by taking the total sales and the transfers to other establishments, deducting from it the cost of materials used, and adjusting these results for changes in inventories of finished products and of goods in processing between the first and the last day of the year. See P.K.M. Tharakan, J.A. Busschaert, W.M. Schoofs, and A. Vaes, Measurements of Factor-Intensities and Natural Resource Content (mimeographed), Centre for Development Studies, Antwerp, 1976.

3/ M. Vandoorne, Factor-Intensity Reversals Re-examined: First Results of a Direct Empirical Verification (mimeographed), Centre for Development Studies, Antwerp, 1977; M. Vandoorne, Estimates of Cumulative Factor-Intensities: Re-emergence of the Reversals (mimeographed), Centre for Development Studies, Antwerp, 1977; M. Vandoorne, Inter-Country Comparison of Direct Factor-Intensities - A Search for Reversals (mimeographed), Centre for Development Studies, Antwerp, 1978.

Table 2. The variables[a/]

No.[b/]	Sector	Value added per worker (B.francs) 1970	Non-wage value added per employee (B. francs) 1970	Cumulative natural resource product requirements (B. francs) 1970	Revealed comparative advantage of Belgium vis-à-vis the developing countries
11	Quarries	596,474	362,460	1,085,848	0.0661
28	Meat preparations	340,530	156,955	960,813	0.1224
52	Canned fish	194,824	62,836	516,172	1.6178
46	Canned vegetables	227,703	98,248	516,172	0.4031
37	Marmelade	297,592	135,610	-	0.0511
29	Dairy products	338,053	121,068	1,069,264	769.4583
53	Grain milling	91,738	34,810	588,870	0.2908
41	Bakeries and cookies	261,081	91,148	-	353.5000
20	Sugar	406,319	137,373	673,590	5.9061
10	Chocolate	620,416	438,889	389,845	12.3690
27	Alcohol and Barm	342,903	-	202,301	1.1110
3	Breweries	843,287	610,647	202,301	......
4	Other beverages	721,975	513,247	202,301	0.2449
32	Tobacco	328,050	145,979	277,319	1.0436
13	Oils and fats	556,192	290,693	721,224	0.0281
12	Margarine	591,748	305,901	-	1.2000
5	Chemicals	677,823	384,592	159,531/207,979	8.2282
15	Soap, perfumes, etc.	545,488	286,871	93,354	68.6667
9	Pharmaceuticals	628,292	388,129	93,354	5.9768
21	Rubber	405,254	170,223	103,659	22.6682

a/ The SITC composition of the branch classification used here appears in the Appendix.

b/ The numbers in this column correspond to the rankings according to the total value added per person.

Table 2. The variables[a]

(Continued)

No.[b]	Sector	Value added per worker (B. francs) 1970	Non-wage value added per employee (B. francs) 1970	Cumulative natural resource product requirements (B. francs) 1970	Revealed comparative advantage of Belgium vis-à-vis the developing countries
33	Woodsawing	326,528	158,646	347,183	0.0472
35	Wood manufacturing	325,082	133,361	347,183/132,351	2.4297
38	Baskets, etc.	293,877	119,005	347,183	307.8974
18	Paper and cardboard	446,413	172,496	214,127	11.3235
31	Paper and cardboard manufacturing	334,722	132,815	127,683	257.8276
7	Newspaperprinting	653,997	395,733	75,155	214.1000
14	Printing and binding of books	551,885	338,692	75,155	32.7714
25	Leather tanning	350,687	136,751	577,668	0.3522
47	Fur	214,640	72,530	162,741	1.7500
49	Gloves	211,851	69,415	188,567	0.7738
50	Washing and carbonizing of wool	207,679	49,986	606,129	0.0267
44	Wool combing	244,869	75,713	606,129	0.0666
36	Spinning of wool	321,405	134,185	606,129	......
45	Jute spinning	236,709	68,409	606,129	0.0506
42	Cotton spinning	258,949	93,780	606,129	0.4352
39	Felt	281,943	101,855	291,911	15.8182

a/ The SITC composition of the branch classification used here appears in the Appendix.

b/ The numbers in this column correspond to the rankings according to the total value added per person.

Table 2. The variables[a]

(Continued)

No.[b]	Sector	Value added per worker (B. francs) 1970	Non-wage value added per employee (B. francs) 1970	Cumulative natural resource product requirements (B. francs) 1970	Revealed comparative advantage of Belgium vis-à-vis the developing countries
24	Wadding	354,284	159,098	291,911	64.9000
34	Wastage of textiles	326,126	178,423	291,911	20.2286
23	Weaving	379,563	198,455	291,911	3.8833
43	Hosiery	250,112	108,318	282,678	0.7926
51	Clothing and confection	201,365	68,679	162,741	1.0724
48	Footwear	214,638	47,571	198,099	0.2947
17	Cokes	497,757	202,782	677,127	......
6	Agglomerates of coal	671,804	395,358	1,132,914	......
1	Petroleum refineries	1,149,846	733,137	475,489	1.1235
26	Clay products	350,547	134,622	134,953	43.3889
40	Ceramics	263,863	77,885	134,953	4.1579
19	Glass	426,273	154,844	87,233	301.6520
30	Agglomerates cement	335,492	129,769	215,151	82.8571
8	Iron and steel	638,065	345,685	554,959/236,656	83.3228
2	Non-ferrous metals	861,381	292,348	313,126	0.0488
22	Plastics	402,128	194,120	76,881	22.7603
16	Scrap	532,842	320,040	-	0.1032

Source: Tharakan, P.K.M., Busschaert, J.A., Schoofs, W.M., and Vaes, A., Measurements of Factor-Intensities and Natural Resource Content, Centre for Development Studies, Antwerp, 1976.

a/ The SITC composition of the branch classification used here appears in the Appendix.

b/ The numbers in this column correspond to the rankings according to the total value added per person.

showed that the "reversals" do occur rather extensively if one makes cross-country comparisons of the rankings of "cumulative" (direct and indirect) factor-intensities for various production processes. But given that firms are able to locate different stages of the production process in different countries, the more important question from a policy point of view is whether large-scale reversals of direct factor-intensities do occur. (A comparison of the rankings of factor-intensities of twenty odd sectors at three-digit ISIC levels for fourteen countries[1/] with different factor-price ratios yielded a Kendall's co-efficient of 0.61. But this rather high co-efficient masks a certain number of important "cross-overs".)

Graph 1 shows the comparison of factor-intensity rankings between Belgium and Singapore. This is a crucial comparison as both countries approximate a free trade situation and thus minimize possible distortions. This comparison shows that Belgium is relatively more capital-intensive than Singapore in sectors such as Plastics (ISIC 356), Pottery and Clay Products (ISIC 361/69), Wood Products (ISIC 331/32), Machinery (ISIC 382/85) and Paper and Paper Products (ISIC 341). In most of these cases, Belgium also deviates from the general pattern of relative factor-intensities.

Natural Resource Product Requirement

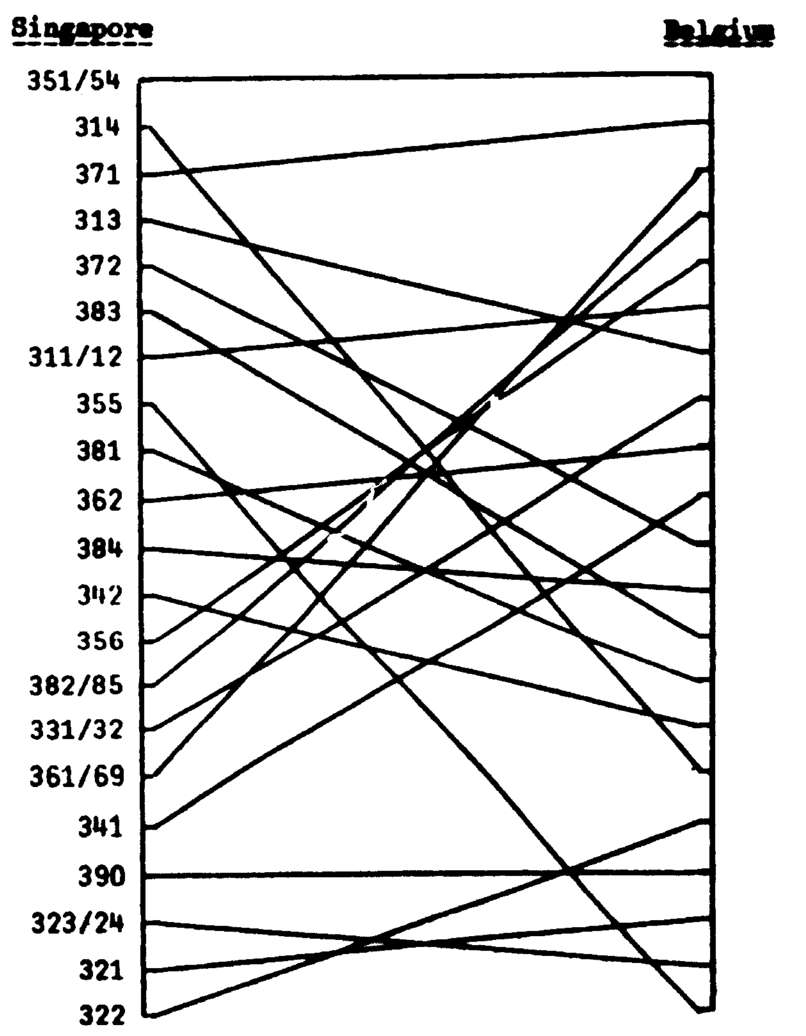
Vanek's proposition that the natural resource endowment of a given country is a distinct and important determinant of its comparative advantage[2/] has largely survived the sharp criticisms against it[3/] and appears to be particularly relevant for the analysis of the patterns of comparative advantages and disadvantages of a natural resource scarce country such as Belgium. Vanek's method was used to estimate the direct and cumulative natural resource product requirements for 61 Belgian industrial sectors corresponding to the 1965 Belgian input/

1/ These countries were: the United States, Great Britain, Sweden, Denmark, Norway, Australia, Canada, Spain, Greece, South Korea, Turkey, Egypt, Singapore and Chile.

2/ J. Vanek, "The Natural Resource Content of Foreign Trade, 1870-1955, and the Relative Abundance of Natural Resources in the United States", Review of Economics and Statistics, May 1959.

3/ W.P. Travis, The Theory of Trade and Protection, Cambridge, Mass., 1964.

GRAPH 1



A COMPARISON OF FACTOR-INTENSITY RANKINGS BETWEEN BELGIUM AND SINGAPORE

351/54	Industrial Chemicals/Petroleum, Coal Products
314	Tobacco
371	Iron and Steel
313	Beverages
372	Non-ferrous Metals
383	Electrical Machinery
311/12	Food Products
355	Rubber Products
381	Metal Products
362	Glass and Glass Products
384	Transport Equipment
342	Printing and Publishing
356	Plastic Products n.e.c.
382/85	Machinery n.e.c./Professional Goods
331/32	Wood Products/Furniture and Fixtures
361/69	Pottery, China, etc./Non-metal Products n.e.c.
341	Paper and Paper Products
390	Other Industries
323/24	Leather and Leather Products/Footwear
321	Textiles
322	Wearing Apparel

Source: Vandoorne, M., Additional Evidence on the Occurence of Factor-Intensity Reversals - A Multi-country Approach, (mimeo), Centre for Development Studies, Antwerp, 1979.

output classification.[1] The results for the products included in the present study are given in column 3 of Table 2.

Each product is, of course, produced with a number of inputs according to an input-structure which is approximated by the input/output tables. Some of these inputs are natural resource products,[2] while others are not. Each one of these inputs, in turn, requires a certain amount of natural resource products and non-natural resource products as inputs. As a result, the tot or cumulative natural resource product requirements[3] often tu out to be m h higher than the direct natural resource product requirement, especially for those products at higher levels of processing. For these reasons, the cumulative natural resource product requirements is the more appropriate variable for the present analysis.

1/ P.K.M. Tharakan, J.A. Busschaert, W.M. Schoofs, and A. Vaes, Measurements of Factor-Intensities and Natural Resource Content (mimeographed), Centre for Development Studies, Antwerp, 1976.

2/ Specified here to contain:
- (01) Agricultural, wood and forest products;
- (02) Fishing products;
- (14) Coal;
- (16) Crude petroleum and natural gas;
- (33) Iron ore;
- (34) Ores of non-ferrous metals;
- (35) Non-metallic minerals.

The figures in the brackets refer to the Belgian (1965) input/output classifications.

3/ The total natural resource product requirement was calculated as follows: the structure of the input/output table is defined as

$$(I - A)\,x = f$$

where: $I - A$ = the identity matrix minus the matrix of direct co-efficients;

x = vector of total output;

f = vector of final demand.

The same structure can be also represented as

$$(I - A)^{-1} f = x$$

where: $(I-A)^{-1}$ = the inverse of $(I - A)$ or the matrix of the direct and indirect co-efficients.

Matrix $(I - A)^{-1}$ consists of elements b_{ik} which indicate the input of good i which is required to produce a unit of final demand of good k. We are interested here only in the additional amount of natural resource products i^* (sectors 01, 02, 14, 16, 33, 34 and 35) that are required to produce one unit of k.

Hence the total natural resource product requirement for each of the products k can be estimated as

$$(TNRPR_k) = \sum_{i^*} b_{i^*k}$$

Revealed Comparative Advantage

The pattern of comparative advantage of Belgium vis-à-vis the developing countries was quantified by calculating a simple, modified version of Belgium's "revealed" comparative advantage.[1/] The index of "revealed" comparative advantage popularized by Balassa[2/] has, however, its shortcomings. Among these shortcomings the most important ones are the implicit assumptions of uniformity of tastes and uniform incidence of duties on internationally-traded products. In spite of these limitations, this index remains one of the best available measures for quantifying the patterns of comparative advantages among countries. For a sample of products, the 1970 measures of "revealed" comparative advantage for Belgium, vis-à-vis the developing countries, are given in column 4 of Table 2. As will be explained in the following section, "distortions" were minimal in that year and hence these figures probably approximate rather well the underlying pattern of revealed comparative advantage of Belgian industry vis-à-vis the Third World.

Having thus quantified the variables which the current state of the theory shows to have positive resource allocation implications, the variables were then empirically tested for their relevance in explaining the "revealed comparative advantage" of Belgium vis-à-vis the developing countries. The results are given in Table 3. The data used in this cross-section regression for all the variables, except total natural resource product requirements, pertain to the year 1970.[3/] 1970 (or 1965 for that matter) was a relatively normal year, in the sense that no major economic convulsions took place during that period. As well, the Generalized System of Preferences was not yet in effect and hence

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1/ The indices used in the estimation of the comparative advantages in the present study can be defined as follows:

$$\frac{X_{BjDC}}{M_{BjDC}}$$

where: X_{BjDC} represents the value of the exports of Belgium of product j to the developing world in a given year; and

M_{BjDC} represents the value of the imports of Belgium of product j from the developing world for the same year.

2/ B. Balassa, "Trade Liberalisation and 'Revealed Comparative Advantage' ", The Manchester School, vol. XXXIII no. 2, pp. 99-123.

3/ For the total natural resource product requirements variable, the data pertaining to 1965 had to be used, as the Belgian input/output table for 1970 was far too aggregated for our purposes.

whatever distortions in the trade flows caused by the trade restrictions would have been mostly mutual. The regression model used in the test was a variation of the Fels-Wolter model.1/

In the first regression, non-wage value added per worker and total natural resource product requirement were used as explanatory variables for determining the revealed comparative advantage of Belgium. Both independent variables yielded the theoretically appropriate signs and acceptable levels of significance, although the natural resource product requirement variable is clearly far more important. In the second regression, where total value added per worker was used instead of non-wage value added per worker, the results are quite similar, although the total value added variable performed slightly less significantly

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1/ $$\frac{X_{BjDC}}{M_{BjDC}} = f(K_{jB}, NRC_{jB})$$

where:

X_{BjDC} = the Belgian exports of product j to the developing countries;

M_{BjDC} = the Belgian imports of product j from the developing countries;

K_{jB} = capital-intensity of the process of production of j in Belgium represented, alternatively, by the value added per man and non-wage value added per man as explained below;

NRC_{jB} = the total natural resource products required in the production of product j in Belgium.

(For the original model, see: G. Fels, "The Choice of Industry Mix in the Division of Labour between Developed and Developing Countries", Weltwirtschaftliches Archiv, Band 108, Heft 1, 1972, pp. 71-121; F. Wolter, "Factor Proportions, Technology and West German Industry's International Trade Patterns", Weltwirtschaftliches Archiv, Band 113, Heft 2, 1977, pp. 250-267.)

Assuming a simple linear relationship between the variables, the regression equation was written as follows:

$$\left(\frac{X_{BjDC}}{M_{BjDC}}\right) = \beta_0 + \beta_1 K_{jB} + \beta_2 NRC_{jB} + \varepsilon$$

where: $\left(\frac{X_{BjDC}}{M_{BjDC}}\right)$, K_{jB} and NRC_{jB} have the same meaning as explained above, β_0, β_1 and β_2 are the parameters to be estimated and ε refers to the error term.

Table 3. Regression results[a]

Number	Constant	K_{jB} (Total value added per worker)	K_{jB} (Non-wage value added per worker)	NRC_{jB} (Total natural resource product requirement)	R^2
1	16.305 (1.8)		0.637 (1.35)	-1.852 (-3.9)	0.34
2	15.44 (1.35)	0.695 (1.02)		-1.888 (-3.98)	0.32
3	-14.94 (- 1.47)	1.218 (1.53)			0.036

a/ Figures in brackets are t values.

than the non-wage value added variable. Given the high rank correlation between these two variables, the similarity of performance of the two equations is to be expected. Finally, when total value added per worker was used alone as an independent variable, only a small part of the pattern of Belgium's revealed comparative advantage vis-à-vis the developing countries could be explained.[1]

Graph 2 shows the relationship between total value added per person and total natural resource requirements for 48 Belgian industries, out of which 38 were included in the sample used in the regression analysis. The normative implications of these variables, their verified relevance in explaining Belgium's revealed comparative advantage vis-à-vis the developing countries and the non-linearity of their relationship make them ideal tools for making a tentative identification of the sectors in which Belgium would have comparative advantages and disadvantages vis-à-vis the developing countries.

Table 4 shows the classification of the industries plotted in Graph 2 into four different categories. Type I consists of industries with high cumulative

1/ The results are not distorted by the presence of multicollinearity as can be seen from the simple correlation co-efficients which were as follows:

$$K_{jB} \text{ (non-wage value added)} \leftrightarrow NRC_{jB} = -0.204$$

$$K_{jB} \text{ (total value added)} \longleftrightarrow NRD_{jB} = -0.193.$$

GRAPH 2

SCATTER DIAGRAM OF TOTAL VALUE ADDED PER PERSON AND CUMULATIVE NATURAL RESOURCE REQUIREMENTS OF BELGIAN INDUSTRIES

The industries plotted in the scatter can be identified by refering to their numbers in Table 2. (The Variables). The vertical line indicates the simple arithmetic mean of the cumulative natural resource requirements and the horizontal line the total value added per person, for the industries included in the sample.

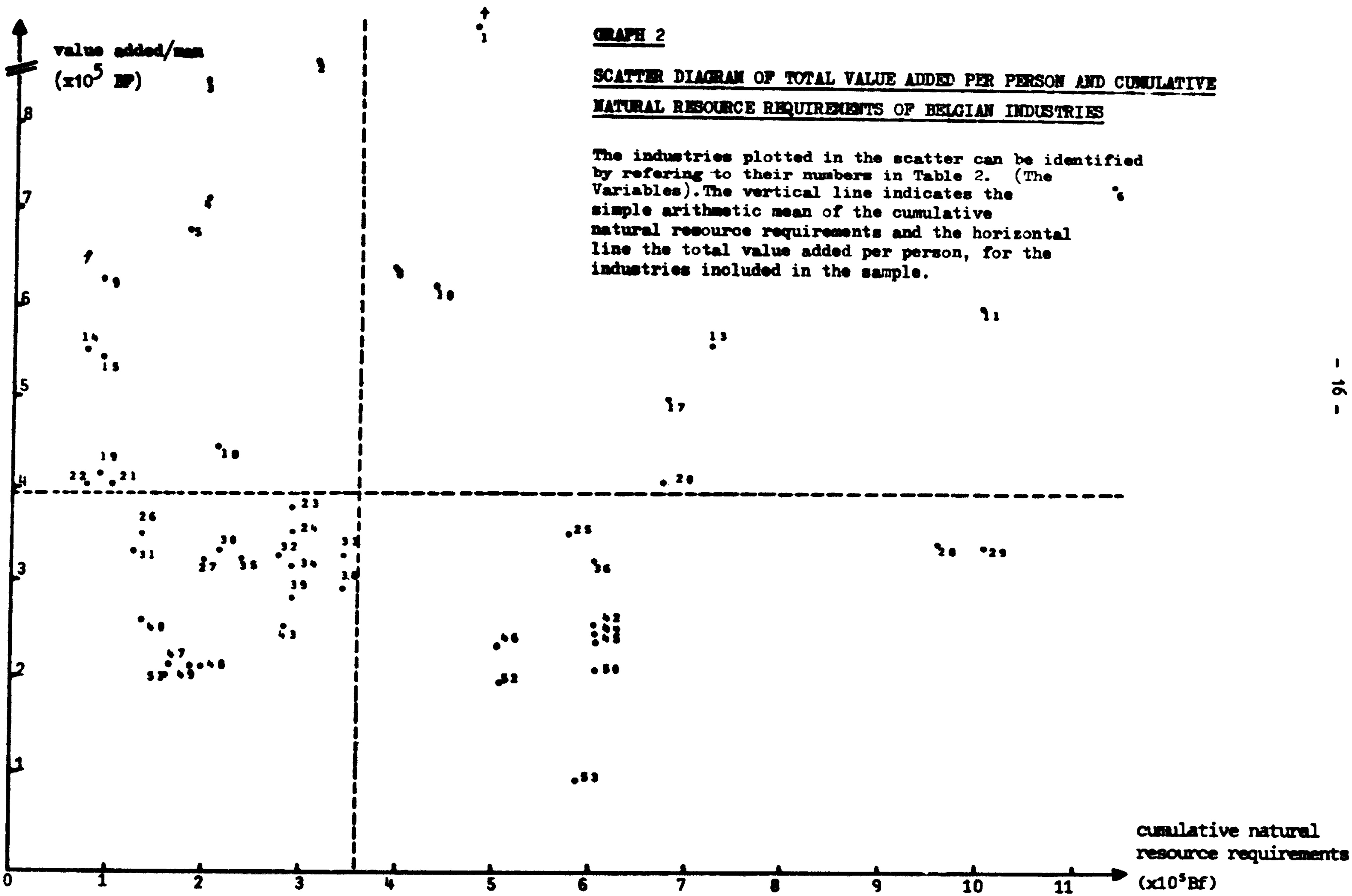

Table 4. The structure of comparative advantage of Belgian industries - a tentative classification

Type I[a]	Type II[b]	Type III[c]	Type IV[d]
Leather tanning	Weaving	Petroleum refineries	Non-ferrous metals
Meat preparations	Wadding	Agglomerates of coal (*)	Breweries (*)
Dairy products (HS,*)[e]	Clay products (R, HS)	Iron and steel	Other beverages
Wool spinning (HS,*)	Alcohol (*)	Chocolate (LS, *)	Chemicals
Cotton spinning	Agglomerates of cement	Quarries	Newspaper printing
Combing of wool	Manufactures of paper and cardboard (*)	Oil and fats (*)	Pharmaceuticals
Jute spinning	Tobacco (LS)	Cokes(*)	Printing and binding of books
Canned vegetables	Wood sawing (LS)	Sugar (HS)	Soap, perfumes, etc.
Washing and carbonizing of wool	Wastage of textiles (LS)		Paper and cardboard (R)
Canned fish	Manufactures of wood (R)		Glass (HS)
Grain milling	Baskets, etc. (*)		Rubber
	Felt		Plastics (R)
	Ceramics		
	Hosiery		
	Fur		
	Footwear		
	Clothing		

a/ Type I = Industries with high, cumulative natural resource produce requirements and low total value added per person.

b/ Type II = Industries with low, cumulative natural resource product requirements and low total value added per person.

c/ Type III = Industries with high, cumulative natural resource product requirements and high total value added per person.

d/ Type IV = Industries with low, cumulative natural resource product requirements and high total value added per person.

e/ Abbreviations used: (*) indicates that the product concerned was not included in the regressions;
R indicates a strong possibility of factor-intensity reversals;
HS indicates high skill content; LS indicates low skill content.

natural resource product requirements and high total value added per person. In between these two classifications, Type II consists of industries with low, cumulative natural resource product requirements and low total value added per person, while Type III shows industries with high, cumulative natural resource product requirements and high total value added per person. Note that the vertical and horizontal lines in the graph which indicate the demarcation between these four categories represent the simple arithmetic mean of the samples (consisting of 48 industries) pertaining to the two variables (K_{jB} and NRC_{jB}). Further, the few industries in which factor-intensity reversals between Belgium and developing countries appear to be possible and the most striking examples of higher than average and lower than average human capital-intensity are indicated in Table 4.

In general, and subject to the qualifications which will be mentioned below, the industries included in the Type I category are the ones in which Belgium has clear disadvantages vis-à-vis the developing countries. It is quite possible that, given the nature of existing protection, some Belgian firms might still be doing well. But clearly a large number of firms within these industries will be subject to redeployment pressures. It should be noted that two of the industries in this category, namely dairy products and the spinning of wool, have, in Belgium, high human skill content.

The industries listed under the Type IV classification, are in general those for which Belgium has comparative advantage vis-à-vis the developing countries. But, of course, this does not guarantee that all Belgian industries in this category will perform well, especially in cases where they have to face competition from other high income countries. It should also be noted that in the case of plastics, factor-intensity reversals seem to take place and hence redeployment pressures are indeterminate. It is also possible that in some of the branches of the sectors listed under Type IV, the capital-intensity might be rather low and the natural resource product requirements somewhat high. The analysis of the aggregated and disaggregated measures of capital stock casts some doubts on the reliability of the high value added figures obtained for paper and paperboard and to a lesser extent for printing of newspapers and printing of books.

The industries classified under Type II and Type III present a more qualified picture. Type II contains a large number of industries for which Belgium has comparative disadvantages with respect to the developing countries, although in some cases, this may be partially compensated for by the low natural resource product requirement. In the case of clay products and manufactures of wood, possible factor-intensity reversals might neutralize the Belgian disadvantage. In addition, the clay products industry in Belgium has a rather high skill content. Note also that woodsawing, wastage of textiles and tobacco all have relatively low skill-intensity ranking and might thus be doubly vulnerable to competition from the developing countries.

In the case of the industries classified under Type III, their high capital intensity represents an advantage for Belgium vis-à-vis the developing countries. But some of the industries listed here could run into difficulties because of their high natural resource requirements.1/ Note also that the chocolate industry in Belgium has a relatively low ranking according to the skill content.

1/ Also note that four of the industries included in this classification could not be taken into account in the regression sample.

II. FORECASTING STRUCTURAL CHANGES: THE STATISTICAL ANALYSIS

The projections of the kind envisaged in this study can be carried out using an aggregated or a disaggregated approach. These alternative methods can be illustrated as follows. As a small and relatively open economy, a substantial part of the Belgian GNP is accounted for by its international trade. Since almost all sectors export a significant share of their output, the future trends of production in these sectors are determined not only by the demand generated within the Belgian frontiers, but also among her major trading partners. An aggregated approach which could be used to deal with the 48 sectors classified in the previous section would involve the building of an econometric model that would "explain" the total output of these sectors as a function of relevant variables. If the empirical results obtained confirm the hypothesis which indicated the choice of the variables and if the relationship observed during the base period could be expected to hold true until the target year, the projection of the total output could be carried out by independently determining the values of the independent variables for the year concerned. The results thus arrived at could be subsequently disaggregated on the basis of the commodity composition co-efficients which, in turn, will have to be projected on the basis of variables which explain their behaviour.

Let us assume that on the basis of economic reasoning and factual analysis, we can formulate the hypothesis that accumulated Belgian output (1960-1975) by all sectors studied is a function of world income and the relation between Belgian and world prices.[1/]

1/
$$\sum_{oi_B = 1}^{48} OT_B^{60-75} = f\left(Y_w, \frac{P_B}{P_w}\right)^{60-75}$$

where:
- oi_B = output of each sector taken into consideration;
- OT_B = the total Belgian output analyzed in the present exercise;
- Y_w = world income;
- P_B = an index of Belgian prices;
- P_w = an index of world prices.

Assuming a particular functional form, we can test this hypothesis through a regression analysis. The empirical results thus obtained would indicate the validity or non-validity of our hypothesis. If the variables are confirmed statistically to be explanatory, the co-efficients obtained could be used to estimate the level of imports for the target year (1985) by determining, independently, the world income level and the Belgian price/world prices ratio for that year, implicitly assuming that the relationships observed would hold over the period of projections.

The nature of the aggregation defined in the first equation implies that its disaggregation into each of the sectors would involve the use of commodity composition co-efficients, which indicate each sector's share in the accumulated output of the sectors studied.1/

The disaggregation of the projected total output would require determining the values of these co-efficients for the target years. If a detailed examination of their behaviour during the base period indicates that their future trends would follow the pattern they showed during the period of observation, their values for the target years could be determined as a function of time. Failing this, suitable assumptions will have to be made to choose likely commodity composition co-efficients. Once the commodity composition co-efficients for the target year are thus determined, the disaggregation of projected total output into sectoral output can be derived.2/

At this point it is worth considering briefly the merits and the shortcomings of such an approach in the context of our objectives. This aggregated method is relatively easy to handle and it gives the different parts of the whole exercise a mutual consistency, but it is inflexible. Though the important variables explaining the performance of different sectors are likely to be similar in most cases, their influence is often modified in different degrees and ways for particular industries. These special problems concerning particular sectors are important and must be taken into account in policy considerations. But the quantification of these diverse influences within the aggregated model framework would be difficult and, when tried, tends to make the model unwieldy.

1/ $$Ci_B^{1 \ldots 48} = \left(\frac{oi_B^{1 \ldots 48}}{\sum_{i_B = 1}^{48} OT_B} \right)$$

2/ $$(oi_B^{1 \ldots 48})^{85} = (Ci_B^{1 \ldots 48})^{85} \times \sum_{i=1}^{48} OT_B^{80}$$

These considerations have led us to choose a more disaggregated approach for our projections. Such a method is similar to the aggregated approach in so far as it seeks to verify functional relationships between the output of the Belgian industries and relevant explanatory variables and then uses such relationships, where verified, to project the future levels of the dependent variables. But it is distinct from the aggregated method in so far as it treats the sectors separately and does not seek to establish mutual consistency of the different projections as a whole.

The adoption of such a disaggregated approach implied the following steps: First of all, the sectors already classified into four categories were retained for the projection exercise. Second, short case studies were compiled on each of the sectors covered. These case studies took into account the general structure of the industry concerned, particularly the trends in output, the share of international trade, the destination of the exports, trends in employment, output per worker, etc. Then separate regression equations were formulated for the quantitative assessment of the prospects of the sectors concerned.

In selecting the particular functional forms for the equations the following three important questions were oonsidered: First, are there any theoretical reasons which indicate the probability of a particular form of relationship between the dependent and the independent variables? Secondly, has the relationship conformed to this pattern during the period under observation? Thirdly, are there theoretical or factual reasons which indicate the probable prevalence of a particular form of functional relationship between the variables during the projection period?

In the case of a certain number of industries of Type I, it was seen from Graph 2 that the relationship between the variables during the sample period showed a certain stagnation and decline, thus suggesting the prevalence of a semi-logarithmic functional form. Exceptions were mainly the heavily protected sectors in which case a simple linear form was relied upon. In the case of the Type IV industries, most of which showed a clear upward trend, a simple linear or double logarithmic functional form was retained. In the case of industries classified under Types II and III where the theoretical indications of likely trends were more ambiguous, Graph 2 was relied upon mainly to indicate the suitable functional form.

The choice of the time period used in the regressions was determined mainly by the availability of comparable data for the variables concerned. Generally, it covers the period from 1960 to 1974. The regression results obtained were used for projections for the year 1985. As is implied in all similar estimates, these forecasts refer to the period centering around the stated target year rather than to the exact year itself.

The dependent variable, which was in practically all cases the output of the industry concerned, was introduced in constant values. The most important explanatory variables used in the regressions were the following:

(i) Real GDP of the EOCD or EC countries;

(ii) Real GDP per capita of the OECD or EC countries;

(iii) Population;

(iv) Unit price (domestic or export) of the Belgian industry concerned relative to that of its main competitors;

(v) Wages per worker in the Belgian industry concerned, relative to wages per worker in the same industry in the main competing country or countries;

(vi) Time trends;

(vii) Dummy variables.

The main independent variable used in the regressions is the total or per capita gross domestic product of the groups of countries to which Belgium supplies most of its output. The groups of such countries vary somewhat between sectors.

The population variable enters the estimate in two ways. First, in the case where per capita consumption has reached the saturation point, further increases are linked directly to the growth of the population. This has been the case for tobacco, where the total consumption seems to show practically no income elasticity. The second impact of the population variable is indirect and is taken account of through the per capita income variable.

The price and wages variables are the main cost variables used in the regressions. The procedure used was as follows: Initially, preference was given to relative unit price variables since, as a comprehensive cost variable, it is more appropriate in the time series analysis. Considerable discussions have taken place about the actual magnitudes of price elasticities where international trade is involved, and the strength and weaknesses of the methods of measurement are well known. Criticism has been particularly directed against the estimation of relative price elasticities by the use of ordinary least-squares approach. The arguments listed by Orcutt[1/] against the use of least-

1/ G.H. Orcutt, "Measurement of Price Elasticities in International Trade", Review of Economics and Statistics, May 1950, pp. 117-132.

squares regression analysis of time series, which he believes would lead to unreliable and biased estimates of price elasticities, seem to have impressed certain specialists[1] more than others.[2] The present trend appears to favour, or at least accept, the use of least-squares method in estimating the elasticities, if consciousness of the bias that could be introduced is maintained.

In cases where the use of the price variable yielded no meaningful result at all, an attempt was made to use the wages per worker of Belgium relative to the wages per worker of Belgium's foreign competitors.

Finally, it should be noted that in the few cases where the role of the trend component appeared to be considerable, time was introduced as an explicit variable in the equation.[3] In one case where an "unexplicable" sharp decline in production was noticed for two years in the series, followed by an equally sharp recovery, a dummy variable was used.

The central notion underlying the use of the income variable in the projections is the marginal propensity to consume. The concept of the marginal propensity to consume deals with the extra unit of consumption generated by the extra unit of income. Since total consumption is the outcome of income distribution and consumer preferences, this concept could be valid only if we assume that such preferences are relatively stable and if changes in income affect the distribution of income only according to a stable pattern.[4] How does the sector by sector approach adopted in the present study correspond to this concept? First of all, it should be pointed out that the disaggregation involved here was done

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1/ H. Neisser, "Comment", Review of Economics and Statistics, Supplement 1958, p. 130; and G. Herberler, "Introduction to Problems in International Economics", Review of Economics and Statistics, Supplement 1958, pp. 3-9.

2/ L.R. Klein et.al., An Econometric Model of the United Kingdom, Oxford, 1961, pp. 128-136.

3/ See P. Rao and R.L. Miller, Applied Econometrics, New Delhi, 1972, pp. 99-104, for an interesting discussion on this procedure.

4/ A large (but often peripheral) number of discussions are still being carried out about the soundness, or otherwise, of these assumptions used in macro-economic analysis. Justifications for these assumptions are often found by keeping the notion of "stability of choice" very large, by relying on the "law of large numbers", which is believed to cancel out the vagaries of individual behaviour, and by seeking verification from the empirical studies which tend to be "operative" under the said assumptions (see for example, G. Ackley, Macroeconomic Theory, New York, 1961, pp. 19-23; and H.A.G. Green, Consumer Theory, Harmondsworth, 1971, pp. 21-29). We would here limit ourselves to the observation that these suppositions still appear to be sufficiently weak to justify the continued search for development of alternate approaches such as dealing in aggregates which are largely homogenous in characteristics and by the introduction of additional variables which would more fully explain the consumption function.

in terms of relatively large components (sectors or industries) and not in terms of individual firms. In other words, the question of individual products is not being dealt with here. Thus disaggregation at the level of the industry mitigates somewhat the weaknesses of the assumption of relative lack of change in consumers' attitudes. While total consumption is the net result of a variety of decisions which in turn are a result of income distribution and consumer preferences towards a large assortment of products differentiated according to income groups (necessities, luxuries, etc.), such preferences towards a particular groups of products (output of an industry) should be relatively more stable than preferences towards individual products.

As indicated by the use of the price as an independent variable, the effect of income on demand is modified by that of prices. The upward or downward movement of the price of a commodity could have an "income effect" or a "substitution effect". Thus the price reduction of a particular commodity would lead to an increase in the real income and possibly to increased demand. Similarly, the lowering of the price of the commodity relative to the other commodities would lead to its being substituted for the purchase of other goods. Inversely, the increase in price of the good concerned would decrease real income and consequently increase the demand for substitutable goods.

The use of relative wages as an independent variable does not imply that the wage component is necessarily the determining competitive element. But even in the case of relatively capital-intensive industries, if the competition turns out to be largely between highly capital-endowed countries (as it is in the present case), the wage differentials can make an important difference, particularly where given products in the sector are homogeneous.

In the remaining pages of this Section, each of the four types of industries will be analyzed separately. In each of the four cases three tables are presented:

(i) A general overview giving the output level, the level of employment, the output per worker, and the export share of total output;1/

(ii) Values of variables used in the regression equations;

(iii) Determination co-efficients and Durbin Watson ratios.

1/ The first year of observation is normally 1960, but in some cases, due to lack of statistical data, it concerns another year; in these particular cases, the actual year of observation will be mentioned between brackets.

Type I industries (high cumulative natural resource product requirements, low total value added per person)

All Type I industries show a more or less declining level of output, with the remarkable exception of canned vegetables, and, to a lesser extent, of canned fish, a sector with an increasing degree of activity (Table 5).

Table 5. Type I industries: Overview

Sector	Output in 1974 (1960=100)	Employment in 1974 (1960=100)	Output/worker in 1974 (1960=100)	Export share in 1960 (Percentage)	Export share in 1974 (Percentage)
Leather tanning	106.52	81.09	131.36	40	72
Cotton spinning	52.35	52.14	100.40	20	26
Combing of wool	23.39	36.65	63.81	26	35
Jute spinning	47.28	57.90	81.66	27	42
Washing and carbonizing of wool	75.85	42.76	177.37	(No information)	
Canned fish	165.98	84.51	196.40	18	38
Wool spinning	71.17	87.48	81.35	28	52
Canned vegetables	335.13	150.02	223.39	46	54

All sectors have shown a decreasing trend in their employment level. This is partly due to improving productivity, and partly due to the lower level of output. Only leather tanning, washing and carbonizing of wool and canned fish show an increasing level of productivity. Particularly striking is the case of canned vegetables; the substantial increase on the demand side could not be compensated for by the impressive productivity jump. The result was a steep increase in employment, which seems to be an exceptional evolution for a Type I industry.

Table 6 gives the values for the regression equations for all Type I industries except jute, a special case which will be discussed separately. In all cases, except leather tanning (where the curve-like shape of the output diagram and the stagnating output level justify a semi-logarithmic regression analysis), linear regressions were used. Recognizing the specific market orientation of different sectors, the GDP for the European Community was computed for leather tanning, the only Type I sector which is clearly export-oriented, and

Table 6. Type I industries: Values for regression equations

Output	Constant	GDP variable	Price variable	Trend	Dummy
Leather tanning	+ 60.525	+ 26.695 log GDP_{EC}	- 16.178 log unit price		
	(0.44)	(2.24)	(0.59)		
Cotton spinning	-510.824	+ 1.957 GDP_{B}	- 0.286 $\frac{\text{X price B}}{\text{OESO}}$	+ 5.043	
	(- 6.57)	(6.95)	(- 1.95)	(9.36)	
Combing of wool	+ 84.057		- 0.855 $\frac{\text{X price B}}{\text{EC}}$	+ 0.988t	-20.67
	(3.24)		(- 3.009)	(18.71)	(- 4.84)
Washing and carbonising of wool	+115.050			- 1.872	
	(22.44)			(- 3.32)	
Canned fish	+ 80.057	+ 0.564 $\frac{GDP_{EC}}{\text{capita}}$	- 0.331 $\frac{\text{X price B}}{\text{Netherlands}}$		
	(1.72)	(2.603)	(- 1.93)		
Wool spinning	-1,641,53	+ 3.237 GDP_{EC}	- 0.314 $\frac{\text{X price B}}{\text{EC}}$	+17.950	
	(- 2.56)	(2.71)	(- 0.47)	(3.06)	
Canned vegetables	-576.74	+ 8.197 $\frac{GDP_{EC}}{\text{capita}}$		- 1.707	
	(- 3.07)	(3.09)		(- 1.94)	

for canned fish and canned vegetables the per capita European Community GDP was computed since both are private consumption goods. Because cotton spinning shows a clear and steady domestic market orientation, the Belgian GDP was used. The two woolworking sectors, washing and carbonizing of wool, and combing of wool, both show (the former more than the latter) a very irregular pattern. In the three cases where the GDP variable was used, it was clearly a significant explanatory variable. In all cases, except washing and carbonizing of wool and canned vegetables, the second explanatory variable was the relative prices. This variable attempted to compare the domestic price level with the price level of Belgium's most important competitor (s).

When competition was clearly from one single country, as in the case of canned fish, the Belgian export price was used in relation to the export price of the country in question, in this case the Netherlands. If competition was from more than one country, the price variable was defined as the Belgian export price divided by the average export price of the competing countries in question. These countries were mainly the Netherlands, the Federal Republic of Germany and France. Where competition could be defined to a great extent in terms of the other European Community member countries, the European Community export price was used as a component of the variable. Finally, in those cases where, in addition to the usual European Community competitors, there seems to be still another serious competitor (usually the United States or Canada), the OECD export price was used in the price variable. Except for leather tanning and wool spinning, the price variable gives the theoretically correct sign and a statistically significant result.

With the exception of leather tanning and canned fish, a time trend has been included in all cases. For washing and carbonizing of wool it was the only valuable explanation of the output level that could be found. In the case of combingof wool, a dummy variable has been introduced to neutralize the exceptionally low output level during the years 1971 and 1972.

Table 7 shows that the co-efficient of determination is high in the case of cotton spinning and combing of wool, and low for leather tanning and for washing and carbonizing of wool. The Durbin Watson ratio seems to be completely in the clear in the case of combing of wool. In the other cases, some auto-correlation could be suspected. But for projection purposes, the problem is not a very serious one.

Table 7. Type I industries

Sector	Determination co-efficient	Durbin Watson ratio
Leather tanning	0.193	1.619
Cotton spinning	0.953	1.862
Combing of wool	0.975	2.663
Washing and carbonizing of wool	0.417	1.239
Canned fish	0.743	1.632
Wool Spinning	0.667	1.962
Canned vegetables	0.912	1.438

The jute sector analysis relies upon a previous study which attempted to estimate total world demand for jute products and its Belgian share for 1980.[1/] In this regression analysis the dependent variable, the world output of jute yarns, is explained firstly by world GDP, representing demand by all sectors which consume jute. Secondly, two price variables are introduced, the first representing the world price for jute yarn, for which the British (Dundee) jute yarn price relative to the British GNP deflator was used as a proxy. After the South Asian countries, the British jute industry is the most important in the world; along with the Belgian industry it plays an important role on the jute yarn export market. For the second price variable, the deflated United States price of polypropylene polymer has been used as a proxy, since this synthetic fibre is the main competitor for jute in the manufacture of sacks and carpet backings.

1/ See P.K.M. Tharakan and W.M. Schoofs, "World Demand for Jute Products and the Share of the Belgian Industry", Working Paper 76/16, Centre for Development Studies, Antwerp, 1976 (mimeographed). The equation used runs as follows:

$$O_{wjy} = \underset{(0.97)}{119.64} + \underset{(0.96)}{2.61}\, GDP_w - \underset{(-1.43)}{0.258}\, P_{wjy} - \underset{(-2.28)}{1.208}\, P_{wpp} - \underset{(-1.22)}{25.657}\, t$$

$$R^2 = 0.69$$

$$DW = 2.39$$

where:

O_{wjy} = world output of jute yarns;

GDP_w = world GDP;

P_{wjy} = world price of jute yarn;

P_{wpp} = world output of polypropylene polymer;

t = time.

The lack of adequate statistical data led to the use of polymer prices (the raw material used in the production of polypropylene) instead of the actual prices of polypropylene yarns, which would have probably been a better index. Given the fact that one price variable covers the end product and the other the principal raw material of its substitute, it was decided to introduce the variables separately, rather than in the more commonly used relative form.

The results obtained are based upon a fifteen-year observation period (1959 - 1973; in 1959, commercial production of polypropylene began) and seem acceptable, except perhaps the negative sign of the polypropylene price variable. Various explanations for this can be postulated. Has the decrease of polypropylene prices brought about such an increase in the demand for end products (carpets, sacks, etc.) that the demand for jute yarns used in the same products was favourably affected? Such complementary relationships between substitutes are not uncommon. Or could it be that the decline of the polymer prices did not follow the same pattern as the prices of polypropylene yarns (because of the absorption of the margin of benefits), thus distorting the nature of the correlation?

As a second step, the study postulated a functional relationship [1/] in order to define the Belgian share in the world demand for jute. This share is determined,first of all, by the tariff preference enjoyed by the Belgian jute yarn exports in its main export markets, the European Community countries (90 per cent of the total export amount). The rate of this preference is equal to the difference between the common external tariff and the tariff imposed on the Belgian jute products coming into these European Community countries. This variable plays an important role in estimating the impact of trade liberalization in jute yarns which took place on 1 January 1978. It is furthermore determined by the output of jute yarn industries in the South Asian countries, the main competitors of Belgium, and price (normalized by the GNP deflator) and time variables.

1/

$$\frac{B_{jy}}{O_{wjy}} = \underset{(5.12)}{208.983} + \underset{(1.78)}{0.16\,P_{ec}} - \underset{(-2.42)}{0.827\,S_{DC}} - \underset{(-1.48)}{0.281\,P_{bjy}} - \underset{(-2.58)}{3.531\,t}$$

$R^2 = 0.60$

DW = 2.19

where: P_{ec} = Belgian jute exports tariff preference in the EC;
S_{DC} = supply by South Asian producers;
P_{bjy} = Belgian jute yarn price;
t = time.

Type II industries (low cumulative natural resource product requirements, low total value added per person)

Table 8 shows that Type II industries have a totally different pattern from Type I industries. Here only felt, fur and footwear have shown a decreasing level of output.

Table 8. Type II industries: Overview

Sector	Output in 1974 (1960=100)	Employment in 1974 (1960=100)	Output/worker in 1974 (1960=100)	Export share in 1960 (Percentage)	Export share in 1974 (Percentage)
Weaving	158.37	82.34	192.35	55	72
Clay	136.99	55.72	245.84	3	3
Alcohol	202.47	76.57	264.42	8	47
Cement	207.91	124.45	167.06	26	22
Paper and cardboard	271.79	136.44	199.20	12	34
Tobacco	152.56	99.95	152.64	13	28
Woodworking and sawing	144.01	91.25	157.82	24	41
Manufactures of wood	360.30	172.71	208.62	13	38
Felt	89.56	55.17	162.33	44	62
Ceramics	121.88	69.79	174.64	21	42
Fur	28.67	30.82	93.02	91	77
Footwear	59.12	32.05	184.46	13	20
Clothing	186.69	150.62	123.95	14	42
Wadding	351.06	127.56	275.21	31	65
Wastage of textiles	195.32	125.34	155.83	64	77

On the other hand, it is manufactures of wood together with the relatively small wadding sector which seem to be the most dynamic. In spite of the generally increasing output trend, only cement industries, manufactures of paper and cardboard, manufactures of wood and clothing and wadding and wastage of textiles have increased (up to 1974) their employment. The productivity values in the last year of observation are generally much higher than those for Type I industries. Only fur has shown a decrease in productivity during the fifteen-year period examined.

In table 9 linear regression analysis has been used for all sectors except manufactures of paper and cardboard, where the strongly growing output level justifies a double logarithmic formulation, and felt, where a semi-logarithmic regression equation was used because of the stagnating output pattern. (The footwear branch will be discussed separately).

A GDP variable has been used in all cases, except for tobacco. For tobacco the Benelux population figure was used as the explanatory variable since - in terms of per capita income - a saturation point seems to have been reached already. For three sectors the Belgian GDP was chosen because of the domestic market orientation of the outlets. In all other cases the European Community GDP has been used except for ceramics and for wastage of textiles where OECD GDP has been selected, because a considerable share of the total export amount goes to OECD countries which are not European Community members.

Because alcohol is mainly a private consumption good, per capita European Community GDP was selected for this sector. All sectors show theoretically correct signs and the t-values indicate a significant relation, except in the case of fur, alcohol, clay and felt.

Following the procedure discussed above, a price variable has been constructed and has been introduced for the following sectors: clay, alcohol, cement, paper and cardboard, manufactures of wood, fur and wastage of textiles. In all these cases the parameters showed theoretically expected signs, but only fur showed a significant result. For all other sectors, i.e. tobacco, ceramics, clothing and wadding, a wages variable was set up; this variable compares the wage level in Belgium with the corresponding wage level (or average wage level) of Belgium's greatest competitor(s) in the particular branch. Such a comparison is by itself significant for labour-intensive sectors, the link is somewhat less obvious. But in these cases, too, if the products happen to be of a standardized nature, the relative wages seem to be playing a marginally decisive role. The wages variable gives the theoretically correct sign in the three cases but, except for clothing, it does not seem to be a very significant explanation for the evolution of output. For weaving, where it gives a very significant result, and for clay, tobacco, woodworking and sawing, fur and felt, where the significance is less, a trend was introduced.

For the footwear sector, a different equation was defined.[1/] This equation explains the market share of the Belgian footwear industry in the European Community countries by means of Belgium's competitive position vis-à-vis the

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1/ see page 34.

Table 9. Type II industries: Values for regression equations

Output	Constant	GDP-Variable	Price Variable	Wages Variable	Trend	Benelux Population
Weaving	+ 11.017 (0.96)	+ 0.126 GDP_{EC} (2.35)			+ 0.768 (5.98	
Clay	2157.54 (1.408)	+ 2.0.26 GDP_{B} (1.55)	− 0.237 $\frac{X\ price\ B}{FR/UK/BRD}$ (−0.27)		− 18.89 (−1.39)	
Alcohol	220.003 (1.33)	+ 0.3613 $\frac{GDP_{EEC}}{capita}$ (0.64)	− 1.75 $\frac{X\ price\ B}{EEC}$ (−1.525)			
Cement	18.33 (0.57)	+ 1.039 GDP_{B} (11.97)	− 0.177 $\frac{X\ price\ B}{EEC}$ (−0.702)			
Log. output manufactures of paper and cardboard	− 1.571 (−3.36)	+ 1.357 log GDP_{B} (24.88)	− 0.0183 log $\frac{X\ price\ B}{Neth.}$ (−0.21)			
Tobacco	− 800.93 (−5.18)			− 0.0541 $\frac{Wages\ B}{Neth.}$ (−0.22)	− 0.312 (−1.20)	+ 9.38 (5.20)
Woodworking and Sawing	− 354.49 (1.95)	+ 2.57 GDP_{EEC} (1.97)			− 5.671 (−1.675)	
Manufactures of Wood	− 138.62 (−4.20)	+ 2.7006 GDP_{EEC} (17.89)	− 0.337 $\frac{X\ price\ B}{FR/NETH/BRD}$ (−0.85)			
Ceramics	+ 89.432 (2.84)	+ 0.179 GDP_{OESO} (3.68)		− 0.000259 $\frac{Wag.\ B}{FR/BRD}$ (−0.0008)		
Fur	− 120.702 (−0.72)	+ 0.633 GDP_{EEC} (0.99)	− 0.0869 $\frac{X\ price\ B}{EEC}$ (−2.26)		+ 1.439 t (1.97)	
Clothing	+ 89.84 (2.38)	+ 0.876 GDP_{EEC} (15.88)		− 0.754 $\frac{Wages\ B}{FR/NETH/BRD}$ (−1.89)		
Felt	− 1913.88 (−1.22)	+ 76.85 log GDP_{EEC} (1.01)			+ 358.121 log t (1.37)	
Wadding	+ 82.624 (0.58)	+ 2.076 GDP_{EEC} (6.51)		− 1.693 $\frac{Wages\ B}{FR/NETH/BRD}$ (−1.57)		
Wastage of Textiles	+ 142.237 (2.35)	+ 1.056 GDP_{OESO} (1.83)	− 0.997 $\frac{X\ price\ B}{BRD}$ (−0.97)			

developing countries, as expressed by a relative price variable, and, secondly, by means of a trend variable. The comparative advantage that the low wage countries enjoy in this labour-intensive sector is an important factor, one that infavourably influences Belgian footwear production. Among the European Community countries, only Italy is performing well in this sector, mainly because of the relatively low wages in that country (still much artisanal home-work) and because of the fashion-oriented and orienting production. Belgium has the steepest production decrease of all EC countries. At present out of each ten pairs of shoes sold in Belgium, nine are imported. This increase in imports, together with the stabilizing market demand for footwear (a product with a rather low income elasticity) together account for the spectacular decline in the Belgian footwear sector.

Table 10 shows a weak determination co-efficient for clay, alcohol, wood-working and sawing, ceramics and wadding; while only clay, tobacco and felt seem to be free from auto-correlation.

Table 10. Type II industries

Sector	Determination co-efficient	Durbin Watson ratio
Weaving	0.921	0.663
Clay	0.365	2.036
Alcohol	0.563	0.556
Cement	0.952	1.195
Manufactures of paper and cardboard	0.972	1.673
Tobacco	0.967	1.988
Woodworking and sawing	0.612	1.021
Manufactures of wood	0.987	0.877
Ceramics	0.447	1.375
Fur	0.950	1.749
Clothing	0.953	1.458
Felt	0.721	1.913
Footwear	0.947	1.829
Wadding	0.864	0.703
Wastage of textiles	0.252	0.793

1/ (footnote from page 34)

$$\frac{\text{European Community}_{\text{consumption}}}{\text{Output}_{\text{Belgium}}} = 36.0021 - 0.822 \frac{\text{X price B}}{\text{X price DC}} + 1.3898\ t \quad \frac{C_{B\,\text{European Community}}}{O_B}$$

$R^2 = 0.947$

$DW = 1.82$

(See M-Chr. Meuwissen, "Protection without Adjustment, A Case Study of the Belgian Footwear Industry", Working paper 78/30, Centre for Development Studies, Antwerp 1978.)

Type III industries (high cumulative natural resource product requirements, high total value added per person)

All type III industries show a steadily increasing output, with the exception of agglomerates of coal (Table 11). Given the large scale conversion of heating systems towards oilfuel consumption during the last decade, the falling activity level in this small sector can easily be understood. The sharply decreasing trends in this sector led to an employment of approximately 50 workers in 1976, compared to 445 in 1960. For this reason, this branch was left out of our analysis.

Table 11. Type III industries: overview

Sector	Output in 1974 (1960=100)	Employment in 1974 (1960=100)	Output/worker in 1974 (1960=100)	Export share in 1960 (Percentage)	1974
Sugar Refineries	114.79	62.83	182.70	15	32
Petroleum Refineries (1962)	237.56	139.35	170.48	42	28
Quarries (1967)	128.83	89.51	143.93	28	31
Iron and Steel	197.25	99.59	224.97	25	37
Agglomerates of Coal	41.28	27.19	151.81	14	6
Oils and Fats	236.21	71.99	328.11	33	44
Cokes (1966)	108.31	105.75	102.22	22	18
Chocolate (1962)	147.65	108.31	136.33	16	32

Sugar refineries are a stagnating sector, sugar being a food product with a low income elasticity. The rather low score for graveries is due to the few years of observation. Nevertheless, only petroleum refineries, chocolate and cokes employed a greater number of people in 1974 than in 1960. The sharp productivity increase in the iron and steel sector has threatened many jobs since 1975, the great crisis year for the Belgian iron and steel sector, when output fell by 30 per cent in one year! Petroleum refineries are also a rather interesting case where, contrary to the general trend, a decrease of the export share occurred during the 15 years of observation. This is explained by the increasing establishment of petro-chemical plants - of which a great part are units of multinational corporations - in Belgium, especially in the port of Antwerp.

Linear regression analysis has been used for all type 3 industries.

Table 12. Type III industries: values for regression equations

OUTPUT	CONSTANT	GDP-VARIABLE	WAGES VARIABLE	PRICE VARIABLE	TREND
SUGAR REFINERIES	+119.58 (2.26)	$+0.4251 \frac{GDP_{EEC}}{capita}$ (4.11)	$-0.674 \frac{Wages\ B}{FR}$ (-1.21)		
PETROLEUM REFINERIES	+174.452 (1.3)	$+3.12\ GDP_{OESO}$ (9.37)	$-4.882 \frac{Wages\ B}{EEC}$ (-2.95)		
QUARRIES	+181.68 (2.87)	$+0.467\ GDP_{OESO}$ (3.63)	$-1.689 \frac{Wages\ B}{NETH}$ (-2.70)		
IRON AND STEEL	+13.655 (0.139)	$+0.940\ GDP_{OESO}$ (EU) (7.54)	$-0.102 \frac{Wages\ B}{BRD/NETH/FR}$ (0.059)		
OILS AND FATS	+661.28 (1.52)	$+0.448\ GDP_{EEC}$ (1.11)	$-6.514 \frac{Wages\ B}{NETH}$ (-1.617)		
COKES	-69.527 (-0.56)			$-0.375 \frac{Price\ Cokes}{Oilfuel}$ (-0.66)	+2.042 (1.19)
CHOCOLATE	+93.965 (33.3)				+3.312 (9.3)

* Only 8 observations

Per capita EC-GDP was used for sugar, a product with a private consumption character. In all other cases EC-GDP (for oils and fats) or OECD-GDP has been used, each time with satisfactory results. A relative wages variable, constructed in the way discussed above, was used as a second explanatory variable. With the exception of iron, steel and sugar refineries, the theoretically expected sign and a sufficient significance was indicated. For cokes, a price variable has been introduced, relating the price of a tonne of cokes to the unit price of an amount of its main competing substitute, oilfuel, with the same total caloric value. For both sectors, cokes and chocolate, a trend variable has been used as a meaningful explanation (in the latter case, the only explanation) of the output trends.

Oils and fats, cokes and sugar refineries show a rather low determination coefficient, the latter, however, together with quarries, has a satisfactory Durbin Watson ratio.

Table 13. Type III industries

Sector	determination coefficient	Durbin Watson ratio
Sugar Refineries	0.516	2.093
Petroleum Refineries	0.902	1.537
Quarries	0.823	2.876
Iron and Steel	0.787	1.599
Oils and Fats	0.489	1.173
Cokes	0.258	1.746
Chocolate	0.872	1.962

Type IV industries (low cumulative natural resource product requirements, high total value added per person)

All type IV industries have shown a steady increase in their level of output during the period under consideration (Table 14). Plastics and chemicals show the absolutely highest levels of growth and that for the year 1974. This is due to a large extent to the anticipated price increases and the fear of shortages, two conditions which accompanied the outbreak of the economic crisis in mid 1974 and which particularly struck the chemical sector. This situation accounted for a real purchase fever which then resulted in large stocks at the end of the year. This in turn, together with the diminishing demand for final products, accounted for decrease in output in 1975. The chemical and the plastic sectors are otherwise pre-eminently the growth sectors of the Belgian economy, the latter showing the absolutely highest employment increase. The chemical sector shows the highest productivity increase and is the most export-oriented industry.

Table 14. Type IV industries: overview

Sector	output in 1974 (1960=100)	employment in 1974 (1960=100)	output/man in 1974 (1960=100)	export share in 1960 (percentage)	export share in 1974 (percentage)
Non-ferrous Metals	242.98	99.45	244.32	no information	
Other Beverages (1963)	163.50	112.95	144.75	7	15
Chemicals	398.58	120.11	331.85	60	85
Book Printing	234.01	121.13	193.18	11	27
Pharmaceuticals (1962)	284.38	157.52	180.54	34	53
Soap and Perfumery	213.47	173.82	122.81	14	37
Glass	155.45	97.01	160.24	73	64
Rubber	223.40	111.63	200.13	27	48
Breweries (1961)	125.18	76.99	162.59	7	18
Plastics (1962)	457.27	248.40	184.09	38	52

There are only three of these capital-intensive type IV industries which have diminished their personnel in the course of the 15 years of observation; non-ferrous metals, due to a spectacular productivity increase and glass, due to the relatively stagnating level of production. The glass sector is also an interesting case, because its export share, contrary to the general trend, diminished between 1960 and 1974. The post 1972 decrease of Belgian exports to the United States and the United Kingdom (partly due to the steady depreciation of the respective currencies), is especially responsible for this evolution, since these countries were formerly two important outlets for the Belgian glass industry. For glass, as for petroleum refineries, a relative increase of the domestic market share occurred.

Linear regression analysis was used in all cases except soap and perfumeries, rubber and plastics. In these cases a double logarithmic formulation was used. The results are shown in table 15.

Table 15.

Type IV Industries: Values for regression equations

OUTPUT	CONSTANT	GDP-VARIABLE	PRICE VARIABLE	WAGES VARIABLE	TREND
NON-FERROUS METALS	-30.385 (-0.82)	$+1.324\ GDP_{EEC}$ (4.17)	$-0.013\ \frac{X\ price\ B}{CANADA}$ (-0.19)		
OTHER BEVERAGES	+16.298 (0.395)	$+1.419\ \frac{GDP_{B}}{capita}$ (12.64)		$-0.767\ \frac{Wages\ B}{FR}$ (1.804)	
CHEMICALS	-339.824 (-6.81)	$+0.999\ \frac{GDP_{OESO}}{capita}$ (1.22)		$+3.491\ \frac{Wages\ B}{BRD/US}$ (3.59)	
PRINTING BOOKS	+189.23 (+3.13)	$+1.243\ GDP_{EEC}$ (12.27)		$-2.034\ \frac{Wages\ B}{FR/BRD/NETH}$ (-3.26)	
PHARMACEUTICALS	+215.179 (1.301)	$+2.246\ GDP_{OESO}$ (12.37)		$-3.6004\ \frac{Wages\ B}{EEC}$ (-2.257)	
LOG. OUTPUT OF SOAP & PARFUMERIES	-2.276 (-7.92)	$+1.221\ \log \frac{GDP_{EEC}}{capita}$ (17.739)	$+0.260\ \log \frac{X\ price\ B}{EEC}$ (4.081)		
GLAS	+11.849 (1.29)	$+0.644\ GDP_{EEC}$ (6.03)	$+0.224\ \frac{X\ price\ NETH/BRD}{B}$ (1.65)		
LOG. OUTPUT OF RUBBER	+3.345 (0.88)	$+1.139\ \log GDP_{EEC}$ (6.98)		$-0.899\ \log \frac{Wages\ B}{EEC}$ (-1.268)	
BREWERIES	+144.867 (2.44)	$+0.185\ GDP_{EEC}$ (1.13)		$-0.758\ \frac{Wages\ B}{DENMARK}$ (-1.76)	
LOG. OUTPUT OF PLASTICS	-8.106 (-3.01)	$+2.852\ \log GDP_{OESO}$ (3.32)			$-0.141\ \log t$ (0.46)

United States GDP growth continued during the 1976-1977 period, though at a slower rate. In order to obtain the per capita GDP projections presented in Table 17 population estimates for 1985 published by the EC and the OECD were used.

Table 17. Retained GDP projections (1960=100) 1/

	1	2	3	4
Belgian GDP	210.72	264.54	244.71	1.85
EEC GDP	204.54	260.13	238.34	1.93
EEC Per Capita GDP	182.13	226.43	207.46	-
OECD GDP	202.41	252.87	238.84*	2.09
OECD Per Capita GDP	168.18	194.69	183.89*	-
$OECD_{EU}$ GDP	197.73	249.92	196.26	1.75

1/ Column 1 = last year of observation (1977)
Column 2 = optimistic assumption (1985)
Column 3 = pessimistic assumption (1985)
Column 4 = annual average growth rate 1974-1977.

* Annual average growth rate between 1973-1977.

In the case of most of the other independent variables the values for the projection year were determined on the basis of linear time trend estimates. Since the price and wages variables used in the regression equations are relative variables, comparing the Belgian price or wages level with one or other of Belgium's most important competitors for the sector concerned, they often show an irregular non-trend pattern during the period of observation. In such cases a very low coefficient of determination makes it difficult to determine in a reliable way the expected value for the projection year. In these cases the projected value has been constructed as an average of the respective variables as measured during the last five years of observation. For the estimate of the Benelux population in the year 1985 (used in the tobacco equation) no calculations were made; the EC projections mentioned above were relied upon. Since the regression equations for shoes and jute were carried out in a different way, their projection will be discussed separately.

Using the observed "output per worker" values during the base period as a proxy for the productivity level, the probable productivity in 1985 was estimated by a simple linear time trend projection. With this value, only a simple calculation is required to arrive at the estimated employment level for the projection year. This linear projection of productivity nevertheless would imply that the general trend of substantial productivity increase, which occurred during the sixties, will continue in the coming years... Increasing unemployment, and the probable end of the growth decade are two factors which suggest, however, that this evolution (the "optimistic" productivity scenario) might not continue uninterrupted. This hypothesis has received some confirmation from the Belgian Trade Union authorities, who closely follow productivity evolution in the industrial sectors, within the framework of their wage claim programmes. Hence, a second "pessimistic" productivity scenario has been built into our estimates. The assumption is made that the productivity level in the coming years will stabize. The estimated output per worker was calculated for 1985 as an average of this co-efficient's observed value during the last four years. The use of this second scenario will yield a far higher employment level for the projection year - thus, given the concern with growing unemployment, the term "pessimistic" scenario is indeed ambiguous. Employment effects are shown both in tables and graphs.

The combining of the estimated value of all explanatory variables into the respective regression equations yields the projection of each sector's output level. The results for each of the 4 types of industries are presented below in a graph and two sets of tables. (Since publication of new statistics during the course of this study provided additional data which could not be included in the calculations, the most recent data are presented in separate tables).

<u>Type I industries</u>

Table 18 and graph 3 show that only leathertanning, canned fish and canned vegetables give projections of increasing output. Leathertanning represents a rather unexpected case, while for canned fish and vegetables it is likely that the domestically available raw material (natural resource content) and the high protection prevailing in the EC have compensated for Belgium's disadvantage vis-à-vis the developing countries. If current trends persist, combining of wool will be of marginal value in the projection year. The same would be the case for woolspinning, cottonspinning and washing and carbonizing of wool, if the pessimistic GDP scenario proves to be accurate.

For the jute sector a somewhat different methodology has been used 1/. First, using a high world GDP estimate (linearly projected) and a low one (based on the observed annual growth rate from 1974 on) in the regression equation, a high and a low world demand for jute yarns has been estimated for the projection year. For the world prices of jute yarn (P_{wjy}) the average price over the last three years has been used, since the increase in prices cannot be steep 2/. The estimation of the prices of the propylene polymer (P_{wpp}) is based on FAO price projections, which have taken into account the probable impact of the energy crisis 3/. After assigning the due value to the time variable, a high and a low world demand estimate have been obtained for the year 1985 4/. Secondly, using the equation 5/ which determines the Belgian share in this world demand, it was possible, after estimating the probable value of the different variables, to determine the likely Belgian output for 1985, under an optimistic assumption (a high world demand). For the tariff preference variable (P_{ec}) a zero-tariff has been included, since tariff liberalisation for jute yarns took effect on 1 January 1978 in the EC countries 6/. Belgian jute yarn prices, which show a slowly decreasing evolution, and the supply constraint variable have been linearly projected.

Analysing the employment projections we can see a general downward trend. Only canned vegetables could possibly increase its employment level; and that only under the assumptions of the optimistic GDP scenario, and only if productivity stabilises approximately around the current level. Thus, it is not the structurally weak, labour-intensive industries which will be able to make a positive contribution to employment creation in Belgium. This also suggests that the "employment creation" argument used by the protectionist lobbies in favour of such industries has very little empirical basis. (Table 18; graphs 4,5.)

1/ See P.K.M. Tharakan and W.M. Schoofs, World Demand for Jute Products and the Share of the Belgian Industry op.cit.

2/ Ibid, p. 38.

3/ See FAO "Indices de la Crise de l'Energie sur la Position Concurrentielle des Matières Premières Agricoles", Rome, 1974, CCP:JV 74/8; cited in P.K.M. Tharakan and W.M. Schoofs op.cit., p. 39.

4/ The mentioned study makes projections for the year 1980. Calculations have consequently been adapted for the 1985 target.

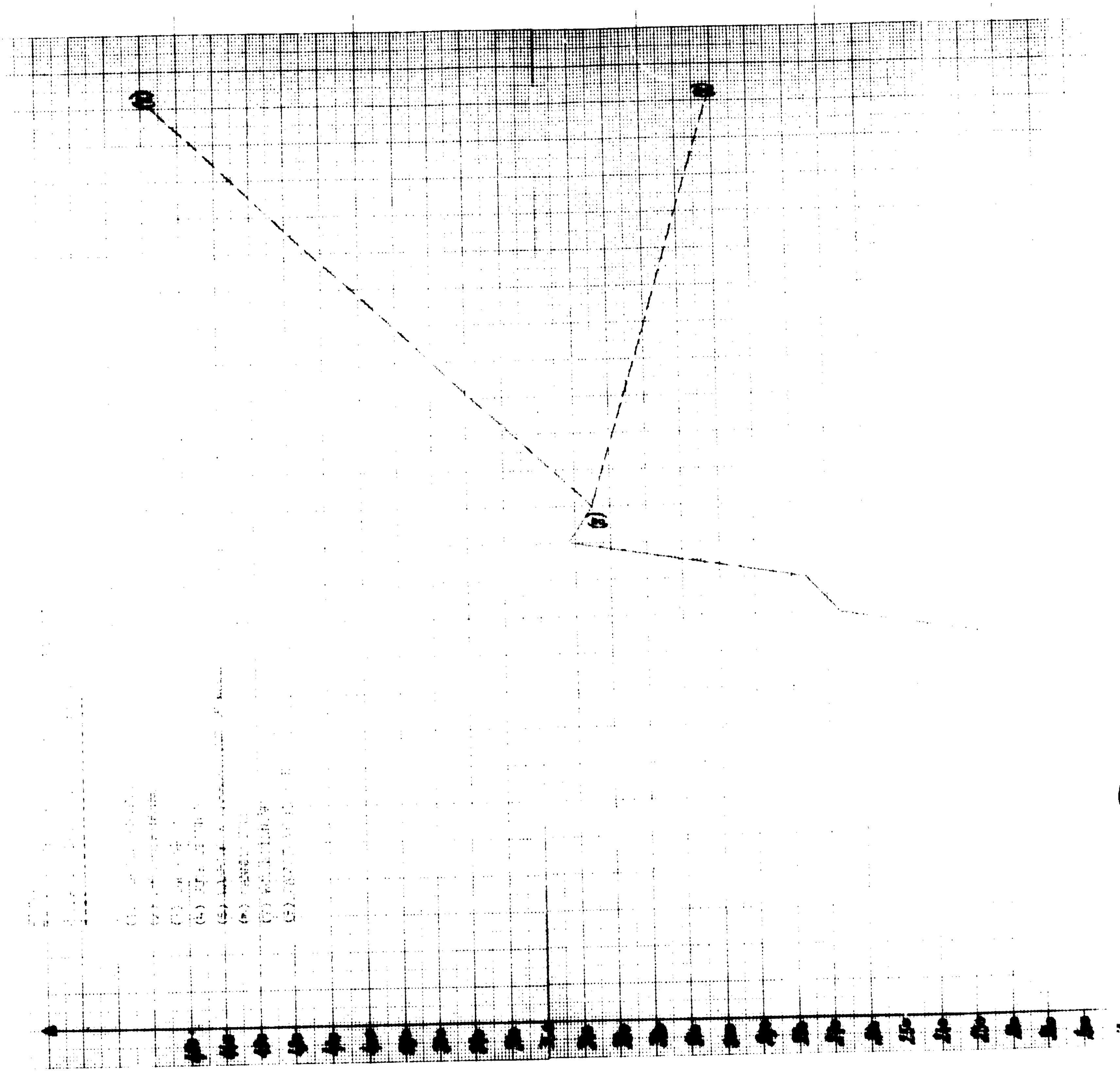
5/ See chapter II, p. 17.

6/ But the more important quantitative restrictions remain.

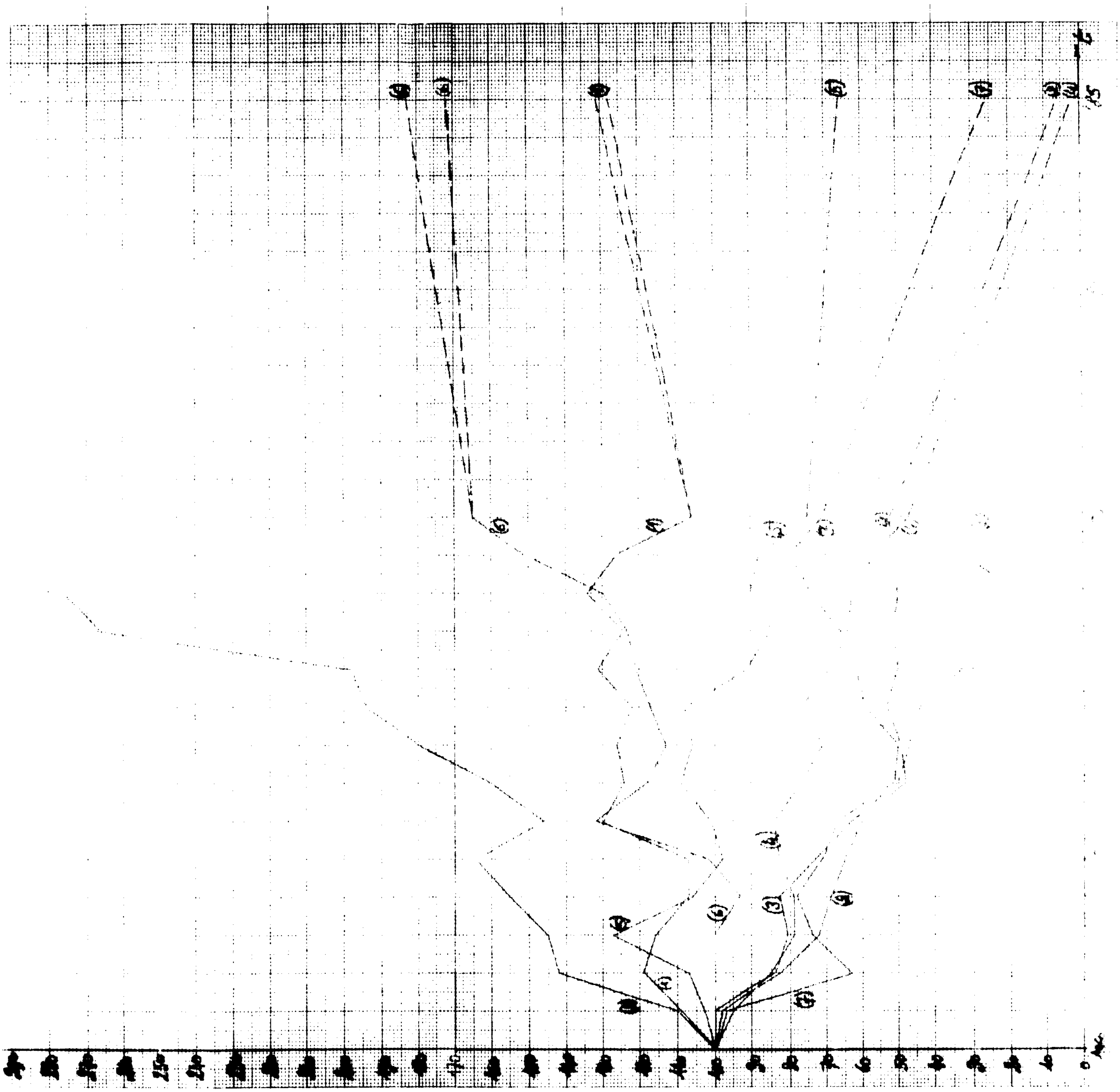
Table 18.

TYPE I INDUSTRIES - **employment/output projections**

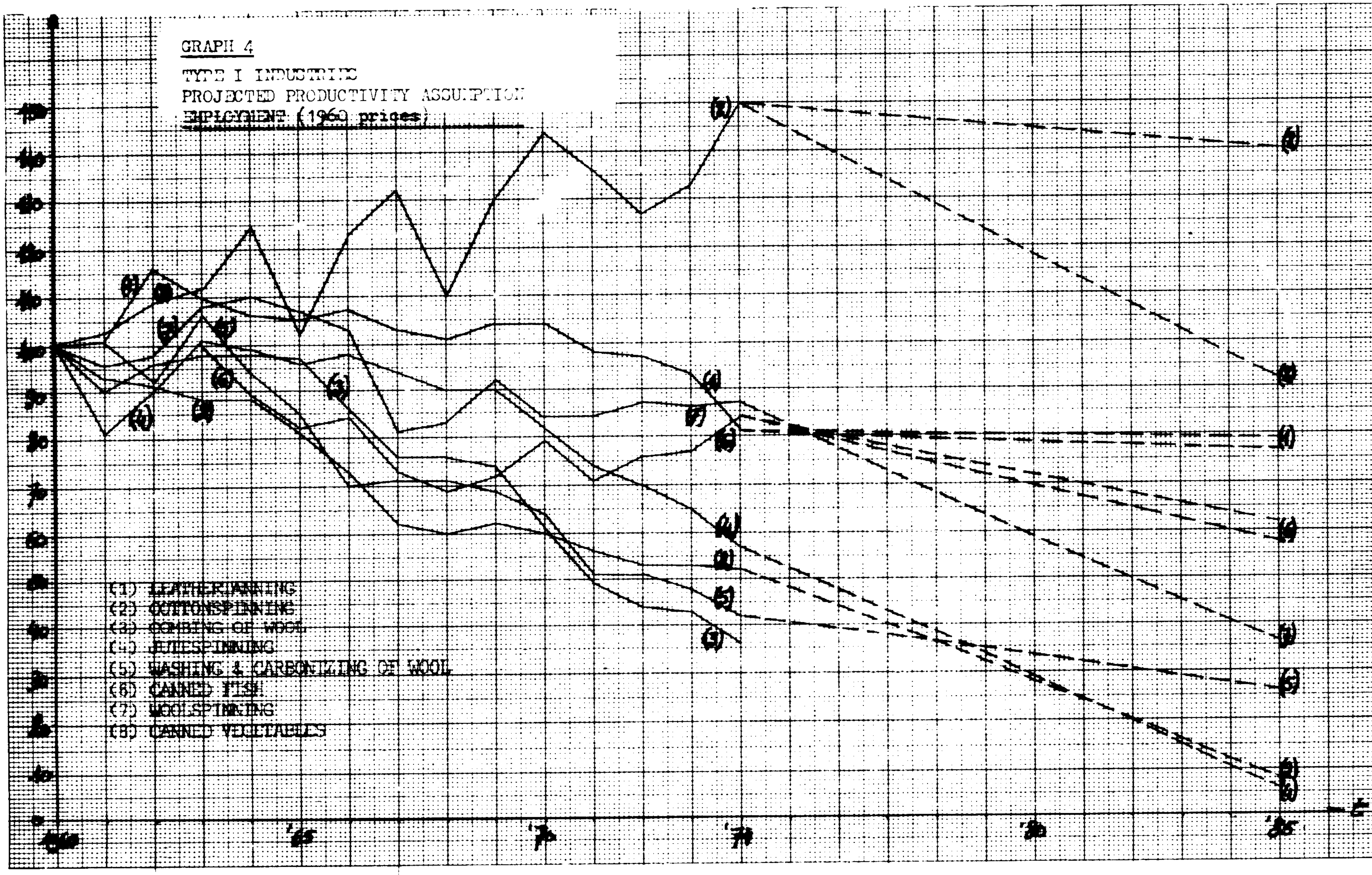
SECTORNAME	EMPLOYMENT PROJECTIONS (1985)					OUTPUT PROJECTIONS (1985)		
	EMPLOYMENT IN LAST YEAR OF OBSERVATION: (1974) {1960=100}	PROJECTED PRODUCTIVITY ASSUMPTION		AVERAGE PRODUCTIVITY ASSUMPTION		OUTPUT IN LAST YEAR OF OBSERVATION: (1974)	PROJECTED OUTPUT (1985)	
		OPTIMISTIC GDP ASSUMPTION	PESSIMISTIC GDP ASSUMPTION	OPTIMISTIC GDP ASSUMPTION	PESSIMISTIC GDP ASSUMPTION		OPTIMISTIC GDP ASSUMPTION	PESSIMISTIC GDP ASSUMPTION
LEATHERTANNING	81.09	79.04	77.53	99.98	98.07	106.52	131.16	128.82
WOOLSPINNING	87.48	36.33	-	32.39	-	71.17	26.62	-
COTTONSPINNING	52.14	6.83	-	6.93	-	52.35	6.18	-
COMBING OF WOOL	36.65	-	-	-	-	23.39	-	-
JUTE SPINNING	57.90	2.17	1.88	1.90	1.65	47.28	1.68	1.46
CANNED VEGETABLES	150.02	140.16	92.49	190.34	125.60	335.13	457.19	301.69
WASHING AND CAR-BONIZING OF WOOL	42.76	26.41	-	37.15	-	75.85	66.37	-
CANNED FISH {1963=100}	84.51	62.18	58.42	84.68	79.68	165.98	183.61	172.89

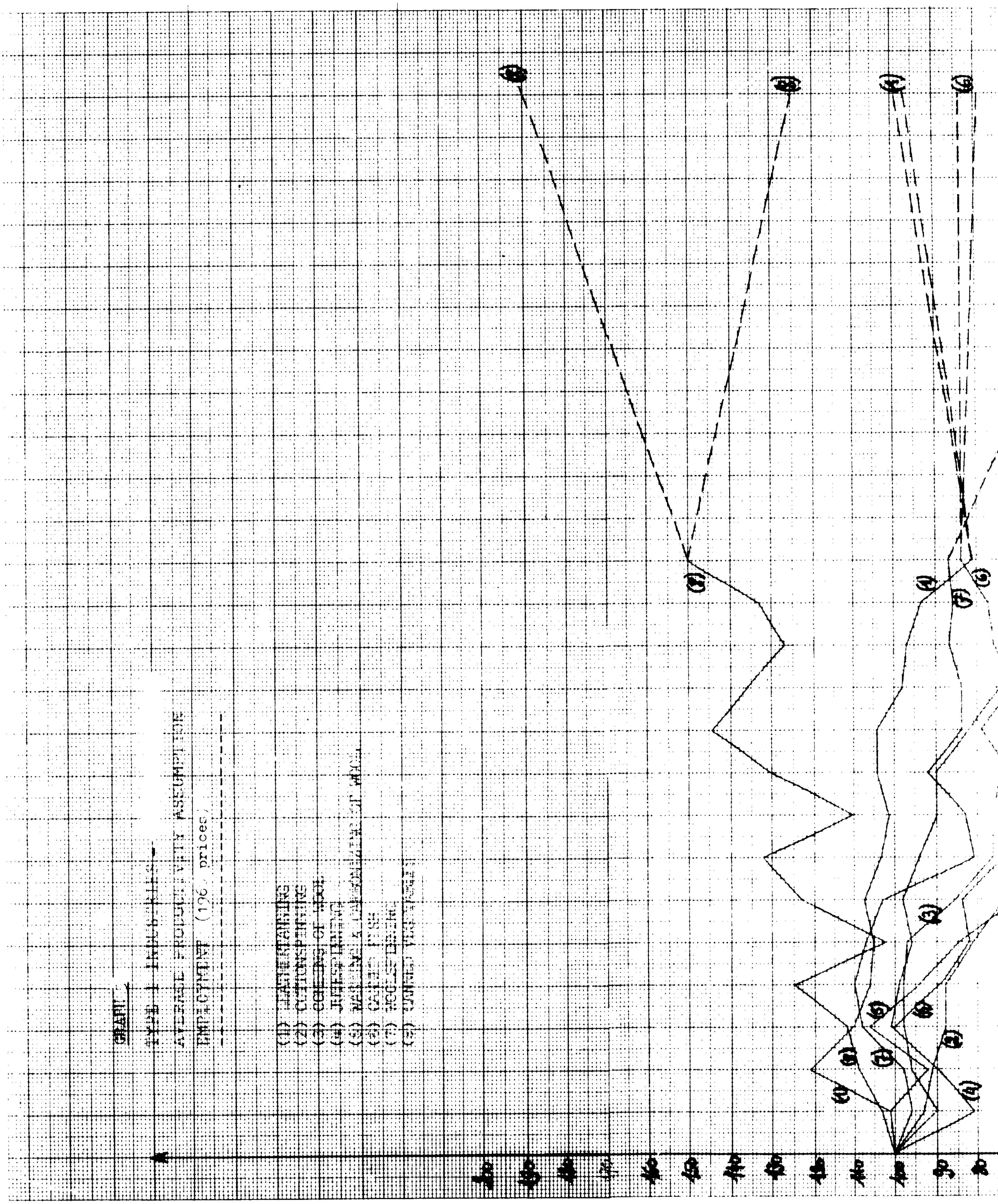


SECTION 1

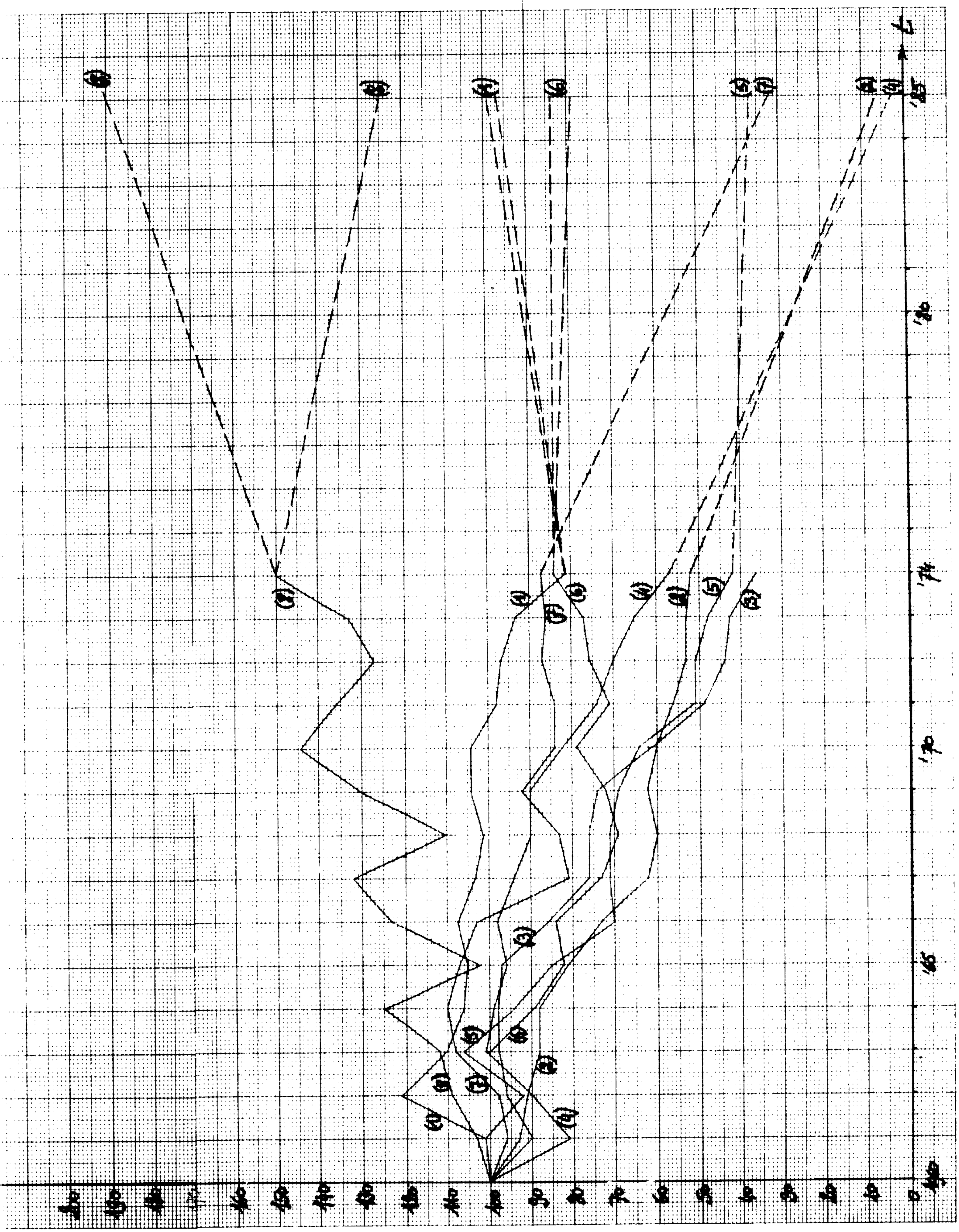


SECTION 2


GRAPH 4
TYPE I INDUSTRIES
PROJECTED PRODUCTIVITY ASSUMPTION
EMPLOYMENT (1960 prices)
(1) LEATHERTANNING
(2) COTTONSPINNING
(3) COMBING OF WOOL
(4) JUTESPINNING
(5) WASHING & CARBONIZING OF WOOL
(6) CANNED FISH
(7) WOOLSPINNING
(8) CANNED VEGETABLES


AVERAGE PRODUCTIVITY ASSUMPTION
(2) COTTONSPINNING
(7) WOOLSPINNING

SECTION 1



SECTION 2

Table 19 clearly shows that 1975 was a year of deep recession for all sectors, while 1976 registered a substantial recovery for some sectors but not for others. Comparing these recent observations with the projections one has the impression that the projected trends lie in the realm of possibility. Jutespinning and combing of wool will possibly reach higher levels than the projected ones. The projection for leathertanning, on the other hand, is probably overestimated.

Table 19. Type I industries

Recent Data not Included in the Calculation

	Output deflated			Employment		
	1974*	1975	1976	1974*	1975	1976
Leathertanning	106.52	84.57	-	81.09	70.65	-
Woolspinning	71.17	65.86	81.67	87.48	80.91	80.58
Cottonspinning	52.35	27.88	-	52.14	43.12	-
Combing of Wool	23.39	13.76	20.41	36.65	30.91	30.66
Jutespinning	47.28	39.15	39.49	57.90	43.66	42.37
Canned Vegetables	355.13	305.03	-	150.02	126.83	-
Washing and Carbonising of Wool	75.85	63.84	66.19	42.76	33.89	40.76
Canned Fish (1963=100)	165.98	146.06	165.35	84.51	65.95	76.92

Type II industries

For type II industries output projections show an increasing trend in a number of sectors. Exceptions are clay, felt, footwear and fur, which are expected to have a falling output level under either set of assumptions (fur production might even be completely eliminated). Similarly output in woodsawing will probably decrease but only if the pessimistic GDP scenario proves accurate. All other type II industries are likely to expand during the coming years with wadding, manufactures of paper and cardboard, and manufactures of wood being possibly important growth sectors. Yet, the relative structural weakness of these sectors make one somewhat skeptical about these results. Tobacco does not show any pessimistic scenario result simply because the GDP variable has been replaced by the population variable. The output for footwear has been projected in a slightly different way. As was explained in describing the regression equations it was the magnitude of the Belgian share in total EC consumption that was estimated for the projection year. Hence, a second linear projection estimating total EC footwear consumption was carried out separately so that the Belgian share in the total could be deduced. (Table 20; graph 6.)

The employment projections for type II industries turn out to be more optimistic than those for type I. There are at least four sectors (agglomerates of cement, manufactures of paper and cardboard, manufactures of wood and clothing) which show an increasing employment level when high GDP and continually rising productivity are assumed. A stabilizing of productivity in the coming years would mean that most of the sectors would increase their employment. Only clay, tobacco, felt, footwear and fur will experience a shrinking of the number of workers under both sets of assumptions. Except tobacco, all of these industries show a clear decline in output level. (Table 20; graphs 7,8.)

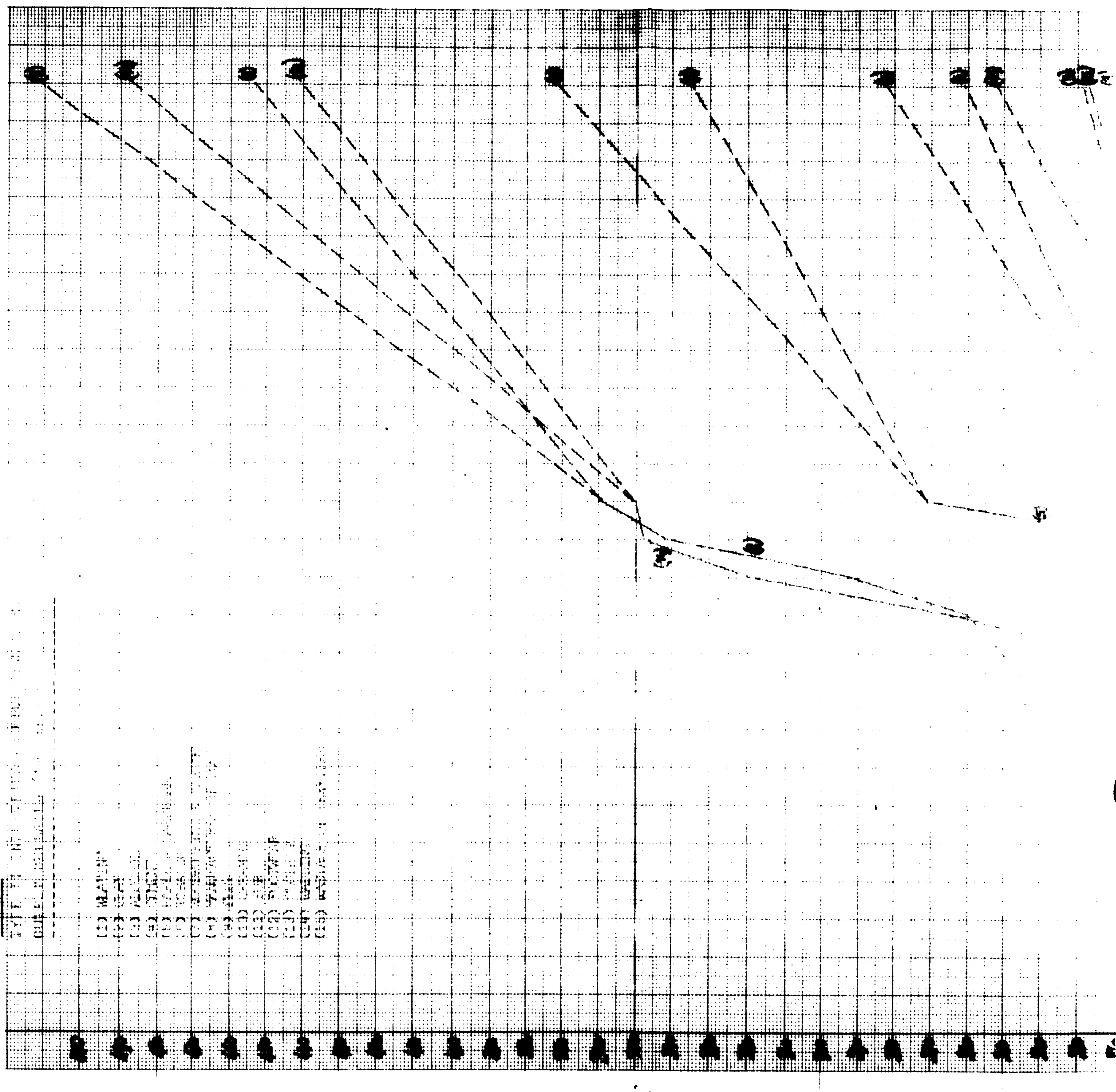
Table 20

TYPE II INDUSTRIES - employment/output projections

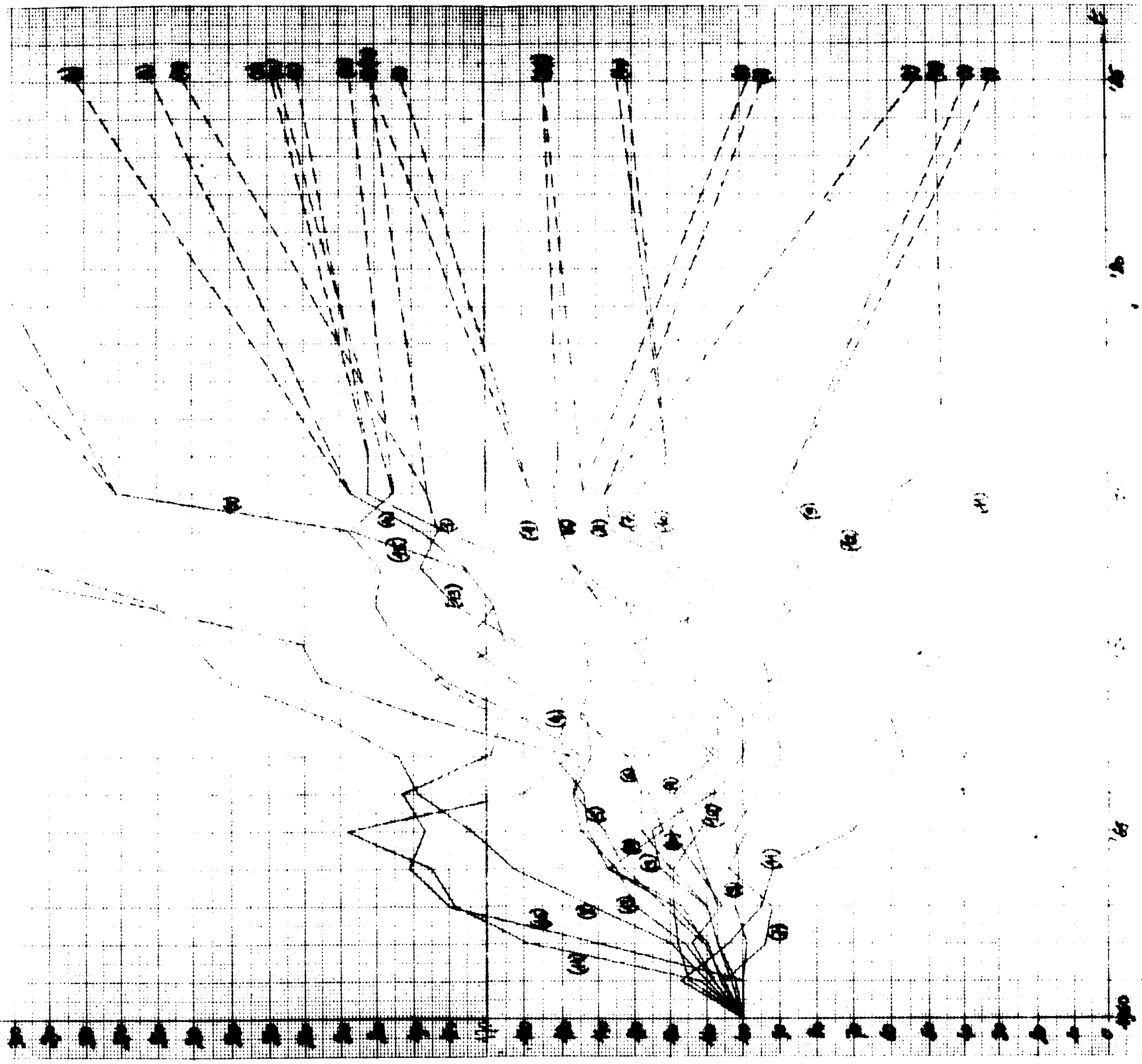
SECTORNAME	EMPLOYMENT PROJECTIONS (1985)					OUTPUT PROJECTIONS (1985)		
	EMPLOYMENT IN LAST YEAR OF OBSERVATION: (1974) (1960=100)	PROJECTED PRODUCTIVITY ASSUMPTION		AVERAGE PRODUCTIVITY ASSUMPTION		OUTPUT IN LAST YEAR OF OBSERVATION: (1974)	PROJECTED OUTPUT (1985)	
		OPTIMISTIC GDP ASSUMPTION	PESSIMISTIC GDP ASSUMPTION	OPTIMISTIC GDP ASSUMPTION	PESSIMISTIC GDP ASSUMPTION		OPTIMISTIC GDP ASSUMPTION	PESSIMISTIC GDP ASSUMPTION
WEAVING	82.15	75.03	72.30	101.51	97.82	158.87	201.06	193.75
WADDING	127.56	122.01	110.66	170.04	154.22	351.06	486.10	440.86
CLAY	55.72	29.26	16.76	38.26	21.92	136.99	94.07	53.88
ALCOHOL*	77.88	69.68	67.59	81.46	79.03	202.40	229.40	222.54
AGGLOMERATES OF CEMENT	124.45	137.45	127.42	169.04	156.70	207.90	282.40	261.79
MANUFACTURES OF PAPER & CARDBOARD	136.44	159.11	143.14	204.71	184.16	271.79	372.38	335.00
TOBACCO*	108.30	82.03	-	101.89	-	152.56	154.29	-
WOODSAWING	91.25	86.28	54.91	103.50	65.87	144.00	154.03	98.03
WASTAGE OF TEXTILES**	125.34	116.02	108.30	148.45	138.58	195.32	228.81	207.99
MANUFACTURES OF WOOD	172.71	180.07	159.37	251.88	222.92	360.30	511.86	453.01
FELT	55.17	19.66	16.27	25.94	22.41	89.56	39.00	32.27
CERAMICS*	77.52	58.66	57.57	78.54	77.08	129.99	134.77	132.26
FUR	30.82	-	-	-	-	28.67	-	-
FOOTWEAR	37.74	24.36	-	31.16	-	59.12	47.55	-
CLOTHING	150.62	180.11	144.11	197.66	158.15	186.69	252.43	201.97

* Last year of observation is 1975.

** (1961=100).



SECTION 1



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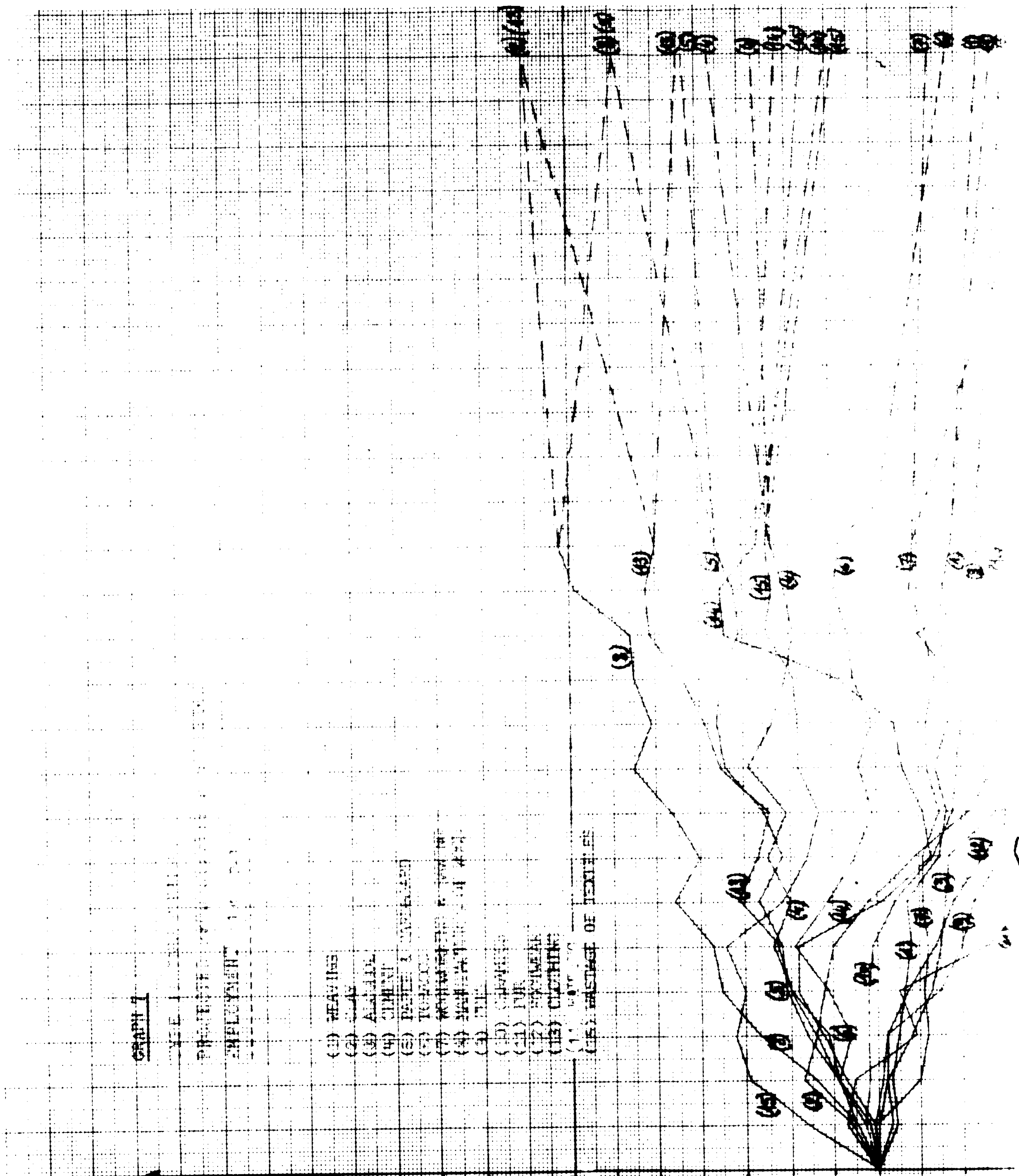
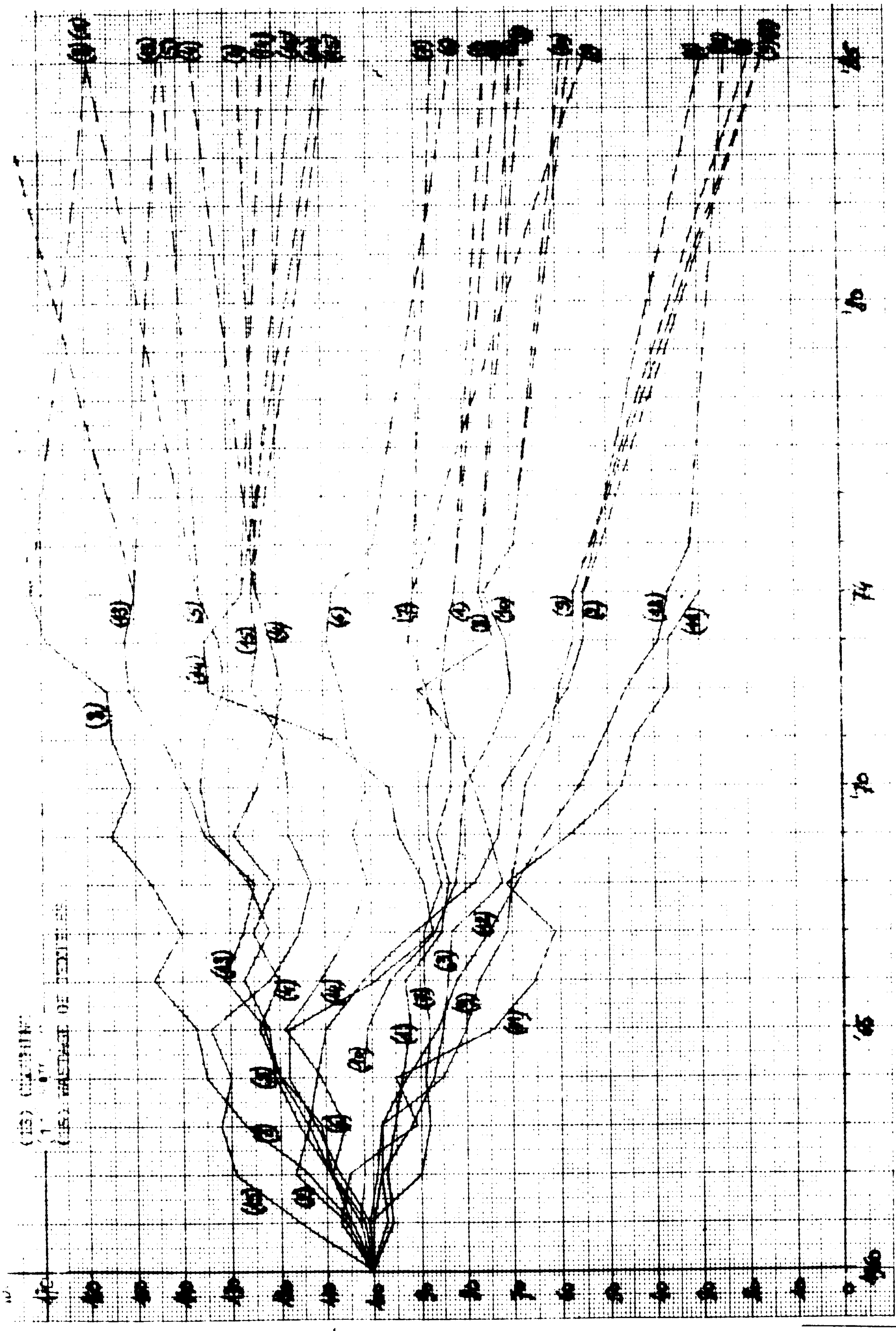
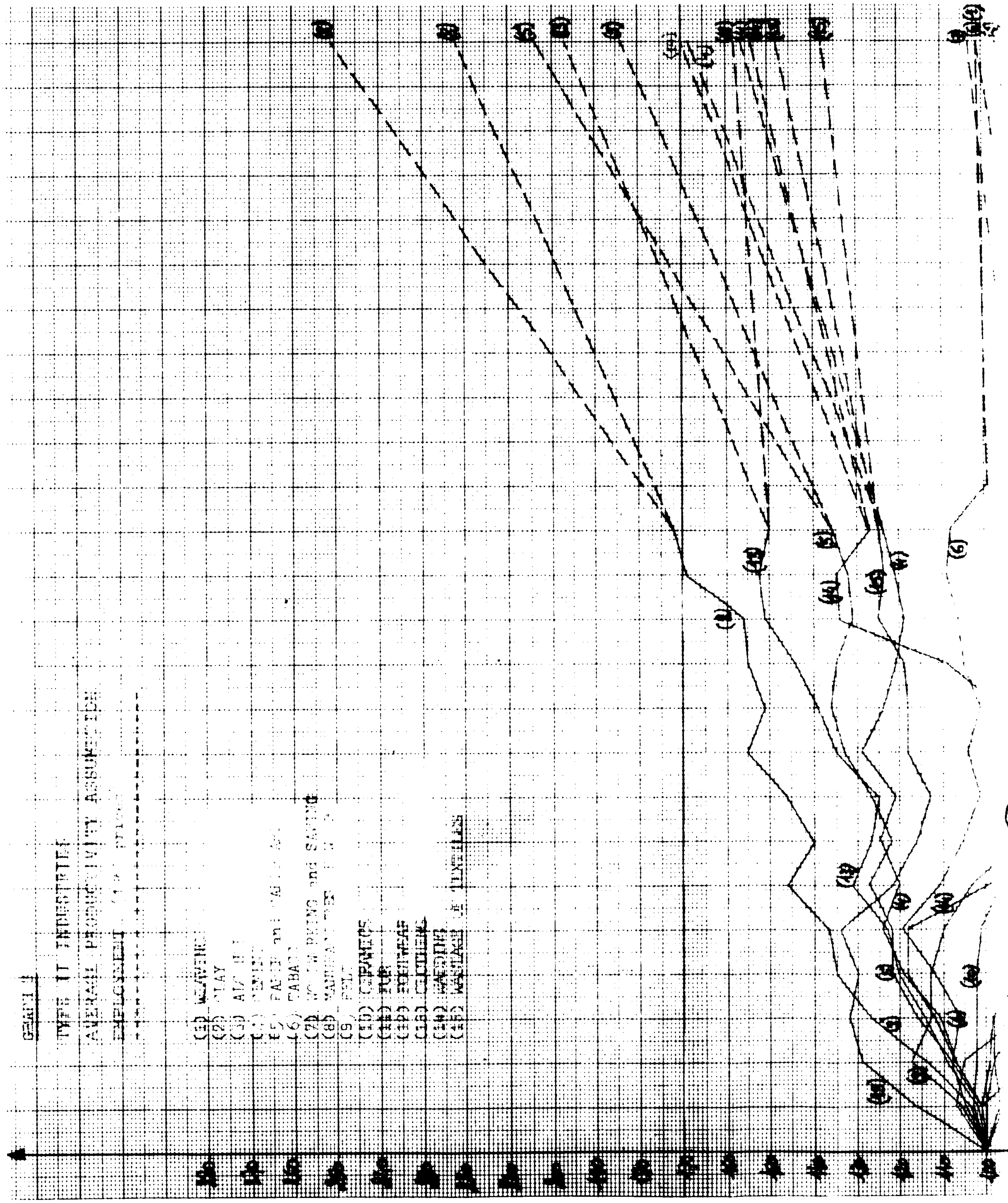

GRAPH 7
EMPLOYMENT
(1) WEAVING
(4) CEMENT
(11) FUR
(13) CLOTHING
(15) WASTAGE OF TEXTILES

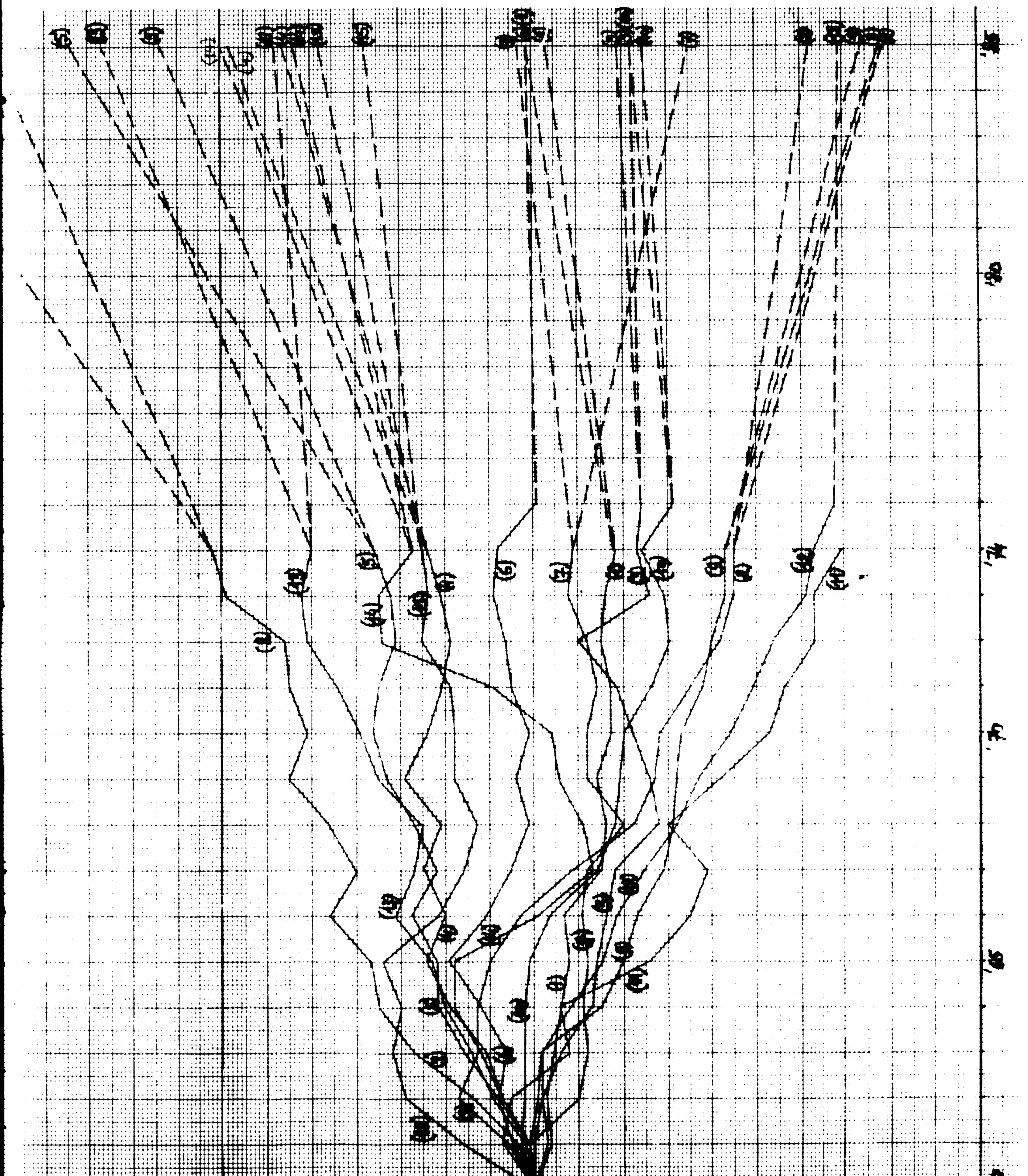
SECTION 1



SECTION 2


TYPE II INDUSTRIES
AVERAGE PRODUCTIVITY ASSUMPTION
EMPLOYMENT
(1) WEAVING
(2) CLAY
(6) TABAC
(9) FELT
(10) CERAMICS
(11) FUR
(12) FOOTWEAR
(13) CLOTHING
(14) WADDING
(15) WASTAGE OF TEXTILES

SECTION 1



SECTION 2

Table 21 gives additional data not included in the calculations.

Table 21. Type II industries

Recent Data not Included in the Calculation

	Output deflated			Employment		
	1974*	1975	1976	1974*	1975	1976
Weaving	158.37	165.80	-	82.15	76.44	-
Wadding	351.06	312.69	317.81	127.56	117.13	111.17
Clay	136.99	-	-	55.72	-	-
Alcohol	202.40	202.47*	211.20	77.88	76.57*	75.01
Agglomerates of Cement	207.90	-	-	124.45	-	-
Manufactures of Paper and Cardboard	271.79	219.37	-	136.44	120.71	-
Tobacco	152.56	151.35*	-	108.30	99.95*	-
Woodsawing	144.00	115.10	-	91.25	84.13	-
Wastage of Textiles (1961=100)	195.32	154.13	-	125.34	118.98	-
Manufactures of Wood	360.30	307.37	-	172.71	153.67	-
Felt	89.56	65.01	-	55.17	49.54	-
Ceramics	129.99	121.88*	-	77.52	69.79*	-
Fur	28.67	43.97	-	30.82	37.01	-
Footwear	59.12	46.35	-	37.74	32.05	-
Clothing	186.69	185.20	-	150.62	133.43	-

* Included in the calculations

Type III industries

Almost all type III industries seem likely to perform well in the coming years. There are only three sectors that will have a lower output level in 1985 than in 1974. If current trends continue, agglomerates of coal might even disappear. (Only 50 people were employed in this sector in 1976). Cokes will also experience a shrinking of output due more to the substitution of other fuels than to the characteristics of the sector itself. However, taking into account the recent crisis in the petroleum sector and the fear of scarcity, it is not impossible that a revival of this sector might occur. Oils and fats are also likely to show a declining trend between 1974 and 1985. One should not be misled by the 1974 output figure which was exceptionally high compared to former years. As a basis for comparison, the 1975 and 1976 data seem to be more reliable. Of all type II industries petroleum refineries undoubtedly show the greatest growth potential. But whether this potential will in fact be realized is another question. Much depends on the future trends in energy saving and substitution. Already, the less efficient and outdated installations seem to be halting activity. The wide range between the optimistic and the pessimistic projection for this sector is to a large extent due to the structure of the equation,which attributes a great weight to the selected OECD GDP variable. It is perhaps also an indication of the great amount of uncertainty one has to take into account in evaluating future trends for this sector. The iron and steel sector was clearly at a turning point in 1975. Production fell by more than 30%, and the slight recovery of 1976 does not offer any promise. In fact, the iron and steel sector is among the main problem sectors of Belgian industry. At present a number of restructuring plans are under way, thus hampering an evaluation of future trends. Moreover, there is a wide range between the optimistic and the pessimistic output projections. (Table 22; graph 9.)

Viewing the employment prospects under the assumption of rapidly increasing productivity presents a rather sombre picture. There is only one sector, petroleum refinery, which seems to be promising in this respect, but as noted above, the outlook for this sector is uncertain. If rising productivity trends continue, even a high GDP growth will not keep the other type III industries from losing employment. The use of the "stabilizing of productivity" assumption presents a more promising image, at least if GDP keeps growing at a high rate. In this case, only agglomerates of coal and cokes will register a loss of employment. (Table 22; graphs 10, 11.)

Comparison of the projected values with the recent data suggests, among other things, that agglomerates of coal risks disappearing as a viable sector by 1985. In the case of iron and steel it is clear that the pessimistic projection seems far more realistic than the optimistic one. As for the other projections, they seem to be well within the range of possibilities.

Table 22

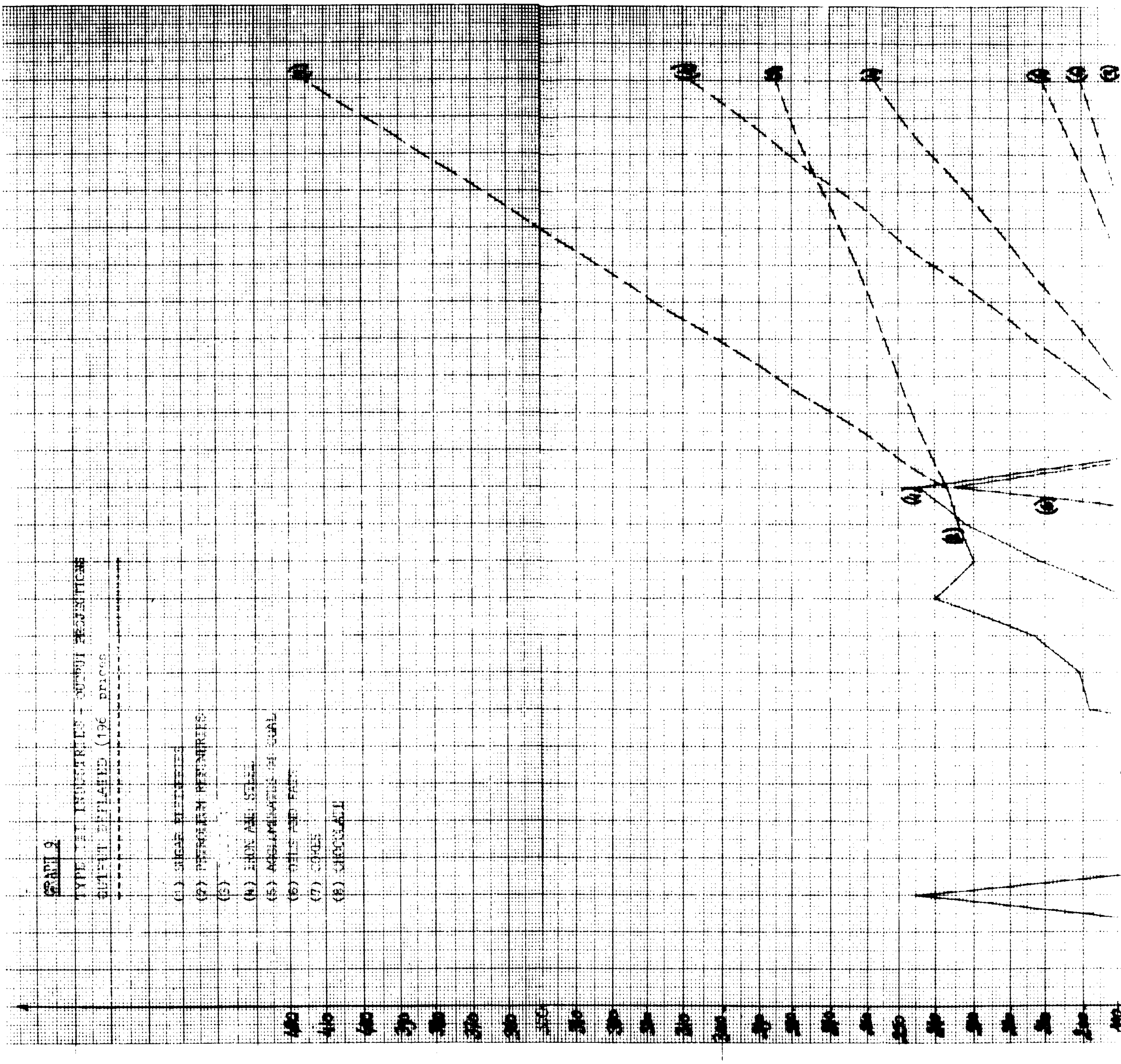
TYPE III INDUSTRIES - employment/output projections

SECTORNAME	EMPLOYMENT PROJECTIONS (1985)					OUTPUT PROJECTIONS (1985)		
	EMPLOYMENT IN LAST YEAR OF OBSERVATION: (1974) (1960=100)	PROJECTED PRODUCTIVITY ASSUMPTION		AVERAGE PRODUCTIVITY ASSUMPTION		OUTPUT IN LAST YEAR OF OBSERVATION: (1974)	PROJECTED OUTPUT (1985)	
		OPTIMISTIC GDP ASSUMPTION	PESSIMISTIC GDP ASSUMPTION	OPTIMISTIC GDP ASSUMPTION	PESSIMISTIC GDP ASSUMPTION		OPTIMISTIC GDP ASSUMPTION	PESSIMISTIC GDP ASSUMPTION
PETROLEUM REFINERIES (1962=100)	139.35	141.48	97.40	243.69	167.65	237.56	415.45	285.81
AGGLOMERATES OF COAL*	27.19	-	-	-	-	41.28	-	-
IRON AND STEEL*	99.59	91.17	76.33	142.79	119.55	244.74	308.93	258.66
CHOCOLATE**	108.31	102.61	-	134.37	-	147.65	173.46	-
QUARRIES (1967=100)	89.51	86.71	83.71	129.11	124.63	128.83	189.16	182.61
OILS AND FATS	71.99	63.79	60.83	79.47	75.78	235.21	210.58	200.82
COKES***	105.75	86.25	-	75.41	-	108.31	65.92	-
SUGAR	62.83	52.60	49.66	77.03	72.73	114.79	144.54	136.47

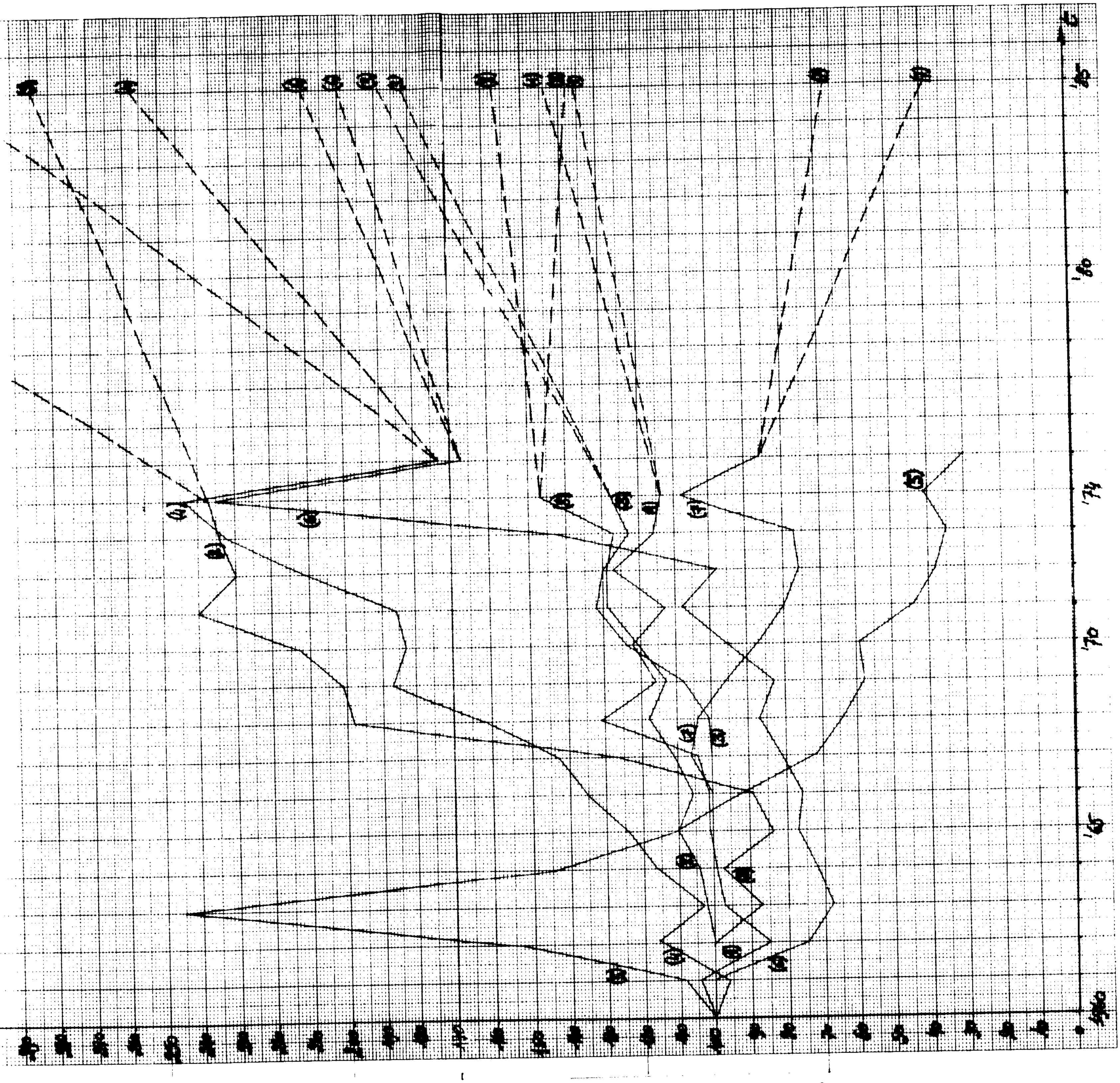
* Last year of observation is 1975.

** (1964=100).

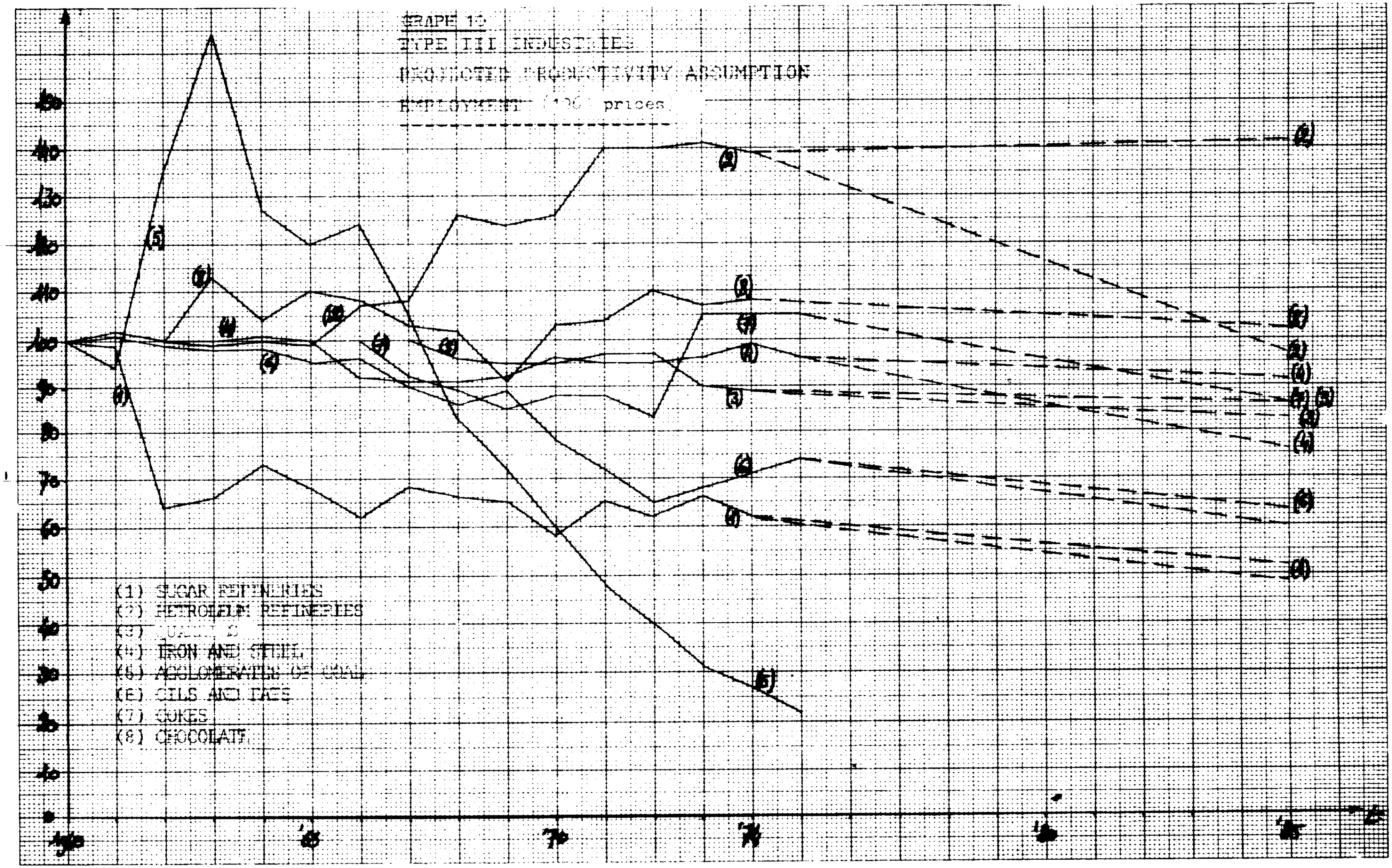
*** (1966=100).


GRAPH 9
TYPE III INDUSTRIES - OUTPUT PROJECTIONS
(1) SUGAR
(2) PETROLEUM REFINERIES
(3)
(4) IRON AND STEEL
(5) AGGLOMERATES OF COAL
(7) COKES
(8) CHOCOLATE

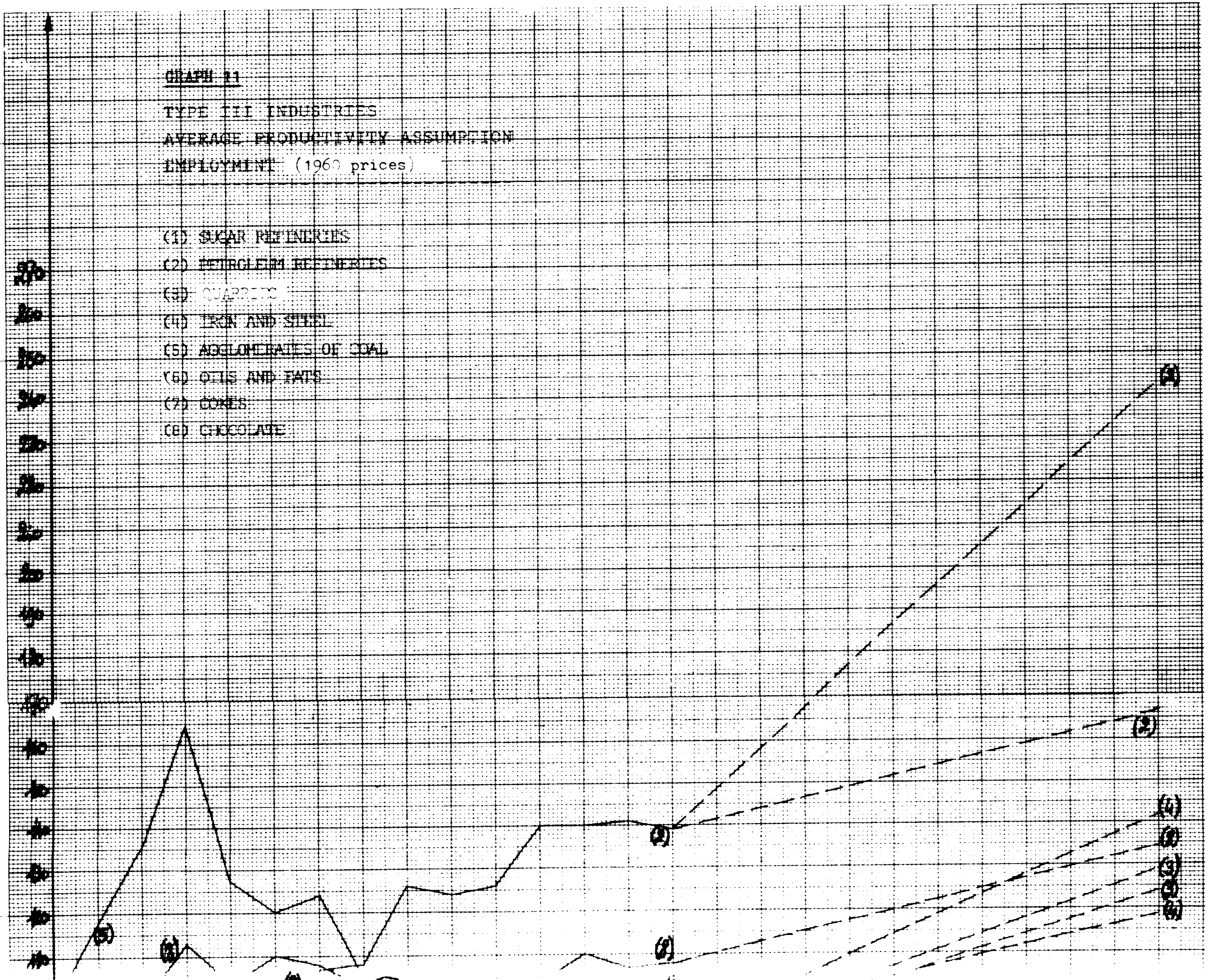
SECTION 1

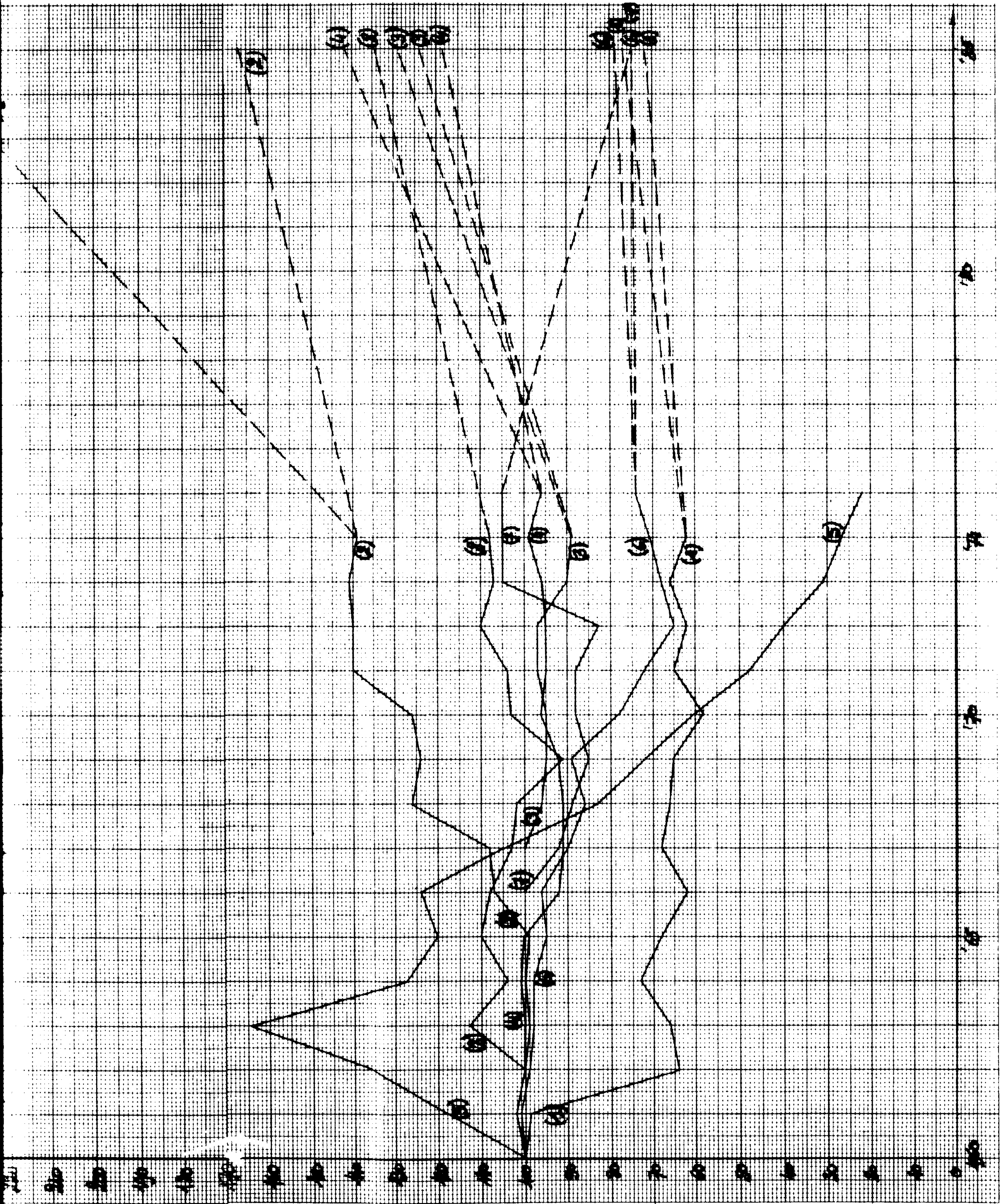


SECTION 2


GRAPH 13
TYPE III INDUSTRIES
PROJECTED PRODUCTIVITY ASSUMPTION
EMPLOYMENT prices
(1) SUGAR REFINERIES
(2) PETROLEUM REFINERIES
(3)
(4) IRON AND STEEL
(5) AGGLOMERATES OF COAL
(6) OILS AND FATS
(7) COKES
(8) CHOCOLATE

SECTION 1


GRAPH 11
TYPE III INDUSTRIES
AVERAGE PRODUCTIVITY ASSUMPTION
EMPLOYMENT (1960 prices)
(1) SUGAR REFINERIES
(2) PETROLEUM REFINERIES
(3) QUARRIES
(4) IRON AND STEEL
(5) AGGLOMERATES OF COAL
(6) OILS AND FATS
(7) COKES
(8) CHOCOLATE



SECTION 2

Table 23. Type III industries

Recent Data not Included in the Calculation

	Output deflated			Employment		
	1974*	1975	1976	1974*	1975	1976
Petroleum Refineries	237.56	-	-	139.35	-	-
Iron and Steel	244.74	173.65*	184.05	99.59	96.20*	93.41
Agglomerates of Coal	41.28	30.15*	19.23	27.19	22.92*	11.24
Chocolate	147.65	144.68	-	108.31	100.70	-
Quarries	128.83	125.90	-	89.51	85.94	-
Oils and Fats	236.21	167.49	172.19	71.99	74.35	71.27
Cokes	108.31	86.70	-	105.75	105.66	-
Sugar	114.79	-	-	62.83	-	-

* Included in the calculations.

Type IV industries

The type IV industries are the real growth sectors. If the optimistic GDP scenario proves realistic, all sectors will substantially increase their level of output, with plastics, soap and perfumes and pharmaceuticals. Even a slackening GDP growth (pessimistic scenario) would not be able to break the growth of type IV industries. The great weight attached to the GDP variable in the plastics sector equation explains the wide range between its optimistic and pessimistic projection. This, however, does not seriously hamper an evolution of future trends for this "spear-head sector". (Table 24; graph 12.)

Under the assumption of high productivity increase, employment in type IV industries will hardly expand. If the productivity growth as experienced in the past 15 years continues, only 4 industries (other beverages, printing and binding of books, soap and perfumes and plastics) will make a modest contribution towards increasing their employment level, and that only if the GDP growth proves to be strong enough (optimistic scenario).

If productivity growth tends towards stabilization, however, all sectors will increase employment. This illustrates how strong productivity growth has been in this type of industry, and consequently, how in spite of their high growth rates, type IV industries seem unlikely to be able to absorb the large number of workers who might lose their jobs in the weak sectors. (Table 24; graphs 13, 14.)

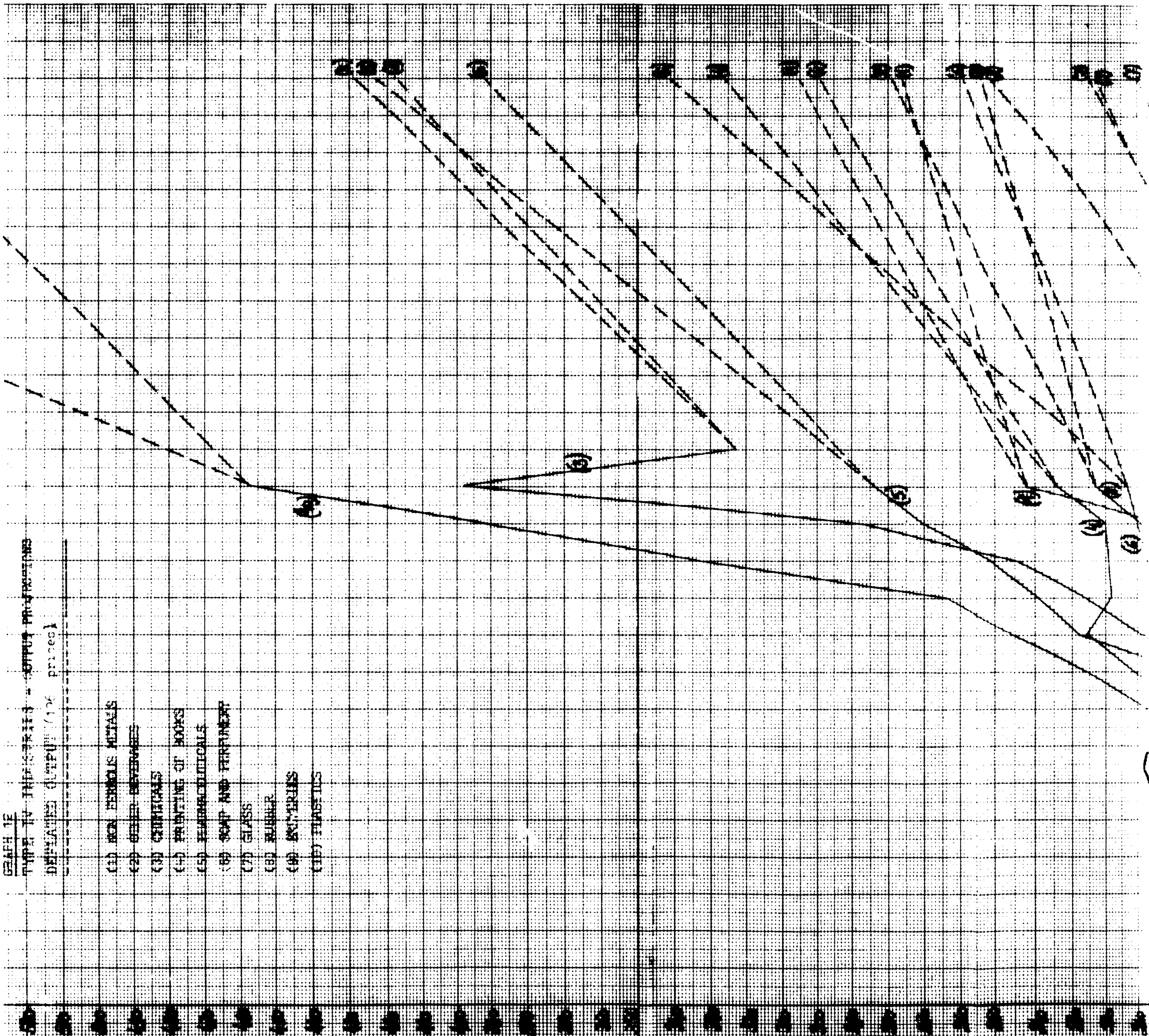
Table 25 shows how 1975 has also been a year of recession for these structually strong sectors. Yet, three sectors were able to overcome the general trend of decline: the continually growing sectors of printing and binding of books and of pharmaceuticals and the stagnating sector of other beverages. Unfortunately, there are no 1976 data which could give information about the momentum of the recovery.

Table 24

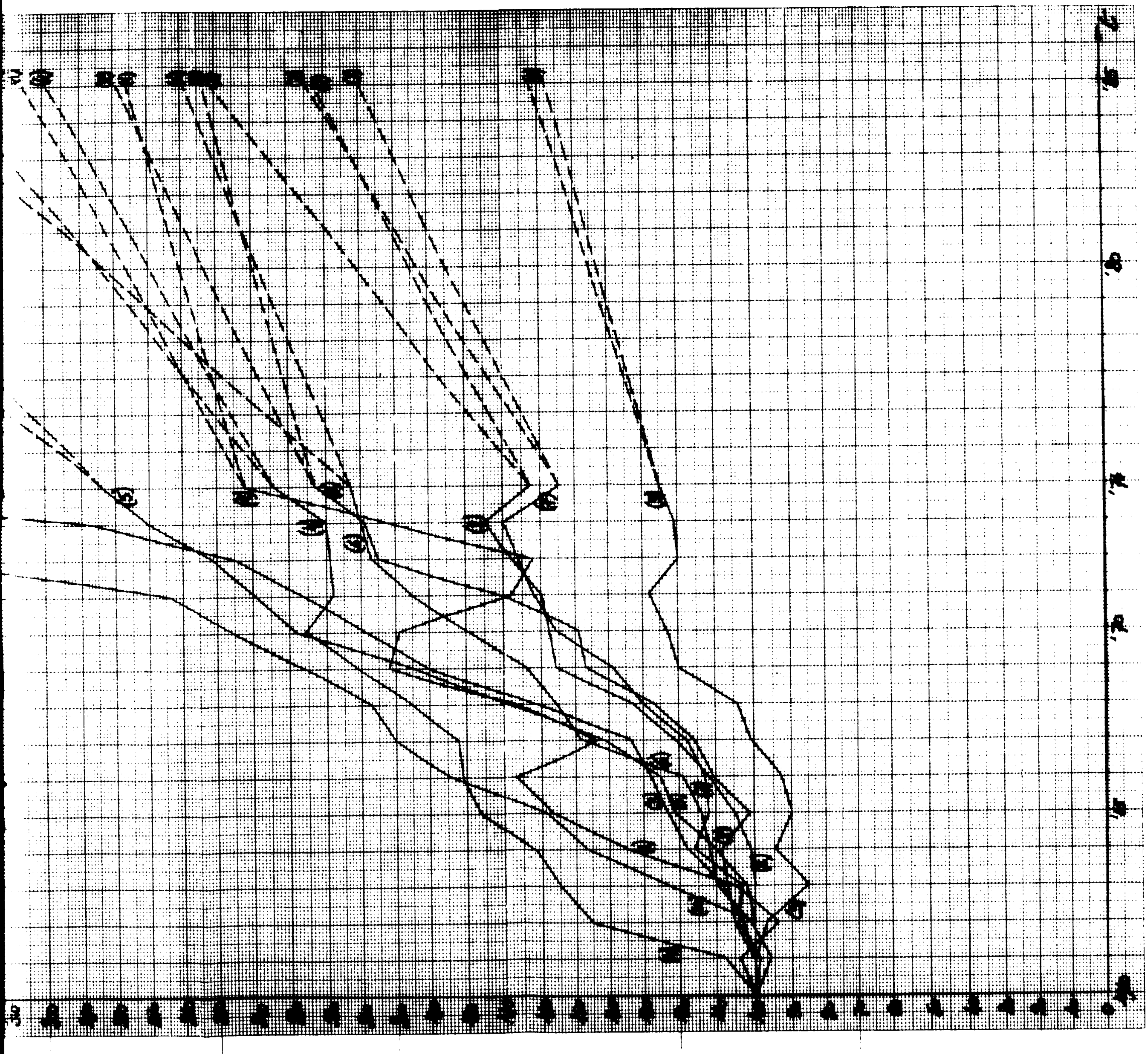
TYPE IV - INDUSTRIES - employment/output projections

SECTORNAME	EMPLOYMENT PROJECTIONS (1985)					OUTPUT PROJECTIONS (1985)		
	EMPLOYMENT IN LAST YEAR OF OBSERVATION: (1974) (1960=100)	PROJECTED PRODUCTIVITY ASSUMPTION		AVERAGE PRODUCTIVITY ASSUMPTION		OUTPUT IN LAST YEAR OF OBSERVATION: (1974)	PROJECTED OUTPUT (1985)	
		OPTIMISTIC GDP ASSUMPTION	PESSIMISTIC GDP ASSUMPTION	OPTIMISTIC GDP ASSUMPTION	PESSIMISTIC GDP ASSUMPTION		OPTIMISTIC GDP ASSUMPTION	PESSIMISTIC GDP ASSUMPTION
NON-FERROUS METALS	99.45	94.17	85.28	143.88	130.29	242.98	305.49	276.54
BREWERIES (1961=100)	76.99	70.51	68.73	94.45	92.07	125.18	162.13	158.03
OTHER BEVERAGES (1963=100)	112.95	121.70	108.68	161.72	144.41	163.50	251.49	224.57
CHEMICALS*	120.11	107.20	104.41	163.22	158.97	398.58	429.67	418.48
PHARMACEUTICALS (1962=100)	157.52	147.07	136.14	232.82	215.51	284.38	423.91	392.40
PRINTING & BINDING OF BOOKS	121.13	126.59	116.10	142.08	130.31	234.00	326.95	299.86
SOAP & PERFUMES	173.82	216.13	163.95	278.09	210.95	213.47	341.51	259.06
GLASS	97.00	90.96	85.14	136.41	127.67	155.45	225.41	210.98
RUBBER	111.63	100.85	91.28	148.71	134.60	223.40	279.49	252.98
PLASTICS (1962=100)	248.40	371.62	315.79	464.41	394.64	457.27	854.90	726.47

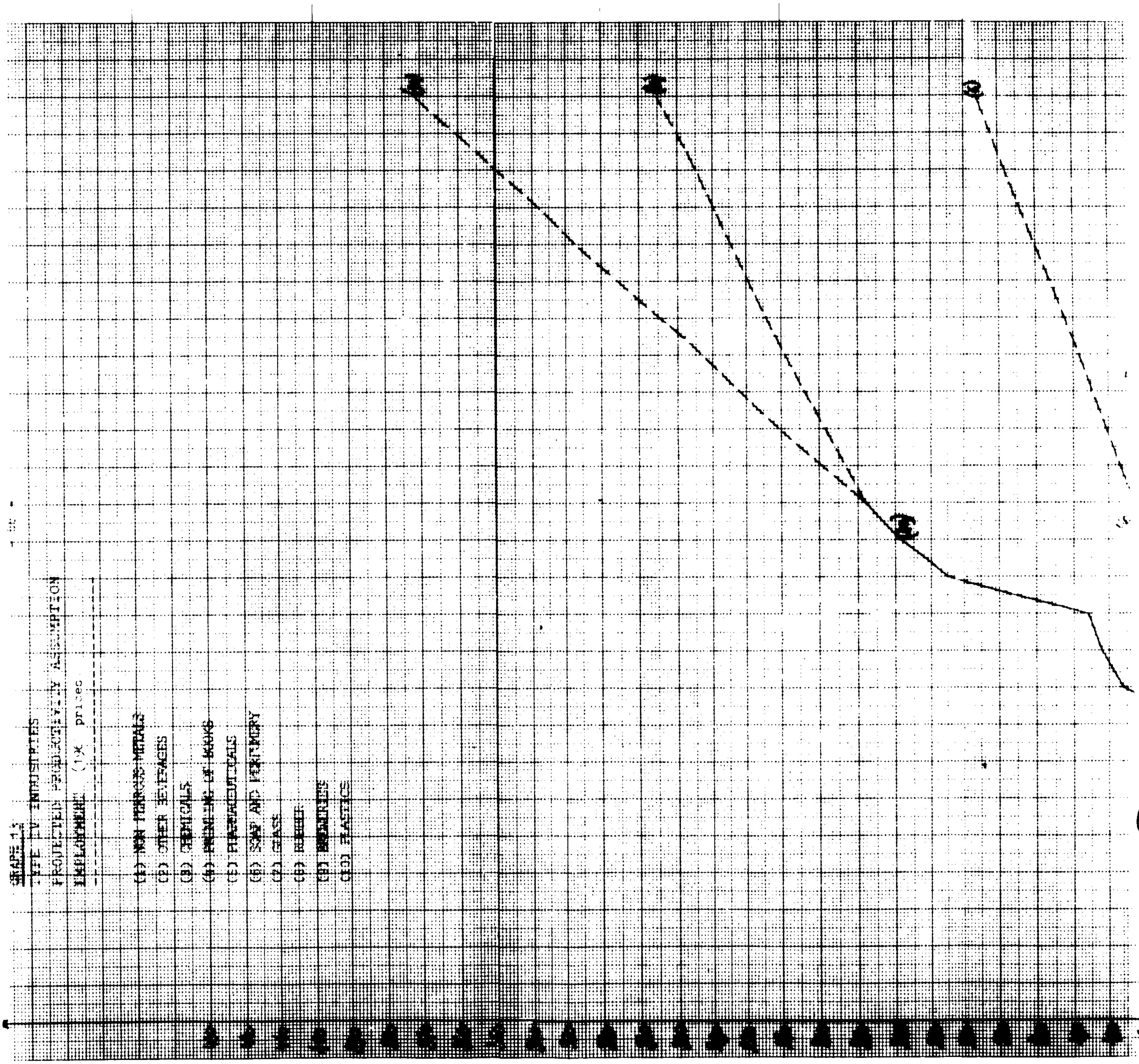
* Last year of observation is 1975.


GRAPH 1E
TYPE IV INDUSTRIES - OUTPUT PROJECTIONS
(1) NON FERROUS METALS
(3) CHEMICALS
(4) PRINTING OF BOOKS
(5) PHARMACEUTICALS
(6) SOAP AND PERFUMERY
(7) GLASS
(8) RUBBER
(10) PLASTICS

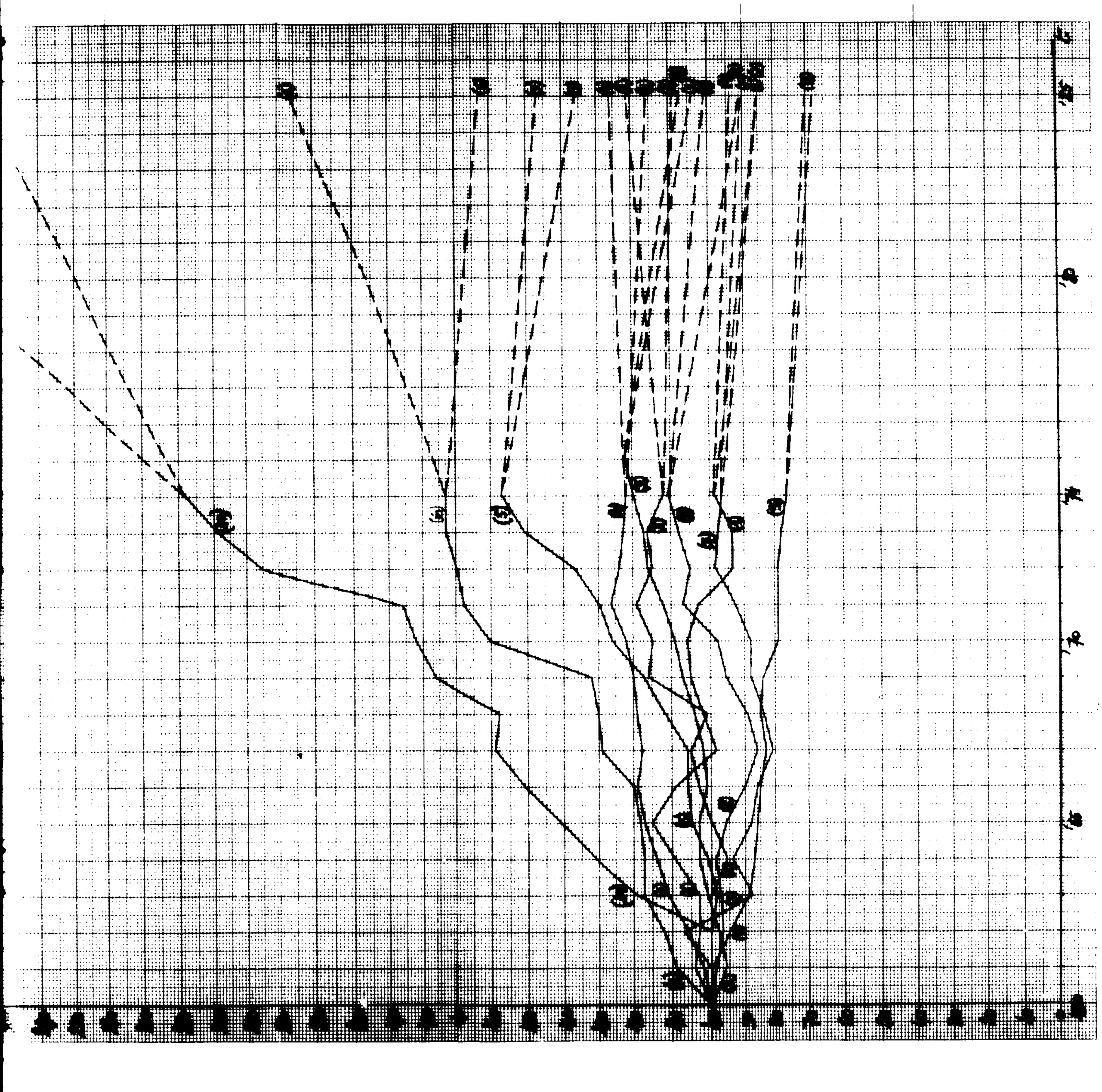
SECTION 1



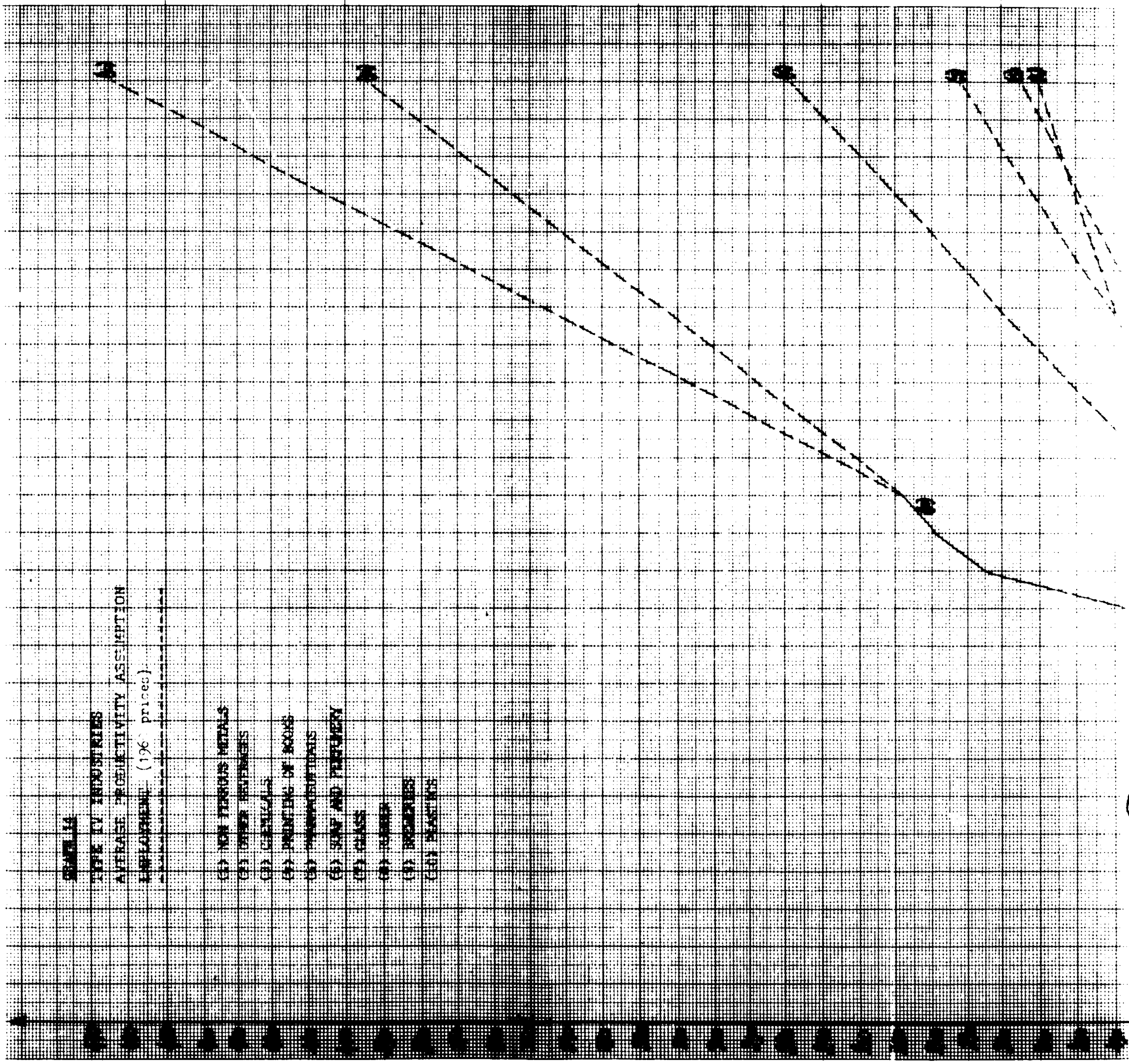
SECTION 2


TYPE IV INDUSTRIES
PROJECTED PRODUCTIVITY ASSUMPTION
EMPLOYMENT
(1) NON FERROUS METALS
(2) OTHER BEVERAGES
(3) CHEMICALS
(4) PRINTING OF BOOKS
(5) PHARMACEUTICALS
(6) SOAP AND PERFUMERY
(7) GLASS
(10) PLASTICS

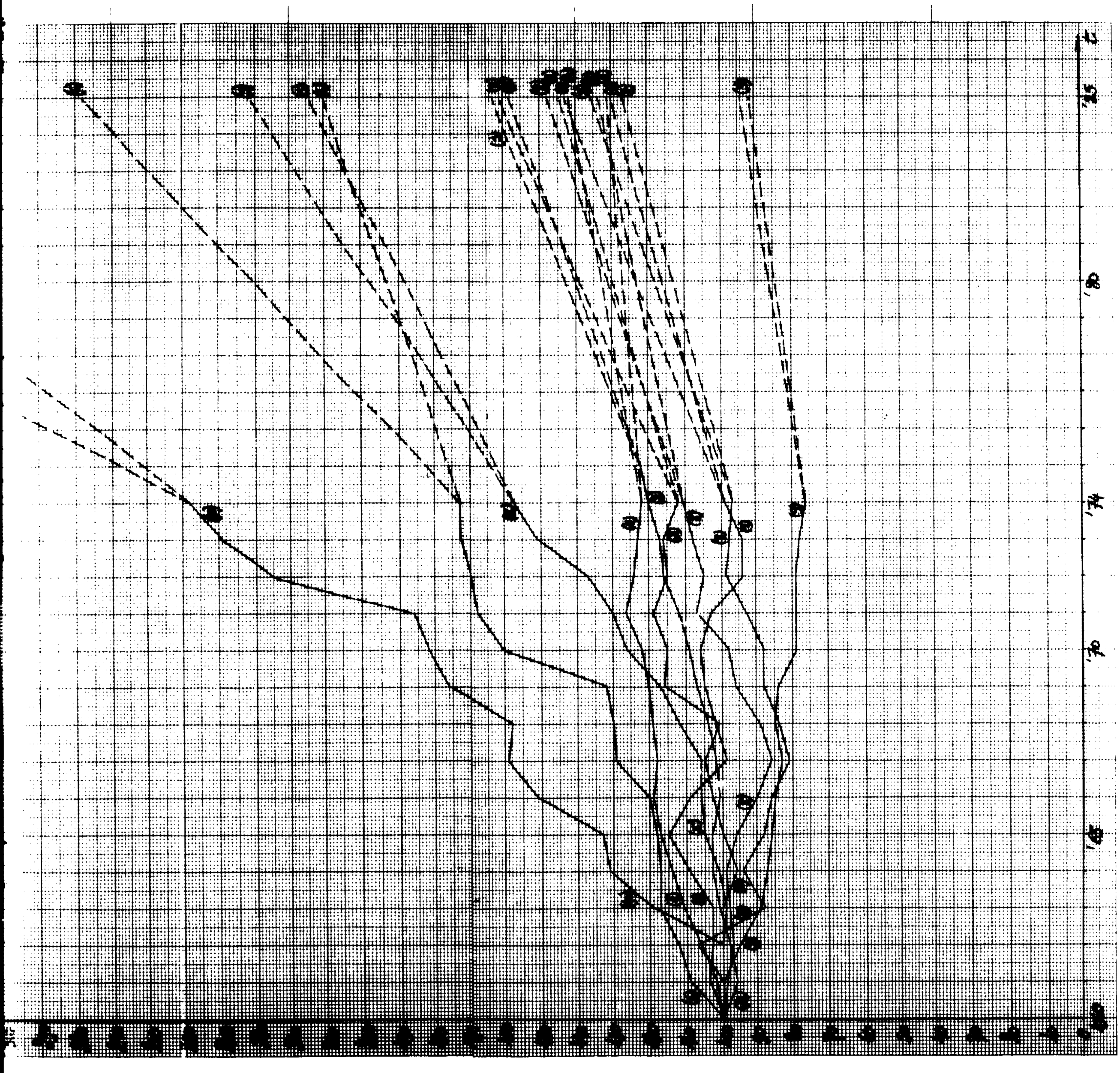
SECTION 1



SECTION 2


GRAPH 14
TYPE IV INDUSTRIES
AVERAGE PRODUCTIVITY ASSUMPTION
EMPLOYMENT (196 prices)
(1) NON FERROUS METALS
(2) OTHER BEVERAGES
(3) CHEMICALS
(4) PRINTING OF BOOKS
(5) PHARMACEUTICALS
(6) SOAP AND PERFUMERY
(7) GLASS
(8) RUBBER
(9) BREWERIES
(10) PLASTICS

SECTION 1



SECTION 2

Table 25. Type IV industries

Recent Data not Included in the Calculation

	Output deflated			Employment		
	1974*	1975	1976	1974*	1975	1976
Non-ferrous Metals	242.98	165.51	-	99.45	94.13	-
Breweries	125.18	117.72	-	76.99	68.58	-
Other Beverages	163.50	169.01	-	112.95	108.68	-
Chemicals	398.58	323.13*	-	120.11	122.77*	-
Pharmaceuticals	284.38	308.01	-	157.52	159.58	-
Printing and Binding of Books	234.00	253.04	-	121.13	109.96	-
Soap and Perfumes	213.47	-	-	173.82	-	-
Glass	155.45	131.57	-	97.00	83.06	-
Rubber	223.40	162.40	-	111.63	99.51	-
Plastics	457.27	-	-	248,40	-	-

* Included in the calculations.

SUMMARY AND CONCLUSION

The objective of the Belgian study is to make a tentative identification of industries for which Belgium has comparative advantages and disadvantages vis-à-vis the developing countries.

The characteristics of the Belgian economy (high physical and human capital endowment and low natural resource availability) were mainly responsible for the approach used in this study. Concentrating on a few neo-factor proportions variables with relatively well known normative implications and following the neo-classical theory of comparative advantages, industrial subsectors are identified which display comparative advantages and disadvantages according to various indicators such as capital stock per man, total and non-wage value added and natural resource product requirement.

After quantifying the mentioned variables for the Belgian industry sectors, their relevance in explaining the "revealed comparative advantage" of Belgium vis-à-vis the developing countries was empirically tested with regression analysis.

The results show, that the natural resource product requirement variable is clearly far more important than total capital intensity (total value added per man) in explaining the patterns of Belgium's revealed comparative advantage with respect to the developing countries.

The next stage of this study was to try and establish the relationships between the exogenous variables of total value added per man and the cumulative natural resource requirements of the Belgian industries. In the process four degrees of relationships between the exogenous variables emerged. Using these degrees the entire sample of industries was classified into four types of industries 1/ which also indicate general comparative advantages; the classification is summarised in table 4 on page 17.

Those industries which are listed under the classification of low cumulative natural resource produce requirements and high value added per person are in general those for which Belgium has comparative advantages vis-à-vis the developing countries.

1/ The classification criteria are the intensities of cumulative natural resource product requirements and total value added per man. Four combinations are possible: High-high, high-low, low-high, low-low.

The available evidence on the possibility of factor intensity reversals and the degree of skill content was used to qualify the classification. It should be noted that owing to various factors, such as policy distortions, the actual performance of some of these sectors can vary from that suggested by the underlying structure of comparative advantage and disadvantage. It is also possible that particular branches within given sectors have characteristics that deviate substantially from the limits of each category.

The study goes on to forecast structural changes in industry-sectors. An aggregative approach was used which could deal with 48 sectors and which involved the building of an econometric model to explain the total output of the Belgian industry sectors in function of relevant variables. This approach implied the following steps: first of all the four-category classification was used again. Secondly, short case studies were compiled on each one of the sectors covered, which included analysis of output trends, international trade relationships and employment trends. For the quantitative assessment of sector prospects, separate regression equations were formulated. The results, where they proved to be significant, were retained for the projection exercise. The results of the projections analysis for the year 1985 show that in general it is to be expected that the type IV industries will constitute "growth sectors". Among the type I industries, only canned fish and canned vegetables show increasing output projections. And from those two only canned vegetables will be able to increase its employment level, while the other sectors of this industry group show a downward employment trend.

These results show very clearly that it is not the structurally weak labour intensive industries which will contribute positively to employment creation in Belgium.

The employment projections of type II industries turn out to be more optimistic than those of type I: cement, paper and cardboard, wood and clothing show an increasing employment level, while for tobacco, clay, felt, fur and footwear a decline in employment may be assumed. Except for the tobacco industry, all the latter industries show at the same time a clear decline in output level. Almost all type III industries seem likely to perform well in the coming years. Only the coal agglomerates, cokes and oils and fats sectors show a decreasing output level up to 1985, and iron and steel is clearly the main problem sector of Belgian industry. Petroleum refineries, however, show the greatest growth potential under the assumptions used.

Although the group IV industries are the real growth sectors, the employment implications are limited, because growth will presumably take the form of a high increase of productivity per worker.

As in the previous part of this study, certain reservations have to be made with regard to the results of this latter part. Although both "pessimistic" and "optimistic" projections were made, one can never be sure that these will really hold in the future, just as the nature of the relationships between the variables may change.

However, taking these reservations into account, Belgian policy with respect to an optimal international division of labour and future industrial and economic development at home should benefit by the consideration given to the pattern of specialisation suggested in this study.

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APPENDIX

Classifications

The classification is the same as the one used in Table 2 (pp. 7 - 9). See J. Busschaert and A. Vaes, Correspondence between Industrial-, Input/Output- and Trade Classifications, Centre for Development Studies, UFSIA, Antwerpen, 1976, paper no. 76/15.

The NACE-numbers can also be found in the above-mentioned paper no. 76/15.

CES = SITC-numbers in part 3 of G. Van Den Bergh, Klassificatiesystemen van de Internationale Handel, een Sleutel tussen NACE-CLIO en SITC, Centrum voor Ekonomische Studiën, KUL, Leuven, August 1972.

Name	S.I.T.C.	Input/Output Table 1965	Input/Output Table 1970	Tables of Planning Office
Pits and Quarries	CES 230 + 663(4+5)	35.1	15.5	12
Meat Preparations	012; 013	3	31	20
Fish Preserves	031(2,3); 032	4	35	22
Vegetable Preserves	054.6; 055(1+5)	4	35	22
Jam and Marmelade	053 excl 053.5	4	35	22
Dairy Products	CES 413	7	33	21
Grain Milling	042.2; 046; 047; 081.2	8.1	35	22
Bakeries, Biscuits, etc.	048	8.2	35	22
Sugar	CES 420	5	35	22
Chocolate	CES 421	6	35	22
Alcohol and Yeast	112(2+4)	10.2	37	23
Breweries	048.2; 112.3	10.2	37	23
Other Beverages	053.5; 111; 112.1	10	37	23

Name	S.I.T.C.	Input/Output Table 1965	Input/Output Table 1970	Tables of Planning Office
Tobacco	122	11	39	24
Oils and Fats	CES 411 - SITC 091.4	12	35	22
Margarine	091.4	12	35	22
Chemicals	CES 252; CES 253; SITC 862 895.2	43, 44, 47	17	13
Soap and Perfumes	CES 257 - SITC (541,862, 895.2)	47	17	13
Pharmaceuticals	541	47	17	13
Rubber	CES 481	48	49.1	30
Wood Sawing [a)]	243	28	45	28
Wood Manufacturing [b)]	631; 632; 821	28, 29, 1	45	28
Baskets, etc. [c)]	633; 841.52; 899.2	28	45	28
Paper and Cardboard	CES 471	30	47	29
Paper and Cardboard Manufacturing	CES 472	31	47	29
Printing of Newspapers	892.1	32	47	29

a) For this sector, it is better to look up the trade figures mentioned in De Belgische Ekonomie in ... (relevant years), Ministerie van Ekonomische Zaken, Brussels, for sawed, carved, simple processed wood;

b) Idem: veneer...+ wood processing n.e.c. + furniture;

c) Idem: brushes + baskets + cork processing.

Name	S.I.T.C.	Input/Output Table 1965	Input/Output Table 1970	Tables of Planning Office
Printing and Binding of Books	892 excl. 892.1	32	47	29
Leathertanning	CES 441	25	43	27
Fur, Pelt	842	24	41	25/26
Fire Proof Clothing, Shoes, etc.	CES 442	27	43	27
Washing & Carbonising of Wool a)	262(1,2)	21.1	41.3	26
Combing of Wool b)	262(7,8)	21.1	41.3	26
Wool Spinning	651.2	21.2	41.3	26
Jute Spinning c)	653.4	21.2	41.3	26
Cotton Spinning	651(3,4)	21.2	41.3	26
Felt	655(1,2)	22.2	41.3	26
Wadding d)	655(8,9)	22.2	41.3	26
Wastage of Textiles	267	22.2	41.3	26
Weaving	652; 653	22	41.3	26
Hosiery	CES 436	23	41.1	25
Clothing	841	(24, 22.2)	41	25/26
Footwear (Shoes, Slippers)	612.3; 851	26	43	27
Cokes	321.8; 521(1+3)	15	5	3

a) De Belgische Ekonomie in ... (relevant years), Ministerie van Ekonomische Zaken, Brussels: washed wool, grease of wool;

b) Idem: wool or hair;

c) Idem: yarns of jute;

d) Idem: wadding, etc.; includes articles for technical use.

Name	S.I.T.C.	Input/Output Table 1965	Input/Output Table 1970	Tables of Planning Office
Agglomerates of Coal	321(5+6)	14.2	3	2
Petroleum Refineries	332	17	7	4
Clay products	662; 663.7	41	15.5	12
Ceramics	663.9; 666; 812.2	41	15.5	12
Glass Products and Glass Manufacturing	CES 247	42	15.1	10
Agglomerates of Cement and Asbestos	661.8; 663.6	10	15.3	11
Concrete	NO TRADE	40	15.3	11
Iron and Steel	CES 221; CES 222	(33, 36, 37)	13.1	8
Non-Ferrous Metals and Non-Ferrous Metals Manufacturing	68	38, 39	13.3 + 19	9/14
Plastics	CES 483	49	49.3	31
Scrap-Iron	282, 284	-	-	-

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