

AN ANALYSIS OF THE POLICY-MAKING IN REGULATING THE INDUSTRIAL STRUCTURE AND DISTRIBUTION IN TRADITIONAL INDUSTRIAL BASE IN MIDDLE LIAONING PROVINCE

Fan Jie (樊杰)

(*Institute of Geography, the Chinese Academy of Sciences, Beijing 100101, PRC*)

ABSTRACT: Vigorous development of old industrial bases is one of the decisive strategies accomplishing the industrial modernization in China. From a new viewpoint, the traditional economic-geographical factors such as structure of mine resources, economic and technical base, and natural environment, and new factors such as evolution of industrial structure, the change of macro-regional and-industrial policies, reform of economic system and management and transform of industrial organization are comprehensively studied and analyzed. The conditions to regulate industrial structure and distribution in old industrial bases are evaluated. The program for regulating industrial structure and distribution of old heavy industrial base in middle Liaoning Province including five cities of Shenyang, Anshan, Fushun, Benxi and Liaoyang is put forward, which is accepted by the Territorial Planning of Liaoning Province worked out from 1988 to 1990. With the aid of the analysis of hierarchical process (AHP), the program is examined and evidenced.

KEY WORDS: regulation of industrial structure, industrial base, middle Liaoning Province

I. INTRODUCTION

The development of modern industry in China has a short history of some one hundred years, and the national industrialization moved on slowly before the founding of the People's Republic of China. However, up to 1949, two areas with relatively concentrated industry—the Middle Liaoning Province (MLP) and the Changjiang (Yangtze) River Delta—had took their shapes roughly, playing important roles in the development of national

economy at that time. They have been continuing to be the largest heavy industry base and the largest light industry base of China respectively in the following forty years. Under the new circumstances of the economic system and macroscopic policies, these two bases have been confronted with the same problem of renewing economy. And it is more urgent for the heavy industrial base of MLP, which has serious problems in such aspects as resources, environment, structure and location, to hammer out a new development strategy and to readjust its industrial structure and location accordingly.

II. NEW DEVELOPMENT MECHANISM AND MAIN DEVELOPMENT CONDITIONS

1. Relation between the Structure of Mineral Resources and Industrial Development Process

The development of modern industry of the industrial base of MLP at the early stage was mainly based on its unique geographical location and abundant mineral resources such as coal, iron, and so on. In the first period after the founding of the People's Republic of China, rich endowment of mineral resources was the key advantageous factor which made this industrial base become the industrial construction area with national priority. After its quick jump into the heavy industrialized stage with raw material industries as its mainstay, the evolution speed of its industrial structure into processing economy is relatively slow. At present, excavation industry and raw material industry are still the dominant part of this industrial base (Table 1), which means that it is still in the former period of the middle stage of industrialization.

The outstanding superiority of the mineral resources of MLP nationwide (B2, index of the model of this paper, Fig 2) has determined the basic function of the base to produce raw materials and supply them to the whole country, and this function is irreplaceable by other areas of the country. The advantageous conditions of good territorial combination of mineral resources (with plentiful iron ore resource accounting for 20% of the country's total) of iron and steel industry determine the dominant role of metallurgical industry with iron and steel industry as the main part in the industrial structure of the base. Metallurgical industry accounts for 1/4 of the total industrial output value of the base, and 13% of the gross output value of China's metallurgical industry comes from this base. More than half of the products of iron and steel industry of this base is supplied to other regions in the whole country, and steel products of this base account for one sixth of the national total. As a result of the predominance of mineral resources, strong production basis of raw materials and increasingly domestic demand for iron and steel, it is difficult for MLP to enter the industrialization stage with light structure quickly.

Table 1 Comparison of gross industrial output value composition among the whole country, Liaoning Province and MLP (1986)

Area	Taking gross industrial output value as 100		Taking output value of heavy industry as 100			Taking output value of light industry as 100	
	Heavy industry	Light industry	Excavation industry	Raw material industry	Processing industry	Using materials of nonagriculture products	Using materials of agriculture products
	China	49.7	50.3	11.0	36.0	53.0	32.2
Liaoning	67.8	32.2	6.4	49.6	44.0	35.0	65.0
MLP	74.5	25.5	2.6	55.7	41.7	38.0	62.0

Source: "Statistical Data of National Economy" of China, Liaoning Province, and MLP (1987)

2. Relation between Eco-Technological Bases and Macroscopic Regional and Industrial Policies

The industrial base of MLP has a powerful industrial economic strength (B_1). (1) The total industrial employment number of the base is 2.66 million, and its annual gross industrial output value is 63.1 billion yuan (RMB). The outputs of its major products such as iron and steel, nonferrous metal, fuel oil, ethylene, synthetic fibre, mining equipments, alternating current electromotor, cable, power transmission and transform equipment and so on separately account for some 10% of the country's total. (2) All of the five cities in MLP have a higher level of urbanization and outstanding leading industry. (3) Close economic linkages among individual regions and industrial departments have taken their shapes, forming the entire superiority of comprehensive system of heavy industry. Besides, strong infrastructure and public service system (B_3) have been developed in this base.

The achievement of such strong economic basis of this base is mainly due to the very good combination of its construction conditions and advantages with macroscopic regional and industrial policies during the past key construction periods. In the country's First Five-Year Plan period, the general guiding principle of developing national economy was "making full use of the established industrial basis, taking energy and raw material industries as the core of construction". Accordingly, the MLP acquired about 10% of the nation's total investment in industrial construction, and quickly became the largest heavy industrial base in China with a mainstay of raw material industries, including iron and steel industry and so on, and machine-electric industry.

Afterwards, the development of MLP was greatly affected by the national policies of emphasized construction of “the third line” (areas which are far from the coastal areas) and the balanced regional development concerning the west part and east part of China. Particularly in the period after 1978, the characteristics and advantages of resource structure and industrial structure of this industrial base had been not well coincident with the introduction of market economy and the open-up policy, compared with other areas such as the Changjiang River Delta and so on. So the industrial growth rate of the MLP relatively slowed down. In 1979–1989, the annual growth rate of gross industrial output value of Liaoning Province was 9.7% (while that of the MLP was lower than this rate), which was not only lower than that of the country’s average (12.4%), but also the slowest among all of the coastal provinces. This means that there exist unfavorable factors in the industrial structure of MLP, which strongly influence the developmental mobility, speed, and efficiency of the base under the new circumstances of economic growth.

3. Relations among Industrial Departments and between Industry and its Construction Environment

Since the 1970s the problem of industrial structure (B_3)—the relation between light and heavy industries—has become increasingly evident, and works as the major reason for the slow development of industry of MLP. The ratio of the investment in capital construction of light industry to heavy industry of the base had been about 1:15 for a long time. The problem is that the superiority of investment in heavy industry itself suppressed the development of light industry, and the preferential development of heavy industry didn’t provided enough raw materials for the development of light industry. Table 1 shows that the proportion of light industry with non-agriculture products as raw materials in MLP was only slightly higher than that of the nation’s average level.

In the development period of national economy with shortage economy as the major characteristic in China, it tends to be a common problem that the regional infrastructure, such as energy, communication and transportation, could not meet the needs of regional industrial development. Because of the over-heavy industrial structure, this kind of problem is much more sharply in MLP. About 20% of the industrial output value of MLP is lost every year due to the electricity shortage. The large quantity of inward transportation of coal made the related railways overburdened, and 30% of the total demand volume of transportation can not be guaranteed.

The contradiction between industrial development and environment construction is sharply reflected in such aspects as eco-environment pollution and the serious shortage of

water resources (B_6) and land resources (B_7). Although the base contributes about 50% of the industrial output value of Liaoning Province's total, it let out 70% of the pollutant of the province's total, enhancing the problem of fresh water shortage of the base (whose fresh water resource only accounts for 33% of the province's total). There are nearly no cultivatable barrens left in MLP. As the possible expansion of industrial land-use is concerned, relatively good conditions exist only in Liaoyang City, and it is impossible for Benxi City to expand its industrial land-use on a large scale.

4. Relation between Economic Management System and Industrial Organization Form

For a long time under the control of single planning economic system, in the areas with heavy industry as their mainstay, the emphases were production rather than consumption life, territorial division of production and nation profit rather than comprehensive development of regional industry and local profit, steady increase of quantity rather than improvement of quality, such leading to a lot of serious problems in MLP.

Since 1949, about 80% of the total revenue of MLP had been turned over to the national government, with the accumulated amount enough to construct two other bases like MLP, but the construction of infrastructure for life was very poor in the base. As 80% of the total revenue of MLP came from industry, among which 80% came from heavy industry, the profit ratio of heavy industry was very low. Therefore, the remained industrial income was not enough to give impetus to the prosperity and development of the regional economy of MLP after transforming the system of distribution and redistribution of national income.

On the basis of requirements of scale economy of heavy industrial enterprises and national priority construction, large enterprises are the mainstay of the industrial organizational structure of MLP. In gross industrial output value, large enterprises provide 29% of the nation's total, but MLP's large enterprises provide 50% of the base's total. Such a kind of scale structure of enterprises is favorable to maintaining competitive advantages under both complete planned economy and complete market economy. But it hindered the high speed development of regional economy under the special situation when planning economy mechanism stresses the macro-control over large key enterprises while the coexisting market economy mechanism is favorable to the flexibility of small enterprises.

In the process of industrial development in China, there is a common problem that the capital construction is emphasized but the technical innovation and transformation is ignored. As a result, MLP became old-fashioned gradually. According to the data of General Survey of Industry (1985), the proportions of industrial technical equipment manufac-

tured in the 1970s and 1980s of the base (42% and 28%) were lower than that of the nation's average level (43% and 39%), but the proportions of the industrial technical equipment dated before 1949 and in the 1950s (3% and 16%) were higher than that of the country's average level (1% and 6%). The ratio of net fixed assets of industrial enterprises of MLP was still 6% lower than that of the nation's average level after several years' technical transformation.

Besides, the emphasis on its specialized function as the national heavy industrial base and the territorial division and coordination with other areas of the country will hinder the development of the export-oriented economy of the MLP. Although 11 counties (or cities) out of MLP were included in the authorized open economic zone of Liaodong Peninsula, the total amount of foreign trade purchase of the MLP only accounts for 34% of the Liaoning Province's total. Furthermore, the primary products such as agricultural products and mineral products account for 75% of the total export products. This means that the development of export-oriented economy of the base is divorced from its advantages of industrial structure. At the same time, the importation of technology and funds/ investment did not closely serve the technical transformation and upgrading of the industrial structure of the base.

III. SCENARIO OF ADJUSTING INDUSTRIAL STRUCTURE AND DISTRIBUTION

1. General Strategy, Decision-Making Network and Starting Point

Briefly speaking, the general strategy (A) of the base can be expressed as follows: under the new development mechanism of economic reform and open-up policy, to make full use of the relative advantages of resources and economic and technical foundation, to speed up the process of industrialization through adjusting industrial structure and distribution, and to acquire high economic, social, and ecological efficiencies.

On the bases of the study above, a decision-making network could be summarized with the major concern about the important relationship between developing conditions and adjustment directions. The basic factors taking into considerations for decision-making include: (1) According to China's experience and lessons of industrial development, national development priority in the short-term adjustment, and the long-term industrial policy, the development of energy and raw material industries will still be the national priorities. The MLP with heavy-chemical industries, based on excellent mineral resources structure and strong economic strength, will be one important area to make the nation's strategy come true. (2) Great attention should be paid to the realizing of long-term object of

processilization of heavy industry, based on the present level of industrialization, and taking upgrading of industrial structure and economic benefit of the base into account. It is possible for strong raw material industries to strengthen the development of local processing industries and light industry with the steady expansion of decision-making power of enterprises by means of providing funds and products. (3) New forms of industrial organizations like enterprise-groups are very helpful for the reorganization and interrelated development of the major backbone enterprises and middle-sized or small enterprises of the base, which not only made it possible to have a more reasonable inter-division and coordination among the industrial departments of the base, but also provided a very effective means for the industrial expansion from core areas to the nearby areas. (4) Taking actively part in the global economic circulation, especially the Northeast Asia Economic Ring, MLP should embody its competitive ability in the variety and quality of dominant products by means of improving the level of production technology, and upgrade the level of industrial structure by importing foreign technology and investment. (5) On the one hand, much attention should be given to the effect of technical progress while adjusting industrial structure and distribution to moderate the contradictions between ecological environment and resource allocation and utilization, or infrastructure; on the other hand, much more considerations should be given to the improvement of construction conditions, especially energy supply, communication and transportation, and development and utilization of water resources, which are the key supplement activities (E) to realize the general strategy.

2. Development of Industrial Departments

Firstly, the transformation of the leading industrial department from iron and steel industry to engineering industry should be completed gradually before the year of 2000. As the leading department, iron and steel industry (C_1) should be developed by enlarging the scale of iron and steel production, enriching the variety of products, increasing the proportions of high-alloy steel, low-alloy steel, and the output of steel plate and steel pipe or tube, and providing counterpart raw materials for the development of engineering industry and light industry of the base. After the year of 2000, engineering industry (C_2) will become the leading industry of the area. An industrial system, including heavy machine tool, mining and petrol-chemical equipment, electricity-transporting and transforming equipment and so on, should be established by means of improving technical transformation of enterprises, division of specialization and coordination among enterprises, and the integration of machinery and electric apparatus.

Secondly, with the prerequisite of not increasing the refining capacity of oil, enhance the processing depth and quality of products of petrochemical industry (C_3) should be enhanced, chemical industry serving agriculture and light industry and deep-processing chem-

ical industry should be developed actively. Based on the raw materials provided by the local metallurgy industry, petrochemical industry and so on, chemical fibre industry, plastics industry and metal processing industry should be developed emphatically.

Thirdly, the construction scale of energy industry (C_5), nonferrous metal refining industry (C_6), and building materials industry (C_7) should be controlled strictly, the structure of technology and products should be adjusted, putting emphasis on the construction of industrial projects with obvious economic and ecological benefit such as generating electricity by oil shale, heat and power plant in cities, and recovery and reutilization of industrial wastes.

Fourthly, new high-tech and industries should be developed step by step while innovating and transforming the traditional industries^[1].

3. Adjustment of Industrial Distribution

The first level: industrial expansion (F) towards the outer-circle (six cities adjacent to MLP). The outer circle is the important energy source base and port of export-oriented economy of MLP, with relatively backward industrial economy in the province. The circle covers 41% of the province's total population, and only 24% of the province's total industrial output value. There are great potentialities for industrial development in the circle, especially the coastal areas which will be the main location of industrial expansion. Correlated with the transformation of the metallurgical industry of the MLP, it is very significant to establish iron and steel base of Bayuquan port and nonferrous metallurgical industry base of Huludao.

The second level: strict controlling industrial development of the inner circle (other middle Liaoning areas surrounding MLP) (G). The construction of any kind of satellite towns or medium-sized or small cities with relatively strong industrial functions will macroscopically intensify the industrial agglomeration of core area and enlarge urban land-use in a disguised form. Only Xinmin and Haicheng, which are relatively far from the core circle and have good communication and transportation location and industrial bases, are qualified to be developed as sub-level industrial centers.

The third level: the directions of industrial development of five cities of MLP. Shenyang City (D_1)—take engineering industry and electronic industry as the pillars; maintain the developmental tendency of light and textile industries including textile, clothing and food industries; develop durable consumer goods, refine chemical and medicine products and new building materials; and reduce or abolish part of the technological process of

nonferrous metallurgical industry. Anshan City (D₂)—take development of iron and steel industry on a large scale as the core; establish the production system of engineering industry with smeltery equipment as the main part; develop properly chemical industry including coal chemical industry as well as petrochemical industry and cement industry (using slay). Fushun City (D₃)—take oil refining industry and petrochemical industry as the leading; develop refined chemical industry, manufacturing of chemical goods for daily use, rubber and plastic industry properly; control or reduce the production scale of primary products of nonferrous metallurgical industry. Benxi City (D₄)—Improve the variety and processing degree of the products of iron and steel industry; develop a metal-related production system of light industrial products such as consumer goods for daily use and consumer goods of high quality, and so on; increase the proportion of high grade cement in the total cement production; develop small-scale machine building industry and light industry processing local products properly. Liaoyang City (D₅)—establish an industrial system with integrated oil processing, chemical industry, and light and textile industry; make good use of local chemical materials to develop chemical fibre and light industries; enhance the production of existing competitive products such as special paper, medicine-making machine, and so on.

IV. EMPIRICAL AHP MODEL

1. General Form of AHP in the Study of Regional Development

A general form (Fig.1) of AHP Model in the research of regional development is designed on the basis of the important issues and work program of quantitative analysis: (1) Acquire the evaluation results of the influence degree of each basic conditions for realizing the general strategy by finishing the single-way priority ranking of level B related to level A. (2) On the basis of single-way priority ranking of level C related to each factor of level B, get the evaluation weight of different department in connection with some development condition; on the basis of the general priority ranking of level C related to level A, point out the position of each department in the realization of general aims. (3) Through the priority ranking of level D related to each factor of level C, get the direction of industrial development of each area; get the order of the priority regional development on the basis of the priority ranking of level D related to level A. (4) Clarify the importance degree of different measures in the realization of the general aims through the result of the priority ranking of level E related to level A^[2].

2. Structure of the Decision-Making Model of MLP

The decision-making model of MLP (Fig.2) is composed of two sub-blocks which only provide ideas of how to deal with the problems and are not included in the operation of

the system due to the unavailability of practical calculation. In the operation process of the model, the logic relationships among the conclusions of qualitative analysis are adjusted and packed in order continuously by means of consistency tests, and the conclusions of qualitative analysis mentioned above and the results of the operation of the model as follows are the final logically available results.

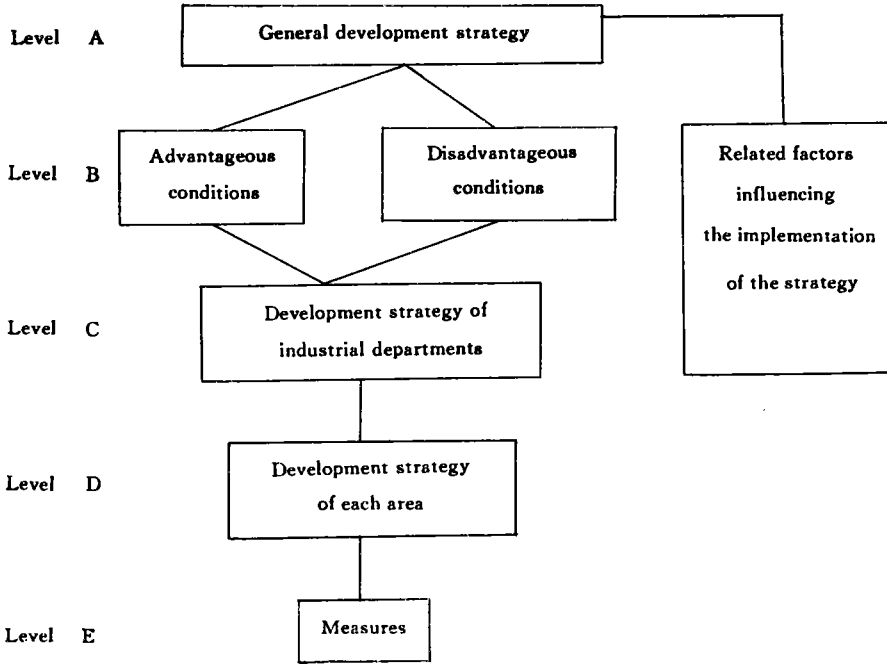


Fig.1 Model of hierarchic structure in regional development

3. Operation of the Model

Operation 1: Construct the judgement matrix. The calculations show that when $\lambda_{max} = 8.670$, $CI(\text{consistency index}) = 0.096$, the result of general priorities is fixed. It illustrates that the key factors for realizing the development strategy are strong economic and technological basis, abundant mineral resources, industrial structure problem and lack of land resources.

Operation 2: Construct eight judgement matrixes separately according to eight factors of level B, get the different features (Table 2) of various development conditions of each department. For example, Column B_8 shows that the key problem of industrial structure is

the weakness of light and textile industry ($B_8C_4 = 36.21$, which is the maximum value), while the maximum value of line C_4 is C_4B_8 , suggesting that the major cause for the development of light industry lies in the adjustment of industrial structure. When $CI = 0.0612$, the results of general priorities of level C related to level A is got. On the basis of this result, the factors of level C could be divided into three groups: $\{C_1, C_2\}$ —with iron and steel industry and engineering industry as leading industrial departments; $\{C_4, C_3\}$ —with light and textile industry and petrochemical industry as key departments; $\{C_7, C_5, C_6\}$ —with building materials, energy, and nonferrous metallurgical industries as general departments.

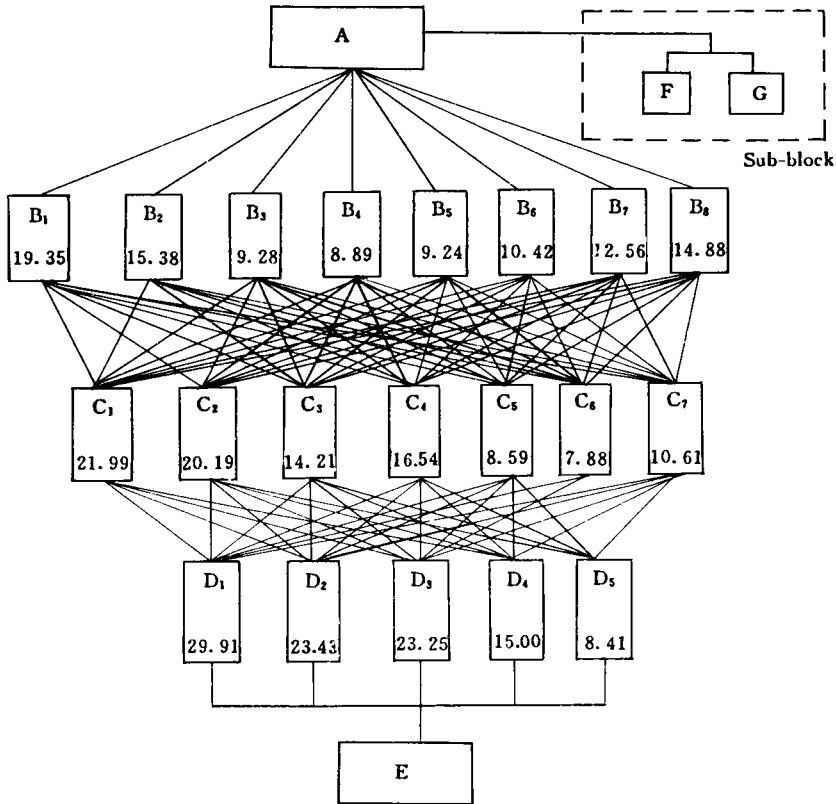


Fig.2 Model of hierarchic structure and composite priorities for industrial base of MLP

Operation 3: Construct seven judgment matrixes of level D related to level C. When $CI = 0.0603$, the results of general priorities of level D related to level A are got, indicating that the priority ranking of regional influence on the level A are Shenyang, Anshan, Fushun, Benxi, and Liaoyang, which is in line with the economic strength of each city and

the relationship between the development priorities of each city and the general development strategy. The industrial development priorities of each city can be decided on the basis of the single-way priority ranking of level D related to level C (Table 3). For example, in line D_2 , the industrial priority of Anshan City is iron and steel industry ($D_2C_1 = 57.10$, which is maximum value). For column C_2 , the focal point of regional distribution of engineering industry is Shenyang City ($C_2D_1 = 48.51$, which is the maximum value).

Table 2 Priorities and consistency index for level C related to every element of level B

	B ₁	B ₂	B ₃	B ₄	B ₅	B ₆	B ₇	B ₈
C ₁	31.83	51.97	27.93	10.80	8.31	10.11	7.63	10.09
C ₂	25.00	—	21.16	12.35	27.84	30.06	30.78	18.29
C ₃	16.37	4.72	16.89	35.27	16.97	8.41	11.49	11.61
C ₄	10.47	—	9.16	16.71	25.27	25.43	14.34	36.21
C ₅	6.85	13.09	5.52	10.04	4.42	6.88	11.07	8.93
C ₆	5.19	8.06	11.83	6.04	5.49	6.35	13.14	7.66
C ₇	4.29	22.15	7.50	8.35	11.69	12.75	11.54	7.26
λ_{\max}	7.237	5.290	7.344	7.442	7.221	7.592	7.348	7.389
CI	0.039	0.072	0.057	0.074	0.037	0.098	0.058	0.065

Table 3 Priorities and consistency index for level D related to every element of level C

	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	C ₇
D ₁	6.47	48.51	13.61	48.31	12.40	66.67	23.08
D ₂	57.10	22.77	8.65	8.91	16.40	—	16.40
D ₃	12.37	13.78	49.81	23.16	38.75	33.33	12.40
D ₄	24.06	9.66	5.12	5.69	23.08	—	38.75
D ₅	—	5.28	22.81	13.93	9.37	—	9.37
λ_{\max}	4.140	5.301	5.328	5.391	5.146	2.000	5.146
CI	0.047	0.075	0.082	0.097	0.037	0.000	0.036

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