

REGIONAL ECONOMIC GROWTH IN CHINA: TOWARDS AN  
ANALYSIS OF REGIONAL DISPARITIES IN A SOCIALIST ECONOMY

by

CYRIL LIN

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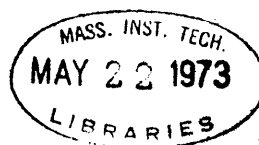
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Signature of Author.....  
Dept. Urban Studies and Planning, January 22nd, 1973

Certified by.....  
Thesis Supervisor

Accepted by...  
Chairman, Departmental Committee on Theses

Rotch



ABSTRACT

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This thesis represents the first step of a research effort undertaken to understand the problems of regional development in the People's Republic of China. It is designed primarily to (1) determine the nature and extent of the regional problem in China with specific reference to regional income disparities; (2) analyze and describe the dynamics of regional economic growth in a Socialist economy; (3) review theoretical and operational models which offer analytical insights into the problem and which could serve as a prototype in the construction of a model of regional growth that could simulate the pattern of regional income convergence-divergence in China; and lastly (4) measure the usefulness of Western regional economic growth theory to developing Asian economies in policy making.

Although no conclusions are made at this stage of the research, the essential feature of Chinese regional economies and the relevant variables and relationships are described. The development of the Chinese spatial economy is also discussed. Finally, a research strategy for future work into the topic is mapped out given the basic information of Chinese regional economies presented in this thesis.

Thesis Supervisor

John Harris

Title

Associate Professor,  
Dept. of Urban Studies and Planning  
Dept. of Economics

"The philosophers have interpreted the world in various ways; the point however is to change it."

-- Karl Marx

"Changes in society are due chiefly to the development of the internal contradictions in society, that is, the contradiction between the productive forces and the relations of production, the contradiction between classes and the contradiction between the old and the new; it is the development of these contradictions that pushes society forward and gives the impetus for the suppression of the old society by the new."

-- Mao Tse-tung

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## CHAPTER ONE: INTRODUCTION

1.1 Perspective

Although many economic theories have paid particular emphasis on the time structure of their analyses, they usually omit specification of the spatial dimension. Traditionally, economic theory has assumed that non-economic factors have a preponderant influence on the spatial distribution of economic activity: since the location of natural resources is fixed, non-economic factors influence the decisions of where to produce, sell, and live. The historical pattern of spatial development, however, suggests the influences of systematic forces other than the mere location of resources and factors.<sup>1</sup>

In capitalist and mixed-market economies, automatic market forces would theoretically maintain a spatial equilibrium. Factors, e.g., labor and capital, would migrate to places with the highest remuneration, thus inducing an equalization of income. Where these factors were immobile or less able to move, the exchange of commodities could play the same equilibrating role.<sup>2</sup>

In planned economies of the Socialist type, spatial equilibrium could also theoretically obtain through a central

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<sup>1</sup>See the discussion in Bos (1965).

<sup>2</sup>This is an adaptation of theorems developed in international trade theory to an interregional context. Mundell (1957) showed that where factor mobility was perfect and commodity mobility was not, factor price equalization could obtain through factor mobility. This is the reciprocal of the classic Heckscher-Ohlin factor price equalization theorem.

determination of the allocation of resources and factors. Aside from the problems of rationality (efficiency in central planning in physical terms without prices), the question of maintaining a spatial equilibrium becomes one of optimization. Although such an approach would be severely limited by the mathematical difficulties involved in solving an immense system of equations describing all the constituent units of the economy, the fundamental problem remains to be a lack of an understanding of the dynamics of regional economic growth and its attendant phenomenon of income disparities.

Differences in per capita incomes between regions of a national economy have increased in the past, and examples of draining of capital and labor from low to high income regions can be found in both developed and developing countries, in both market and socialist economies. An international cross-section study by Williamson (1965) of regional inequities (disparities) in 24 countries established the universality of the problem (cf. Table 1.1). Grouped according to Kuznet's seven level-of-development classification, these countries suggest a significant relationship between regional inequities and the level of development for averages of each income class. In yet another study by Mera (1970) on the same topic, it is observed that per capita income of different regions of countries differ greatly, and this disparity appears to be related to the degree of urbanization.<sup>1</sup>

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<sup>1</sup>Mera points to the fact that in the United States, the per capita income of predominantly urban Connecticut is slightly more than twice that of rural Mississippi, and in Japan, the per capita product of Tokyo Prefecture is about two and a half times that of rural Kagoshima Prefecture. In the developing countries, the per capita income of the South in Brazil is three times that of the Northeast. In India, West Bengal and Maharashtra States which include the metropolises of Bombay and Calcutta have a per capita net domestic product about 40 percent higher than the national average.

TABLE 1.1

International Cross-Section Comparison of Regional Inequities<sup>a</sup>

Country and Kuznets group classification	Years covered	$V_w^b$	$V_{uw}^c$	$M_w^d$	Size (miles <sup>2</sup> )
Group I					
Australia	'49/'50-				
	'59/'60	.058	.078	4.77	2,974,581
New Zealand	'55	.063	.082	4.93	103,736
Canada	'50-'61	.192	.259	17.30	3,845,774
United Kingdom	'59/'60	.141	.156	11.39	94,279
United States	'50-'61	.182	.189	16.56	3,022,387
Sweden	'50, '55, '61	.200	.168	15.52	173,378
Group I average		.139	.155	11.72	
Group II					
Finland	'50, '54, '58	.331	.276	26.64	130,165
France	'54, '55/'56,				
	'58	.283	.215	20.80	212,659
West Germany	'50-'55, '60	.205	.205	16.98	94,723
Netherlands	'50, '55, '58	.131	.128	12.45	12,850
Norway	'52, '57-'60	.309	.253	23.84	125,064
Group II average		.252	.215	20.14	
Group III					
Ireland	'60	.268	.271	24.20	26,601
Chile	'58	.327	.440	30.65	286,397
Austria	'57	.225	.201	18.69	32,369
Puerto Rico	'60	.520	.378	42.31	3,435
Group III average		.335	.323	28.96	
Group IV					
Brazil	'50-'59	.700	.654	53.78	3,288,050
Italy	'51, '55, '60	.360	.367	30.94	117,471
Spain	'55, '57	.415	.356	32.32	195,504
Colombia	'53	.541	.561	46.70	439,617
Greece	'54	.302	.295	26.56	51,246
Group IV average		.464	.447	38.06	
Group V					
Yugoslavia	'56, '59, '60	.340	.444	25.54	95,558
Japan	'51-'59	.244	.222	19.98	142,644
Group V average		.292	.333	22.26	

TABLE 1.1

International Cross-Section Comparison of Regional Inequities  
(Continued)

Country and Kuznets group classification	Years covered	$\bar{V}_w$	$\bar{V}_{uw}$	$M_w$	Size (miles <sup>2</sup> )
Group VI Philippines	'57	.556	.627	29.59	115,600
Group VII India	'50/'51, '55/'56	.275	.580	19.39	1,221,880
Total Average		.299	.309	23.78	

<sup>a</sup>From Williamson, (1965), p.112.

<sup>b</sup>A weighted coefficient of variation which measures the dispersion of the regional income per capita levels relative to the national average while each regional deviation is weighted by its share in the national population.

<sup>c</sup>The unweighted coefficient of variation.

<sup>d</sup>An alternative measure which sums the differentials to the first power with signs disregarded. This statistic produces a significantly different result only in the case of the Philippines.

Friedman (1966) describes the abrupt awakening to the spatial dimension of economic development in part as a consequence to rapid and dramatic changes in the economic life in the postwar era:

"An urban revolution -- propelled by vast internal population transfers and the automobile -- engulfed the remnants of Europe's nineteenth century cities. Old agricultural problem areas clamored for the attention of a population newly grown rich and demanded a rectification of ancient and patiently borne griefs. Technological progress often bypassed traditional centers of commerce and industry and left them to cope with obsolete facilities, high taxes, and an overaged but underemployed labor force. Finally, the spatial shifts in productive facilities which were predicted to follow from the realization in full of the objectives of a Common European Market raised serious problems of adjustment in the areas of rapid expansion -- the 'growth poles' of the New Europe -- no less than in the areas of stagnation or decline."

In the developing countries, "growth pains" often manifest themselves in the form of an urban-rural dichotomy, epitomizing regional differences in the distribution of economic activities, incomes, and welfare. Consequently, urban growth has become a problem identified within the domain of regional policy.

Thus, the existence of regional disparities in the course of national economic development in the developing countries on the one hand, and its persistence in the developed countries on the other hand, have spurred the addition of regional development as a fourth concern in what Friedman (1966) calls the original triad of national independence,



national economic development, and national planning. More than just recognizing the existence of geographical inequities in the distribution of activities and welfare, regional economics, which is the substantive content of regional policy, implies a corollary belief that national development strategies are often best implemented at the regional level. Witness that a principal research area in regional economics, the phenomenon of regional disparities, derives basically from policy concerned more with the political implications of regional differences in income levels than with the optimal spatial distribution of economic activities. The thesis that regional policy is a function of the spatial transformation engendered by economic growth has been maintained by Friedman (cf. Table 1.2).

It is the same host of concerns that have prompted the simultaneous emergence of regional economics in the Socialist-bloc countries. Although theory has not evolved as formalized in the West, Marxist research has been more preoccupied with the practical problems of maintaining both a spatial equilibrium and a material balance in planned economic growth. While it appears that almost all the Socialist-bloc countries have delineated national development strategies along regional lines, very little published information makes it difficult to ascertain the importance of regional development in the People's Republic of China.<sup>1</sup> Yet the problem of

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<sup>1</sup>The numerous articles and books on the subject as well

TABLE 1.2

Phases of National Development and Regional Policy<sup>a</sup>

Type of Economy	Preindustrial	Transitional	Industrial	Post-industrial
Industry as % of GNP (1950-1955)	0-10	10-25	25-50	declining
Importance of regional policy for national economic growth	inappropriate	critical	vestigial	shift to a new focus
Policy emphasis	creating pre-conditions for economic development	creating a spatial organization capable of sustaining transition to industrialism	depressed areas, area redevelopment; spatial adjustments to common markets	urban renewal, spatial order and circulation within metropolitan regions; open spaces
Examples of countries in category	Tanganyika Paraguay Bolivia Afghanistan Cambodia Burma	Venezuela Brazil Colombia Turkey India Pakistan Iraq Mexico	France Italy West Germany Japan Israel England Australia	U.S.A.

<sup>a</sup>From Friedman (1966), p.7.

regional development appears intuitively to be most serious in China. Consider the Chinese policies of developing new inland industrial centers in the frontier regions of Sinkiang, Kansu, and Tibet; the welfare implications of the migration from the countryside to the cities and the attendant government policies of relocating youths to the frontier regions and other rural restification programs; the problems faced by Chinese planners encountered with a poor transport network led them to emphasize regional self-sufficiency and to restrict interregional trade. These facts lead one to infer the presence of a regional problem whose order of magnitude must be commensurate with her population size.

This thesis represents the first step of a research effort this writer is undertaking to understand the problems of regional development in the People's Republic of China. The research effort is designed primarily to (1) determine the nature and extent of the problem in China; (2) analyze and describe the dynamics of regional economic growth in a Socialist economy; (3) construct a model of regional economic growth that could trace the historical pattern of regional growth in China from 1949 to the present; and secondarily to (4) measure the usefulness and validity of Western regional

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as their participation in various international conferences dealing with regional policy are good indications of Socialists' attempts to develop regional development policies. China, in contrast, has produced no available treatise on the subject to date to reflect a serious governmental level inquiry into the subject. See, for example, other Socialist-bloc countries' regional problems, Robinson (1969) and Isard (1961).

economic growth theory and operational models to the developing Asian economies.

This paper is not a Bachelor's Thesis in the traditional sense; no hypothesis is posed and tested. Nor is the bulk of the material covered in this thesis original contributions. Instead it represents more of a log-book of progress in my research effort. Nevertheless, the research effort, of which this thesis is the first part, will be a valuable educational experience in the fullest sense.

The problems involved in this research make it extremely difficult to delineate a logical sequence of study. The most basic concerns the availability of reliable Chinese data: I am gambling on the supposition that with increased exchanges between the West and China, this writer may be able to obtain much needed information with the assistance of the Chinese government; alternatively, there are good secondary sources in Hongkong and various research organizations in the United States.

A second difficulty relates to the selection of theory and models for my purpose. This problem is, in fact, of more immediate concern to me than anything else. Hopefully, this problem may be resolved as I develop a better understanding of the theoretical material when the research progresses. My plan of study will, therefore, be guided by expediency and my final product, a model of regional economic growth in China, will have to be an additive and cumulative result

integrated by parts.

The rest of this first chapter will be devoted to a brief exposition of the planning and analytical problems involved in this study: it defines the research area I want to focus on.

Chapter Two gives the institutional and structural framework of the Chinese political economy. It lists the objectives and elements of the Chinese development effort in so far as they are relevant to this study. The emphasis will be on isolating the factors determining national economic growth, and more importantly, the influences of structural change in the economy on regional growth. The spatial economy is also presented at length to show the influences of national economic growth on the regional distribution of economic activities.

Chapter Three is a quasi-comprehensive review of regional economic growth literature and operational models taken from various sources. It is an attempt to collect diverse theories into a coherent package immediately relevant to the question of regional economic growth. This will be the main body of knowledge from which I shall derive elements and principles towards formulating a theory of regional growth in China. Because these theories and models were developed in the West and are oriented towards market economies, my

interest is on their logic. They are not reviewed in the context of possible calibrations to the Chinese economy, but are regarded instead as treatises providing us with an understanding of the dynamics of regional growth in the abstract. It remains to discriminate between that which is contradictory to this purpose and that which offers analytical insight.

Chapter Four describes briefly the parameters, variables, and relations in a socialist economy for which my model will be designed. It is the most inadequate chapter in the thesis and this aspect will have to be substantially strengthened by future research.

The last chapter, Chapter Five, summarizes the progress made in this initial stage of the research effort. It compiles the most important information and insights learned in the previous chapters but, at the same time, it points out the deficiencies which have to be rectified. A research strategy for the next stage is mapped out and the critical issues to be investigated are defined. No conclusion is made because none can be made at this point.

## 1.2 The Planning Problem

When the Chinese Communists ascended to power in 1949, they inherited an economy marked by a spatial concentration of modern industry in a few industrial centers, mainly in the coastal areas. Transport facilities, mostly railroads, were confined to a relatively small number of provinces in the eastern part of the nation. China proper (i.e., excluding the autonomous regions of Inner Mongolia, Sinkiang, Tibet, etc.) had only a few vital lateral and longitudinal trunk lines while Manchuria, the center of concentrated heavy industries developed during the Japanese occupation, had a fairly developed transport network. Thus, the inherited economy was often envisaged as comprising of three sectors: (1) a vast, largely self-sufficient agricultural sector; (2) a modern sector located almost entirely along the coastal areas and concentrated in the urban areas, devoted largely to the management of goods and other light industry; and (3) a heavy industry sector located primarily in the Northeast in Manchuria and not linked to the rest of the national economy until after Liberation in 1949. Years of civil wars, regional military movements initiated by ambitious warlords, and the Sino-Japanese wars had limited economic relations between the coastal cities and the agricultural sector. Relations between the various sectors, although limited, were important to the economy. It has been pointed out that import, and later Chinese manufacture, of factory-made textiles

eroded the traditional handicraft industry in the countryside. Advantages of the resultant cheaper costs of textiles had to be evaluated in light of the consequent failure of village economies to find alternative productive uses for the marginal time and labor left to peasants beyond their basic task of cultivation. Expanding cities also increased the demand for agricultural imports and supplies for urban needs.

The most urgent task facing Chinese planners in 1949 was the restoration of the basic capacity of the economy to pre-'49 levels by 1952, and the integration of the various sectors for the exchange and flow of goods and services, preparing the way for a long-term program of socialization of the economy, massive industrialization, and agricultural modernization.

The regional problem is reflected in one of the development objectives announced by Chou En-lai in 1955:

"We shall locate the productive forces of industry in different parts of the country in such a way that they will be close to producing areas of raw materials and fuel and also to consumer markets. They will also satisfy the requirement for the strengthening of national security, lead to gradual improvement of the irrational locational pattern, and elevate the economic level of the backward areas. In the establishment of industrial areas, we shall, first of all, utilize, reconstruct, and transform the existing industrial bases so as to avoid over-concentration of enterprises and to bring about a measure of decentralization."<sup>1</sup>

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<sup>1</sup>From the Chung Hua Ren Min Kung Ho Kuo Fa Chan Kuo Min Cheng-chi Ti I Ko Wu Nien Chi Hua (The First Five Year Plan of the People's Republic of China), (1955), pp.31-33 (in Chinese).



The spatial distribution of economic activities planned for the First Five Year Plan period was spelled out in even greater detail by the then head of the State Planning Commission, Li Fu-ch'un:

"The Five Year Plan of capital construction includes a relatively rational spatial arrangement. Industrial bases in Manchuria, Shanghai, and other cities will be appropriately utilized so that they exercise their function in bringing about the rapid expansion of production to meet the demand of the economy and to support the construction of new industrial bases...active efforts will also be made to establish new industrial bases in North China, and certain areas in Northwest and Central China, and to begin in part industrial construction in the Southwest. On the basis of this policy, 472 of the 694 above-norm industrial construction projects planned to be started during the first five years will be in the interior provinces and only 222 will be in the coastal areas. Appropriate railway construction arrangements are also being made to meet the requirements of industrial construction and the overall development of the national economy and to provide links between the original and the new industrial bases. At the same time, on the basis of this industrial policy, our present task in urban construction is not to develop the large cities on the coast, but to develop medium and small cities in the interior and to restrict appropriately the expansion of large cities. The present blind or unplanned development of the coastal cities is a phenomenon that has to be corrected."<sup>1</sup>

Because there were only a few metropolitan industrial and commercial centers, major markets with concentrated demand for producer and consumer goods were also few. In the large

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<sup>1</sup>In Ren Min Shou Ts'e, (People's Handbook), 1956, pp.59-60 (in Chinese).

hinterland areas areas with a primarily agricultural output, production and population were concentrated in the few regions of greater soil fertility.

The development of the economy under the Communists was affected mainly by the known distribution of natural resources. For example, although coal reserves are now found throughout the country, a limited number of known large iron deposits determined the locational development of the iron and steel industry. Thus, despite impressive expansion in Chinese industry since 1949, it remains relatively underdeveloped in relation to the country's endowment of natural resources. Factories and mines are still concentrated in the eastern third of the country.

Regional statistics are fragmentary, but it appears that China progressed in building up industrial centers in the interior regions (cf. Section 2.5 in Chapter Two). To countermand the concentration of industry along the eastern coast, the First Five Year Plan specified that new industrial projects were to be located mainly in the interior regions. Accordingly, inland cities such as Pao-t'ou, T'ai-yuan, Wu-han, Sian, Lanchou, and Ch'eng-tu were expanded greatly in both population and physical size. Further, two-thirds of the some 300 projects under the Russian technical and material assistance programs from 1950 to 1956 were part of an inland development plan. In 1956, however, a drop in national industrial output made

Chinese planners realize the necessity of upgrading and increasing production in the traditional industrial areas while simultaneously constructing new plants away from the old centers. The period of adjustment following the disappointments of the Great Leap Forward and the cessation of Russian aid seriously affected regional development. In both the frontier and developed regions, small and uneconomic factories that sprang up during the years 1958 to 1960 were shut down.<sup>1</sup>

The National Economic Commission of the Nationalist government showed that in 1948 only 18 cities in 13 provinces had sufficient manufacturing capacity to be considered as even modest industrial centers (cf. Table 1.3). Ten of the 26 provinces that comprise China (excluding Taiwan) had no important manufacturing centers before 1949. The backward areas can be identified as:

<u>Region</u>	<u>Provinces or Autonomous Regions</u>
North China and Inner Mongolia	Shansi, Inner Mongolia
East China	Anhwei, Chekiang
Central-South China	Honan, Kwangsi
Northwest China	Ningsia, Tsinghai, Sinkiang
Southwest China and Tibet	Tibet

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<sup>1</sup>Since most of newer, smaller, and less viable enterprises were located in the frontier regions, these areas suffered disproportionately during the retrenchment period when investment funds were conserved for the more reliable and older industrial plants in the coastal regions.

TABLE 1.3

Distribution of Manufacturing Motive Power, Employment, and  
Factories in China Proper at the End of World War II<sup>a</sup>

Cities or City Combinations	Share % of Indicated Parameter		
	Motive Power	Employment	Number of Factories
Shanghai	57.7	60.9	60.4
Tienstin	16.8	9.9	9.4
Tsingtao	7.4	4.7	1.4
Peking	6.3	1.5	2.1
Nanking	2.5	1.8	6.9
Wu-han	2.2	3.6	3.6
Chungking	2.2	5.5	5.2
Canton	1.5	4.5	3.7
Kunming	0.7	1.1	0.5
Nan-chang & Chiu-chiang	0.7	1.1	1.3
Sian	0.6	1.1	0.5
Chang-sha & Heng-yang	0.6	1.5	1.7
Foochow	0.4	0.6	1.4
Lan-chou	0.3	0.5	0.3
Kuei-yang	0.2	0.8	0.6
Swatow	-	0.9	0.9
Total	100.0	100.0	100.0

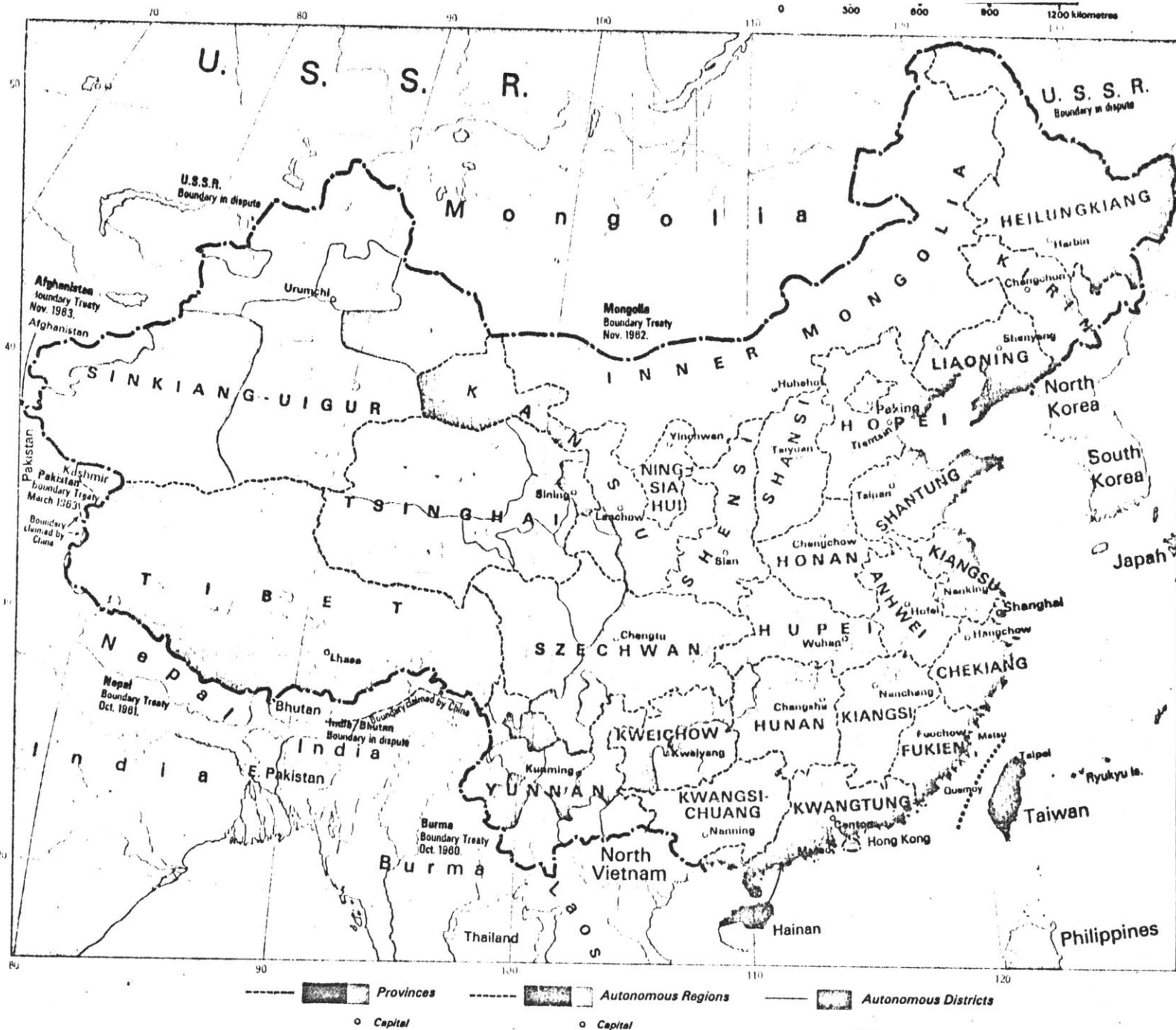
<sup>a</sup>Source: Wu (1967). Original data from Industrial Survey of Principal Cities in China, Preliminary Report, Nanking: National Economic Commission, 1949.

In 1957, following Chou En-lai's speech emphasizing the long time horizon over which decentralization would occur, the country was divided into seven Economic Cooperation Regions:

<u>Economic Cooperation Regions</u>	<u>Provinces or Autonomous Regions</u>
Northeast China (Manchuria)	Liaoning, Kirin, Heilungkiang
North China	Hopeh, Shansi, Inner Mongolia
Northwest China	Kansu, Shensi, Sinkiang, Tsinghai, Ningshia
East China	Kiangsu, Chekiang, Shantung, Anhwei
Central-South China Central China	Honan, Hupeh, Hunan, Kiangsi
South China	Kwangtung, Kwangsi, Fukien
Southwest China	Szechuan, Yunnan, Kweichow, Tibet

Areal and population data for these regions are given in Table 1.4.

Northeast China, which includes most of former Manchuria, continues to rank as China's largest industrial concentration and the foremost center of heavy industry. The region is also the largest producer of electric power, iron, steel, gold, natural and synthetic petroleum, timber, and a variety of machinery equipment. While heavy industry continues to be concentrated in the southern part of the region (Mukden, An-shan, Pen-ch'i, Fu-shun, and Dairen), about a



China shares 9,000 miles of her frontier with twelve nations. At number of points there have been frontier disputes between China and her neighbours, and one with India developed into a war in 1962. To the south, within 500 miles lie South Korea, Japan, Taiwan, the Philippines as well as the Ryukyu Islands occupied by the United States. Nationalist China (Taiwan) also occupies the islands of Quemoy and Matsu, close to the mainland. Macao (Portugal) and Hong Kong (U.K.) on the mainland are leased to foreign powers.

The administrative organisation of China was changed after the Communist revolution of 1949, and has been reorganised on a number of occasions since. At various times large economic and political regions composed of a number of provinces have been formed but then abolished. The first order administrative units are the provinces (21), Autonomous Regions (5) and the centrally administered cities of Peking and Shanghai. The provinces are divided into *hsien* (c. 1,500) and important cities (c. 150). Before 1958 the *hsien* were further divided into *hsiangs* (rural districts) and small towns, but these have been replaced by communes. Various types of agricultural co-operation were tried leading to the establishment of the first commune at Weihsin (Honan) in April 1958. By the end of that year nearly all the rural population had been organised into some 26,500 communes. A small town and the surrounding *hsien* formed a typical commune, and on an average there are about fourteen communes in each *hsien*. Communes have also been formed in the urban areas.

The equality of the different peoples is recognised within the constitution, in so far as this is compatible with their inseparability from the People's Republic. The larger concentrated groups of peoples are organised into Autonomous Regions, and even the smaller groups occupying just a *hsien* have a measure of autonomy. The Autonomous Regions make up nearly half the total area of China, but their population forms only a twentieth of the whole.

FIGURE 1.1a Map of China

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REGIONS

NE: Northeast

N: North

NW: Northwest

E: East

CS: Central-South, Central

S: South

SW: Southwest

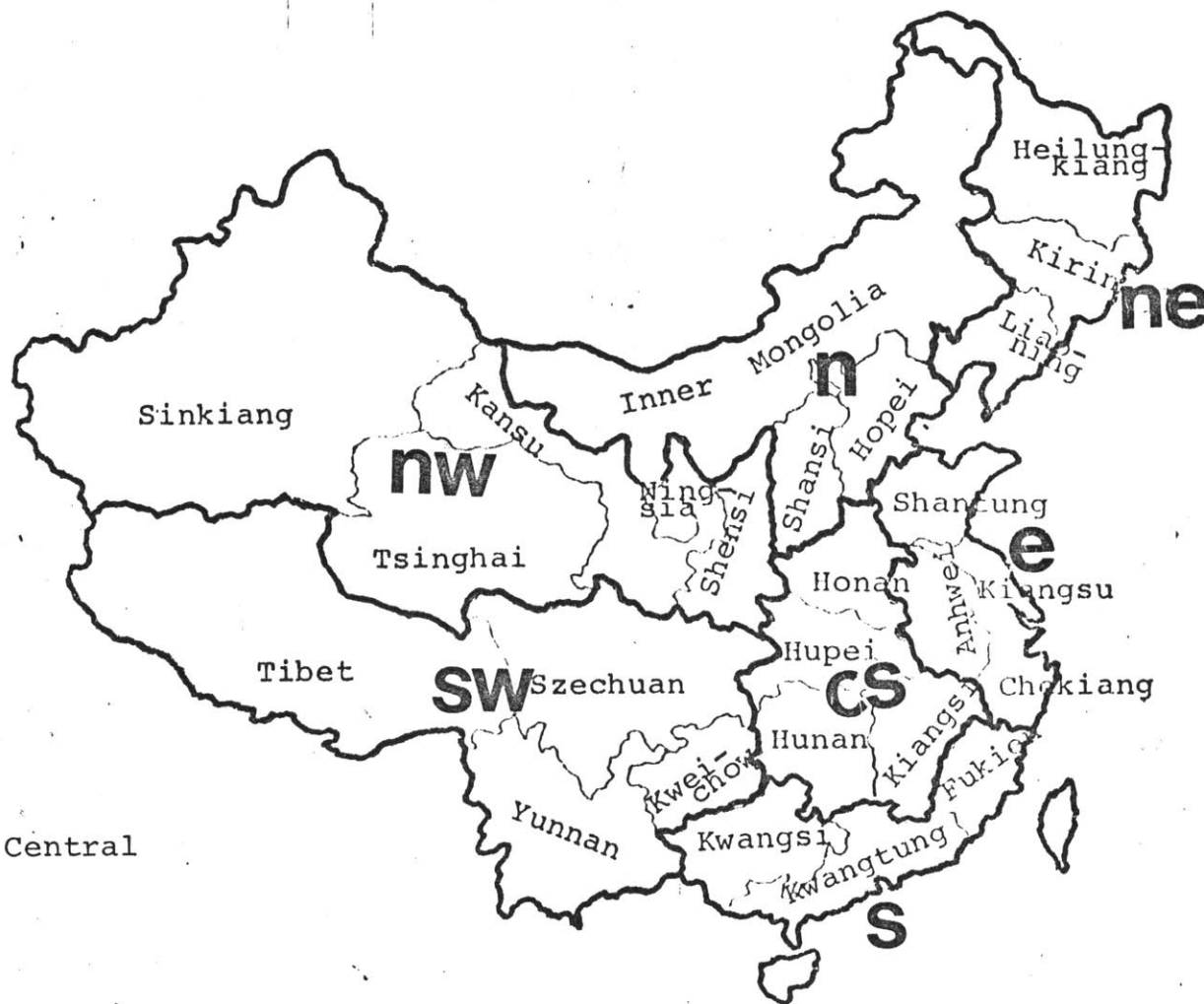


FIGURE 1.1b: Economic Cooperation Regions

TABLE 1.4

Area and Population of the Seven Economic Cooperation Regions  
(1957)

Region (by province & autonomous region)	Area		Population	
	Square miles	% of nat'l total	Thousands	% of nat'l total
<b>Northeast</b>				
Liaoning	58,301	1.6	24,090	3.7
Kirin	72,201	2.0	12,550	1.9
Heilungkiang	178,996	4.8	14,860	2.3
Regional total	289,498	8.4	51,500	7.9
<b>North</b>				
Hopeh	76,139	2.0	44,720	6.9
Shansi	60,656	1.6	15,960	2.5
Inner Mongolia	456,756	12.4	9,200	1.4
Regional total	593,551	16.0	69,880	10.8
<b>Northwest</b>				
Kansu	141,506	3.8	12,800	1.9
Shensi	75,598	2.0	18,130	2.8
Sinkiang	635,829	17.2	5,640	0.9
Tsinghai	278,378	7.5	2,050	0.3
Regional total	1,831,311	30.5	38,620	5.9
<b>East</b>				
Kiangsu	39,460	1.1	45,230	6.9
Chekiang	39,305	1.1	25,280	3.9
Shantung	59,189	1.6	54,030	8.5
Anhwei	54,015	1.5	33,560	5.2
Regional total	191,969	5.3	163,100	24.5
<b>Central-South, Central</b>				
Honan	64,479	1.7	48,670	7.5
Hupei	72,394	2.0	30,790	4.9
Hunan	81,274	2.2	36,220	5.6
Kiangsi	63,629	1.7	18,610	2.9
Regional total	281,776	7.6	134,290	20.9
<b>South</b>				
Kwangtung	89,344	2.4	37,960	5.9
Kwangsi	85,096	2.3	19,390	2.9
Fukien	47,529	1.3	14,650	2.3
Regional total	221,969	6.0	72,000	11.1
<b>Southwest</b>				
Szechuan	219,691	6.0	72,160	11.2
Yunnan	168,417	4.6	19,100	2.9
Kweichow	67,181	1.8	16,890	2.6
Tibet	471,660	12.8	1,270	0.2
Regional total	926,949	25.2	109,420	17.0



fifth of projects completed under the Soviet aid program are located to the north in Kirin and Harbin, and Heilungkiang. These projects therefore were instrumental in extending this region's industrial areas.

Though smallest in size, East China contains about a third of the country's population. This factor helps explain the ranking position of the region in manufacturing of textiles and other consumer goods. It is second in total industrial production with large electrical, chemical, iron, steel, and machinery outputs. The region's productive capacity is located mainly in Shanghai, China's largest industrial and commercial metropolis.

North China ranks third in total industrial production. The major industrialized area is located in a triangle formed by the cities of Peking, T'ang-shan, and Tienstin. It leads the nation in coal output and ranks high in iron, steel, electric power, chemicals, and various consumer goods production. Industrial development of this region has been spurred by plentiful supplies of coal deposits and a relatively good railroad network.

Central South China, second to East China in population, is the country's largest producer of refined sugar and second in textiles and paper. Light industry is centered in the Canton area while heavy industry is concentrated in the Middle Yangtze (River) valley at Wu-han and Hsiang-t'an

and at Lo-yang in northern Honan province. The region is an important producer of raw materials, especially in non-ferrous metals.

Northwest China, by far the largest region, is also the least industrialized. All industries in the region have been developed since 1949. Besides the petroleum industry, which is widespread, important industrial facilities are pocketed around the cities of Lan-chou and Sian.

The general picture of the problems of regional development can further be discerned from the following tables: Tables 1.5 and 1.6 give the ranking of the production areas of the pre-Communist economy. Table 1.7 shows the degree of economic development by administrative divisions (provinces and autonomous regions). Table 1.8 gives an indication of 1955 income levels for selected provinces.

The preceding discussion is intended to suggest the nature of the regional planning problem in China. Because of the insufficient data sources, it gives at best a partial picture. Let us therefore conclude this section with a consideration of regional planning problems in the abstract.

Rodwin (1963) states that planners in developing countries often view the spatial aspect of regional policy as involving a mutually exclusive choice between dispersal of investments such that regions will receive a fair share of the benefits of development or the concentration of activities at planned or existing growth centers. This set of alternatives

TABLE 1.5

Ranking of Production Areas in Modern Manufacturing in China  
 Proper at the End of World War Two<sup>a</sup>

Ranking of Cities (or combination) According to Indicated Parameter			
Rank	Motive power	Employment	Number of of factories
1	Shanghai	Shanghai	Shanghai
2	Tienstin	Tienstin	Tienstin
3	Tsingtao	Chungking	Nanking
4	Peking	Tsingtao	Chungking
5	Nanking	Canton	Canton
6	Wu-han	Wu-han	Wu-han
	Chungking		
7	Canton	Nanking	Peking
8	Nan-chang	Peking	Chang-sha
	Chiu-chang		Heng-yang
	Kunming		
9	Sian	Chang-sha	Foochow
	Chang-sha	Heng-yang	Tsingtao
	Heng-yang		
10	Foochow	Nan-chang	Nan-chang
		Chiu-chang	Chiu-chang
11	Lan-chou	Kunming	Swatow
		Sian	
12	Kuei-yang	Swatow	Kuei-yang
13	Swatow	Kuei-yang	Kunming
			Sian
14	--	Foochow	Lan-chou
15	--	Lan-chou	--

<sup>a</sup>Source: Wu (1967).

TABLE 1.6

Ranking of Provinces and Regions in Modern Manufacturing  
in China Proper at the End of World War Two<sup>a</sup>

Ranking of Provinces According to Indicated Parameter			
Rank	Motive power	Employment	Number of factories
1	Kiangsu	Kiangsu	Kiangsu
2	Hopeh	Hopeh	Hopeh
3	Shantung	Szechuan	Szechuan
4	Hupeh	Kwangtung	Kwangtung
5	Kwangtung	Shantung	Hupeh
6	Yunnan	Hupeh	Hunan
7	Kiangsi	Hunan	Fukien
8	Hunan	Shensi	Shantung
	Shensi	Kiangsi	Kiangsi
9	Kansu	Yunnan	Kweichow
10	Kweichow	Kiangsi	Yunnan
		Fukien	Shensi
11	--	Kansu	Kansu

Ranking of Region According to Indicated Parameter <sup>b</sup>			
Rank	Motive power	Employment	Number of factories
1	East	East	East
2	North	North	North
3	Central	Southwest	Central
4	Southwest	Central	Southwest
5	South	South	South
6	Northwest	Northwest	Northwest

<sup>a</sup>Source: Wu (1967).

<sup>b</sup>The pre-Communist (1949) classification of regions had only six regions.

TABLE 1.7  
Relative Degree of Economic Development of Provinces in  
Pre-Communist China<sup>a</sup>

Province	Rank in Modern Manufacturing	Rank in Agricultural Production
Group I (Relatively developed)		
Manchuria	1	2
Kiangsu	1	3
Shantung	3	4
Szechuan	5	1
Kwangtung	6	5
Hopeh	2	8
Hupei	4	7
Group II (Relatively developed in agriculture only)		
Shensi	10	8
Hunan	9	9
Honan	14	6
Chekiang	14	10
Anhwei	14	11
Group III (Relatively developed in industry only)		
Yunnan	7	16
Group IV (Relatively undeveloped)		
Kiangsi	8	12
Fukien	11	14
Kwangsi	13	13
Shansi	14	15
Kweichow	13	17
Inner Mongolia	14	19
Kansu	12	20
Tsinghai	14	21
Ningsia	14	22
Sinkiang	13	23
Tibet	14	23

<sup>a</sup>Source: Wu (1967).

TABLE 1.8

Per Capita Income and Expenditures of Workers and Employees  
and of Peasants for National Average and Selected Provinces<sup>a</sup>

1955 (in current Yuan)

Province	Excluding non- commodity expenditure		Including non- commodity expenditure	
	Income	Expenditure	Income	Expenditure
National average	148	138	183	173
Workers & employees	98	93	102	97
Peasants	90	85	94	89
Liaoning	170	157	207	194
Workers & employees	128	111	133	166
Peasants	122	105	127	110
Hopei				
Workers & employees	138	132	166	160
(Excluding Tienstin)	149	136	176	163
(Including Tienstin)	104	97	114	102
Peasants	98	86	103	91
Kiangsu				
Workers & employees	144	133	189	178
(Excluding Shanghai)	189	173	243	227
(Including Shanghai)	129	115	136	122
Peasants	123	109	130	116
Hupei	128	120	154	146
Workers & employees	88	75	90	77
Peasants	84	71	86	73
Szechuan	123	116	157	150
Workers & employees	74	70	76	72
Peasants	68	64	70	66
Shensi	172	136	213	177
Workers & employees	100	98	105	103
Peasants	94	92	99	97

<sup>a</sup> Source: Chen, Nai Ruenn, Chinese Economic Statistics: A Handbook for Mainland China, Chicago: Aldine Publishing Co., 1967, p.430.

is often equated to the determination of priorities between (1) social equity (decentralization), and (2) growth in productive output (concentrated growth).

A further implication derives from the choice between immediate benefits and greater but more distant returns, although this issue as an economic problem is usually less crucial than immediate political concerns. Therefore, in the allocation of resources among unevenly developed regions, welfare and social equity must be weighed against economic growth and efficiency.

Friedman (1966) suggests that, in developed countries, development and functional specialization are two aspects of the same process (at least in the Western developed nations). Specialization has always been localized, and thus, the articulation of areal and functional differences into a compact, related economic system calls for the integration of the spatial economy.

While both Rodwin and Friedman argue for some form of decentralization, the former advocating a concept called concentrated decentralization, and the latter emphasizing the importance of transmitting growth factors to less developed areas (somewhat similar to Hirschman's (1958) "Trickling down" effects), Alonso (1968), in contrast, states that our present state of knowledge of urban-regional growth dynamics doesn't

support any of the various growth strategies.

These issues suggest that regional development rests, firstly, on the need to integrate stagnant or backward regions into a national policy of economic development, and secondly, a desire to decrease the gap between regions of a country in terms of welfare and economic opportunities. Policy should then be influenced by the desire for an equilibrium with respect to location, interregional trade, prices, and production for a matrix of regions as instruments for fostering national economic growth.



### 1.3 The Analytical Problem

With the advent of industrialization, population and production become increasingly concentrated in agglomerations or cities. During the earlier stages of development, marginal returns to the factors of production differ between regions, consequently income differences. At a more advanced stage of development, most of the population and activities tend to be polarized in large metropolises. These centers epitomize not only urban-rural differences in income levels but regional disparities as well.

Earlier we have shown that differential aggregate growth rates among regions is an established pattern in many countries of the world. Although location theory suggests that regions grow at different rates due to economies of agglomeration, factor and commodity flows would nevertheless create factor price equalization leading to income convergence. The process of income convergence and divergence has been studied by Myrdal (1957). Myrdal hypothesized that an initial random shock (of industrialization) would favor regions with good resources, transport facilities, and developed markets from previous developments. Economies of agglomeration would also lower production costs and raise the returns to factors at these growth points. The transmission of growth or spill-over effects, would depend on market imperfections

and inter-industry linkages. A poor transport network would also reduce interregional trade while either capital market imperfections or high risks would inhibit capital flows to less developed areas. Myrdal also lists a number of disequilibrating factor flows: the more dynamic and vigorous elements of a population might also migrate to the growing centers leaving behind a fewer number of high income earners. With capital more mobile than labor, it depresses the wage of a region by leaving; there are also intersectoral effects when traditional handicrafts industries can not compete with the more efficient and productive industries in the advanced region. Further, potential inter-industry linkages are minimized by low supply elasticity in poor region. Thus a cumulative and circular causation from these "vicious cycles" continually increase disparities between regions.

Basically similar to Myrdal's model, the Hirschman (1958) model however considers a turning point in the development process which permits per capita income convergence. Convergence is achieved through "trickling down" effects: a developing transportation network radiating from the advanced region into the less developed region allows for less selective migration and primary exports from the backward region; diminishing returns at the margin also shifts development from the advanced to the backward region. All these lead to the development of the backward region and raises

its income, leading to convergence.

Williamson (1965) hypothesized that "under conditions of free factor mobility, and abstracting from transport costs, spatial inequality can persist only via lags in dynamic adjustment. That spatial inequality, depressed areas, and backward regions appear to persist may simply suggest to some that internal factor flows (tending to reduce interregional inequality) do not occur with sufficient speed and quantity to offset the dynamic indigenous conditions which cause relatively faster resource augmentation and technological change in the rich developing regions (tending to increase inequality." In addition, he suggests that regions within nations rarely have equal capacity for growth. And when growth does occur in certain regions, barriers may exist to inhibit interregional transmission of growth. Consequently, he argues that "as long as the barriers to trade and factor flows (as well as communication of technological change) persist, regional inequality will clearly increase."

Williamson identifies four disequilibrating effects: (1) interregional labor migration may be selectively characterized as vigorous and entrepreneurial, the educated and skilled, and of productive age. Selective migration of this type accentuates a tendency towards regional income divergence because labor participation rates, ceteris paribus, will tend to rise in the rich and fall in the poor regions.

In other words, growth centers, or regions where growth is occurring, tend to act as a suction pump pulling in the more dynamic elements from the poorer regions, resulting in a greater regional differential in resource endowment.

(2) Regional inequality may also be a result of a perverse interregional flow of capital. External economies and economies of scale and agglomeration may induce capital migration from the poor to rich regions; alternatively, high apparent risk premium, lack of entrepreneurial ability, and an insufficiently developed capital market in the poorer region makes investments there by interests in the richer regions unattractive.

(3) The national government's preoccupation with rapid industrialization and or national development may sacrifice interests of the poorer regions. Thus, the central government policy, in as much as it has control over factor flows and over the allocation of resources directly influences growth rates between regions.

(4) A lack of interregional linkages may prevent interregional transmission of growth factors. If national development is viewed as an economic unification of regional markets, then sluggish development of interregional linkages induces regionalization of the economy.

### 1.3.1 Regional Disparity: Alternative Definitions

The description of the factors leading to regional disparity given above, although an incomplete one, serves as a partial description of regional disparity in that disparity is defined as a consequence of a number of disequilibrating forces. Disparity in the scientific usage of the word means the existence of differences, but traditionally it has (witness the emergence of regional disparity as a policy concern) also been used to imply a moral evaluation, i.e., the humane problem of differences in living standards.

The difficulty of a precise definition stems from the variable objectives of a national regional development program. For example, the number of alternative measures of disparity used by various countries participating in the Varenna Conference is almost equal to the number of countries participating. Ideally, we would like to employ two measures of disparity in as much the regional problem in China appear to be twofold: in the advanced regions, the focus is on maintaining a convergence of income levels between the constituent provinces; the regional problem in this area resembles that of backward areas in the developed countries. In contrast, the problem of the backward regions is basically that of developing frontier, sparsely populated, and virgin territories. Disparity here can perhaps be more meaningfully defined in terms of cross regional income or output.

Since the area is sparsely populated, no useful common standard can be used to measure their welfare vis-a-vis those of the advanced regions. Further, the economy in the frontier regions resemble that of a preindustrial, primitive, and nomadic society. As such, using per capita income as a indicator of development in an unmonetarized economy assumes an illusory significance.

The crucial difference between the developed and underdeveloped regions is that in the former, regional policy would be aimed towards maintaining a spatial equilibrium with respect to growth rates and welfare levels among provinces, while in the latter, policy would probably be oriented towards economic development in the most elementary sense. In other words, we can refer to Friedman's thesis of regional policy as a function of the phase of national development; in China different regions are in fact in different phases.

In addition to the two possible regional problem mentioned above, a third could be the integration of the frontier regions into an unified national space economy, combining the more developed coastal regions with the less developed to achieve a truly unified nation. Under such a policy, regional disparity could perhaps be measured using social indicators.

With respect to the developed regions, disparity

can be measured multi-dimensionally: per capita incomes, gross regional income, sectoral output in the case of Marxist proportional development, employment levels, rate of investment and savings, capital formation, etc.

The most important point to be made here is that although an operational definition of disparity should be defined by the purpose of a specific regional development policy, we are constrained by a lack of information on the topic. Therefore, I have only presented alternative definitions.

### 1.3.2 Measurement of Income: Accounts and Prices

While we are ultimately interested in a formulation of social accounts at the regional level, insufficient information prevents us from proceeding directly to the task. Our best alternative is to present the Communist Chinese concept of National Income and its accounting elements in as much as it differs formally and substantively from the Western definition.<sup>1</sup>

The limitations of such an approach will become apparent as the discussion progresses, but it remains for

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<sup>1</sup>A good exposition of income accounts and its implication for modelling regional economic development in the advanced Western countries can be found in A. Bloch (1971).

us to attempt to overcome these difficulties as much as possible. This task will have to be met in the later stages of the research effort as it is obviously beyond the scope of this thesis.

Before defining income accounts in the Chinese Socialist economy, let us consider the statistical implications of alternative measures. If we are to define disparity in terms of welfare, then income received by residents in the region should be used. Alternatively, if we are concerned with regional productivity and growth rates, then income produced by factors within the region is the appropriate measure. As an indicator of welfare, personal income per capita, exclusive of non-distributed corporate income and inclusive of transfer payments from non-local governments, is superior to regional income per capita.

Income per capita also contains inherent biases derived from non-quantitative or non-monetarized aspects of welfare. In the previous section we pointed to the example of undeveloped regions in China with a relatively unmonetarized economy. Further, in the developed regions, a more urbanized population distort comparisons of welfare in monetary terms; the purchasing power of money in the backward regions is usually greater than in the advanced regions. Further, great cultural differences between regions, as in China, may distort consumption levels in comparative analysis. However, since prices are controlled by the central government, with wages determined



in part by the local standard of living, an interregional comparison of regional incomes per capita may not be as biased as it may first seem.

Let us facilitate the characterization of the Socialist concept of income by defining it in Western terms, i.e., net domestic product at market prices. National income in China follows that of domestic product, precluding that of national product. The domestic product is a geographical concept inclusive of all outputs within the country, regardless whether they accrue to residents or non-residents. Domestic output in China is equivalent to national income minus factor income accrued to residents abroad, plus factor income accrued to non-residents in the country.

It covers only income generated by material production and excludes the service sector. This is a corollary of the Marxist distinction between productive and non-productive (i.e. services) labor, whereby productive labor is meant only human efforts through which part of nature is transformed into material goods.

National income in China is a net income concept, excluding depreciation allowance of fixed capital, in contradistinction to the gross income concept. In Marxist terms, national income is equivalent to what remains when *c*, intermediate goods and capital consumption allowance, is deducted from the total production value of the national economy,

or  $v$  plus  $m$  (i.e., national income =  $v + m - c$ ). By restricting national income to that of net income, it becomes conceptually impossible to deny expansion of capacity in the economy.<sup>1</sup>

It covers all that is valued in terms of market prices inclusive of taxes minus subsidies, and it precludes valuation in terms of factor costs. While in the West national income allows alternative valuations of market prices or factor costs, in China it is invariably valued at realized prices, i.e., at prices inclusive of indirect taxes less subsidies.

In the West national income purports to measure the output of the economy ( in terms of either output or earnings) over a defined time period. The scale of its measurement, an exchange ratio or prices, is predetermined according to a certain objective standard to be made comparable among its various components. In China, however, national income is conceived as the total value (exchange value) created in the economy in a certain time period, or the total output produced over the same time period. The term value implies a substantive (political) meaning in Marxist economics, but if we leave aside its ideological content the problem of national income reduces basically to the meaning of the prices used.

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<sup>1</sup>Since gross investment can only be either positive or zero, and since it allows for capital consumption allowance, capacity in the economy will not necessarily be expanded as in the case where capital depreciation is greater than net investments. Since net income is exclusive of capital depreciation allowance, any investment will only expand capacity.

Three points concerning prices must be emphasized:

(1) in contrast to capitalist economies where prices assume a resource allocative function, this function and the market mechanism is denied in a socialist economy. Planning by material balances, or planning in physical terms without prices, plays the central resource allocative function. The parametric function of price remains only in three cases:

a). allocation of consumer goods among consumers; b). procurement of major agricultural products, and; c). allocation of producer goods among the state enterprises.

(2) Almost all prices are controlled in varying degrees. It is strictest over factory prices and transfer prices of basic industrial commodities, which are determined planned prices. Wage rates and interest rates are also strictly controlled. Procurement prices of farm products and retail prices of consumer goods strongly are strongly controlled by the State Internal Trade Companies or the Supply and Marketing Cooperatives who predominate the market share in each transaction. In the miniature "free market" comparable to the Russian Kolhoz (collective market), transaction prices are subjected to government supervision.

(3) Formation of these controlled prices however does not seem to be consistent with a uniform price. The objective in pricing policy seems to be the maintenance of the general price level and the historical structure of relative

prices of the major commodity groups. As such, the present structure of relative prices appear to be similar to that of an economy characterized by scarce capital and abundant labor. Planned factory prices of industrial commodities are set by by industrial branches as the sum of the average planned production cost and the planned profit, which is defined as the planned ratio of profit to production cost multiplied by the average planned production cost. These formulaes appear to encourage differential incentives among branches and enterprises to meet production targets and cost reductions within the limits of an enterprise's de jure and de facto discretionary powers on decision making.

On the basis of these points, it appears that the national income measured by such a price structure is not very effective in reflecting a true picture of its internal structure or in making intertemporal comparisons. Nevertheless, centralized planning by material balances without prices does not necessarily imply nor result in an irrational allocation of resources as commonly believed in the West. Zauberman (1971) states that on the planning level, prices form the scaffolding of macro-balances which expresses the macro-allocative decisions. In fact, the planner's choices in capital formation are made to a large extent on price-based calculations.

Just as national income in the West is constructed in three phases, the Chinese concept is similarly constructed

in phases through which the national income or product flows: national income produced, distributed, and expended. The difference here is that in China national income is derived solely from the viewpoint of the production phase. The latter two phases are determined not from a substantive content but as a definitional adjustment to the production phase.

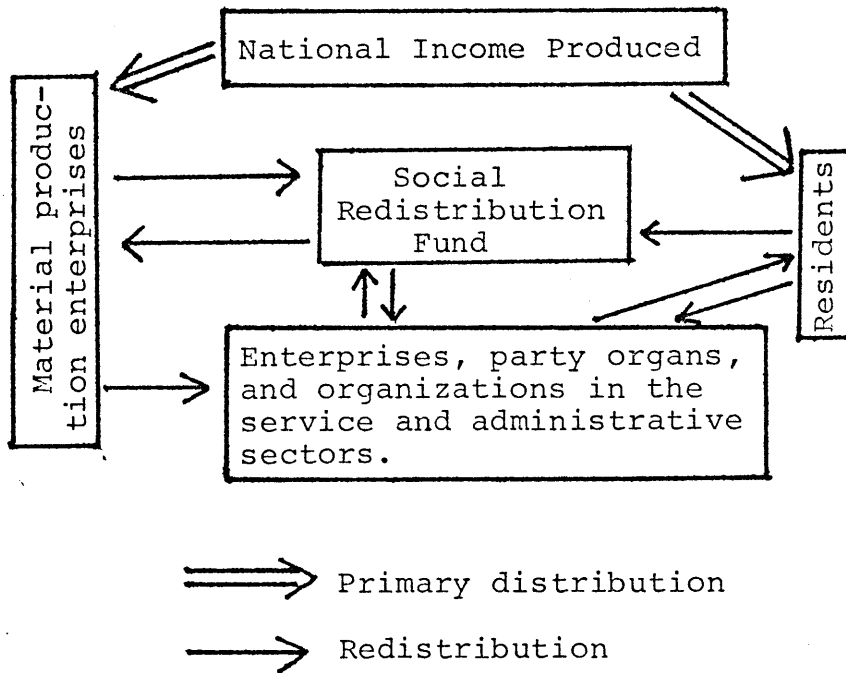
National income produced is constituted by the material producing sector which until the end of the First Five Year Plan had been divided into five departments: (1) industry; (2) agriculture; (3) building industry; (4) transport, post and telecommunications; and lastly (5) commerce and trade. Since the Second Five Year Plan however, a sixth department "other industries" has been added.

National income distributed describes the flow of national income generated in the production phase and disposed through two means: (1) primary distribution, and (2) redistribution. Primary distribution indicates the distribution of national income produced within the material producing sector. In this initial phase, national income distributed is also called primary income. Redistribution indicates the process by which primary income is again distributed, this time among all sectors of the society beyond the limits of the material producing sector. This latter redistribution is also called final income. Figure 1.2 graphically describes this process.

National income expended is defined as the sum total

of national income distributed and foreign trade balance; this is also called available national income. Available national income is divided into two uses: consumption fund and accumulation fund. Under the consumption fund, social consumption, government consumption, is made distinct from residents' consumption, or material consumption in the total consumption expenditures.

FIGURE 1.2

Distribution and Redistribution of National Income<sup>a</sup>

<sup>a</sup>Adapted from Ishikawa (1965), p.20.

## CHAPTER TWO: THE CHINESE ECONOMY

2.1 Strategy for Development

## 2.1.1 Industry and Agriculture

The Chinese strategy for economic development calls for a concentration of efforts on the development of the industrial sector, a development focused on the rapid expansion of capital goods industries to be accompanied by a more modest rate of growth in the consumer goods industries. 58.2 percent of the total investment in the First Five Year Plan was allocated to industry. Of this figure, 88 percent went to heavy industry and 11 percent to light industry. At the end of the Plan period, it was announced that the gross industrial output had increased by nearly 120 percent; over 200 percent in capital goods and 85 percent in consumer goods. Basic heavy industries, such as iron and steel, underwent the most rapid development and have assumed the role of "primary growth sectors," while impressive development in mineral fuels, electric power, metallurgical and machine building industries were also reported. A few industries, notably petroleum, fell seriously short of the planned targets. The output of consumer goods also lagged and failed to meet adequately the increase in demand generated by a relatively rapid process of industrialization, leading to serious shortages and tight rationing. Another serious problem was the inefficient and overambitious planning by individual enterprises that

resulted in wastage of investment funds and bottlenecks in the supply of materials.

By the fourth year of the First Five Year Plan, socialization of the whole economy had been achieved, and rapid industrialization based on the development of heavy industry attained. A major wage reform raised the average incomes of industrial and urban workers by 14.5 per cent. Basic construction, planning and control, planning by material balances and allocation, comprehensive planning of state budgets, business finance and bank credit, were by this time systemized and improved with practice.

In 1956, the Central Committee of the Chinese Communist Party convened the Party's Eighth National Congress in September to discuss a major item on the agenda, the proposal for the Second Five Year Plan. This Plan proposed to make China 70 per cent self sufficient in machinery and equipment including some heavy and precision machines which would be needed for further national development by 1962, the end of the Second Plan period. The basic tasks of the Second Plan included continued development of various industries with heavy industries as the core and further promotion of industrial, agricultural, and handicraft production with concomitant development of transportation and trade. Expanding industries, such as metal processing, machine making, coal, etc., were to be given special emphasis together with the weaker industries, such as petroleum, radio, and the planned industries of synthetic chemicals and



TABLE 2.1

Selected Official Data Relating to the Proposed Targets for the Second Five-Year Plan

Item	Unit	Proposed targets		Actual output		1959 Output (official)
		(FFYP)	(SFYP)	'57	'58	
<b>A. Heavy Industry</b>						
1.Coal	mil. tons	113.00	190-210	130.00	270.00	347.80
2.Crude oil	mil. tons	2.01	5-6	1.46	2.26	3.68
3.Elec. power	bil. kw-hrs	15.90	40-43	19.34	27.53	41.50
4.Steel	mil. tons	4.12	10.5-12.0	5.35	8.00	8.63
5.Ch. fertilizer	thous. tons	.58	3.0-3.2	.63	.81	1.30
6.Metallurg. equip.	thous. tons	8.00	30-40	-	-	205.00
7.Power gen. equip.	mil. kw s	.16	1.4-1.5	.20	.80	2.15
8.Cement	mil. tons	6.00	12.5-14.5	6.86	9.30	12.27
<b>B. Light Industry</b>						
1.Cotton yarn	mil. bales	5.00	8-9	4.65	6.10	8.20
2.Cotton cloth	bil. meters	5.58	7.3-8.0	5.05	5.70	7.50
3.Salt	mil. tons	7.55	10-11	8.38	10.40	11.04
4.Machine-made paper	mil. tons	.66	1.5-1.6	.91	1.22	1.70
<b>C. Crops</b>						
1.Food grains	mil. tons	181.60	250.00	185.00	250.00	270.00
2.Ginned cotton	mil. tons	1.64	2.40	1.64	2.10	2.41
3.Soybeans	mil. tons	11.22	12.50	10.05	10.50	11.50
<b>D. Livestock</b>						
1.Cattle	mil head	73.61	90.00	63.32	-	-
2.Pigs	mil head	138.34	250.00	220.00	145.90	180.00

Source: Li (1964).

nuclear power.

In comparison with the First Plan, basic investment in the Second Plan period was expected to double with industry increasing its share from 58.2 per cent to about 60 per cent, while agriculture's share was to be increased from 7.6 per cent to 10 per cent. The proposed targets for the Second Plan are given in Table 2.1, which includes official output data for 1957 through 1959 as part of the statistics with which Chinese planners were working.

In 1957, when it was realized that the rate of agricultural output could not increase rapidly without substantial increase in state investments in that sector, the Planning authorities conceded the importance of agriculture relative to industrial development. The theme underlying the Second Plan, which was that heavy industry should constitute the center of the plan with priority in development over all other sectors, however, remained unaltered, although policies and controls began to reflect an increasing concern with the role of agriculture in economic development.

As is the case with most developing countries, agriculture in China is called upon to foster the process of economic growth in three principal ways: (1) to provide a food consumption standard required for fostering increased productivity of labor and maintenance of political stabilization; (2) to furnish a source of foreign exchange for needed imports; and (3) to supply the needed raw materials and inputs for an industrialization program.

Agriculture under the Communist leadership was developed primarily through better organization and through the introduction of better farm techniques rather than with capital investment. Only 7.6 per cent of total investments during the First Plan period was allocated to agriculture. However, productivity was increased by such capital-saving measures as the use of improved farm tools, soil improvement reclamation of farm land, and other equally labor-intensive projects. Capital was created by the recruitment of "disguisedly unemployed" labor to participate in mass water-conservancy and irrigation-building projects. Agricultural holdings were first equalized by redistribution later to be amalgamated into large units under cooperative managements. As a result, agricultural production increased by 22 per cent in the First Plan period. Although this exceeded the plan target by 1.9 per cent, it was probably below what should have been to keep pace with the increase in industrial production and population growth.

With an increasing realization of agriculture's role in development, a major social revolution was initiated in 1958 that recruited 99 per cent of the peasants into 26,000 communes, each having an average membership of 5,000 households. It was hoped that the technical advantages of greater efficiency in the mobilization of manpower, materials, and financial resources would more than compensate for any loss in enthusiasm. Since the start of the Second Plan, a

"Great Leap Forward" in agriculture has been achieved. Despite the failures and disappointments of the industrial great leap forward, e.g., backyard steel furnaces, it was claimed that agricultural output increased by 25 per cent in 1958 over 1957 and again by 16.7 per cent in 1959.

Li Fu-ch'un, Chairman of State Planning Commission, published a report in 1963 entitled "Supplementary Plan for the Last Three Years of the Second Five Year Plan,"<sup>1</sup> which advanced the idea of regarding agriculture as the foundation with industry taking the lead in economic development. This change in the basic policy of priority on heavy industry began to develop when the 1960 harvest turned out to be much worse than expected. In the same year, a movement of "All People to Agriculture and Food Grains" reached a peak in September. In November, an editorial in the Party's theoretical organ, the Red Flag, stated that "Simultaneous Development of Industry and Agriculture is an Important Law in China's Socialist Economy."<sup>2</sup> When severe natural calamities further depressed agricultural output in 1961, or so it was claimed, the Eighth Plenum of the Central Committee decided that "since

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<sup>1</sup>People's Daily, March 31, 1960, pp. 2-3. As quoted C. M. Li (1964).

<sup>2</sup>Red Flag, November, 1960.

there had been tremendous development in heavy industry in the last three years, its output of major products already far in excess of the planned level for 1961 and 1962, the scale of basic construction should, therefore, be appropriately reduced." To ease the severe shortage of consumer goods, assistance was to be given to "further development of light industry, rural and urban handicrafts, family side-line occupations and suburban agriculture, and to the revival of primary markets in the rural areas." Thus, official policy was to be "readjustment, consolidation, reinforcement and improvement," which signalled the end of the Great Leap Forward.

With the 1961 harvest still unimproved, the Party issued to its field cadres secret directives contained in a document known as "Seventy Articles of Industrial Policy." It directed that all basic construction was to be suspended together with the closing of all unprofitable enterprises and to suspend the practice of recruiting labor from rural areas. Despite a policy shift, warnings were still raised against a one-sided emphasis on agriculture at the expense of industry, transportation, culture, and education.

In September, 1962, the Tenth Plenum of the Party's Central Committee completed the change from a priority development of heavy industry to "agriculture first" by resolving that "as the immediate urgent task of the people, the development of agriculture, itself the foundation of the

national economy with industry as the leading factor, must be given the top-most position." The policy was to "relocate resolutely our work from the industrial departments to the sphere where agriculture is the foundation."

Hence, there was not any official or formal formulation of a Second Five Year Plan aside from brief statements of intent and output targets. The Great Leap Forward and its attendant fluctuating time horizons (sometimes monthly, and weekly, or even daily), and chaos made planning impossible for the period 1958 to 1962. The first three years of the Second Plan period basically continued the First Plan policies of focusing on the rapid growth of heavy industry, while the last two years witnessed increasingly severe applications of measures of "readjustment, consolidation, reinforcement, and improvement" in basic construction and industry with agricultural modernization finally earning an over-riding priority in development.

Since 1963, there has been no available official information concerning the economy released by Chinese authorities. Information and tidbit evidences collected from refugees and reconnaissance by intelligence organizations are too factually unreliable to work with, while projections for the 1960s appear to have no statistical nor planning value.

In January, 1963, Chou En-lai announced the opening of the Third Five Year Plan. That announcement proved to be premature, for it was not until January, 1965, was the

beginning of the Third Plan officially reported in the People's Congress. A new 10-yuan note was issued in January, 1966, apparently intended to supply additional currency necessary for the economic expansion expected in the Third Plan. But in 1966, the Great Proletarian Cultural Revolution was started and the Third Plan fell into oblivion.

Numerous references to a forthcoming Fourth Five Year Plan have been made by various enterprises in their annual reports in 1970, and in monitored radio broadcasts, but to date there has been no official announcement of such a Plan. And if the Plan is already in existence, its targets and policies remain a secret.<sup>1</sup>

#### 2.1.2 Investment, Capital, and Savings

Through forced savings in the form of taxation, profits of government enterprises, control of the pricing mechanism, subscription to bond issues and other types of forced loans, the Chinese economy shifts income from consumption and unproductive private investments to maintain a very high level of investments.

Fixed investments more than doubled between 1950 and 1952, as shown in Table 2.2. It was almost doubled again

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<sup>1</sup>The Fourth Five Year Plan was referred to in a report by the Hsiang-t'an Steel enterprise, and also in a July 1970 Hunan Report. These were contained in monitored radio broadcasts and are listed in China News Analysis, Aug. 7, 1970.

in the next three years and increased by another fifty per cent in 1957 as compared to 1955.<sup>1</sup> The Leap-Forward period pushed investment to nearly three times the 1955 level in 1958-1959. While in 1950, only about 10 per cent of output went into fixed investment; by 1957, that figure was carried to 16 per cent. The Leap-Forward figure for investments was almost 25 per cent of the GNP.

While impressive, the rate of investment is not remarkable because generally Chinese prices overstate the value of investment goods and other producer goods relative to consumer goods. Investments in China can be distinguished between the Traditional and Modern sectors. Traditional can be defined as those enterprises which carry out their operation as they have done before industrialization, or "traditionally." The Modern sector consists of enterprises using production techniques more comparable to those in developed economics, and usually imply industrial units, that is, exclusive of traditional enterprises.

When the Modern sector is defined as excluding individual handicrafts, modern transport and communications, public utilities, military construction, and investments in science, culture, education and health, its investment amounted to about 55 per cent of all investments from 1951 to 1954

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<sup>1</sup>Fixed investment is inclusive of all additions and major repairs to buildings and productive facilities and exclusive of changes in inventories and procurement of military equipment. Gross domestic fixed investment is estimated at current prices. These estimates and other information presented in this section are from W. W. Hollister (1964).



(cf. Table 2.3). Excluding heavy industry, the rate declined to about one-fifth of all investment in 1958-59. The priority in which heavy industry is regarded (cf. the preceding section 2.1.1) is evident from the fact that its share of about 25 per cent of all investment in 1952 reached about 45 per cent in 1958 - 59.

Traditional investment consists of investments in agriculture, trade, non-agricultural investments in housing, communal services, and government. Thus defined, its proportion showed a decline in the period from 1950-59 simultaneous with heavy industry's increasing share in the same period. This decline after 1952 took place primarily not in agriculture but in the other sectors identified under the Traditional sector. Table 2.4 suggests that inspite of an absolute increase in investment in the economy, agriculture's share continued at about the same level. In monetary terms, agricultural investment in 1956 was about 4.7 billion yuan, twice the figure in 1952; and in 1959, the figure reached about 10 billion yuan, again almost twice the figure in 1956.

Agriculture was the primary source of savings financing the industrialization program in the First Plan period. These savings were generated by the agricultural sector providing inputs at extremely low costs to the industrial sector which was then able to sell products at high state-controlled prices. Thus, enterprises' profits in China have formed the major source of savings, such that in 1960, 93.4

TABLE 2.2  
Gross Fixed Investment in China, 1950-59

Gross Fixed Investment	Year									
	'50	'51	'52	'53	'54	'55	'56	'57	'58	'59
Billion yuan	2.4	4.0	6.4	10.5	12.5	13.0	19.1	18.2	33.0	38.5
% of GNP	5.5	6.4	9.1	12.4	13.9	13.8	17.9	15.9	23.9	25.7

TABLE 2.3  
Gross Fixed Investment in Modern Sectors, 1950-59

Modern Investment	Year									
	'50	'51	'52	'53	'54	'55	'56	'57	'58	'59
Billion yuan	1.18	2.15	3.61	5.70	6.94	7.48	11.34	11.12	21.24	25.31
% of total fixed invest.	48.8	54.4	56.5	54.5	55.4	57.5	59.3	61.1	64.3	65.7
Heavy ind. as % of total fixed invest.	11.6	12.6	23.4	24.5	27.6	31.9	33.9	36.9	45.1	44.3
Other sectors as % of total	37.2	41.8	33.1	30.0	27.8	25.6	25.4	24.2	19.2	21.4

TABLE 2.4

Gross Fixed Investment in the Traditional Sector, 1950-59

Traditional Investment	'50	'51	'52	'53	'54	'55	'56	'57	'58	'59
Billion yuan	1.24	1.80	2.78	4.76	5.59	5.52	7.77	7.07	11.79	13.21
% of total fixed invest.	51.2	45.6	43.5	45.5	44.6	42.5	40.7	38.9	35.7	34.3
Agricultural invest. as % of total	45.2	38.7	34.6	26.2	26.6	28.3	24.4	25.2	26.4	26.6
Other sectors	6.0	6.9	8.9	19.3	18.0	14.2	16.3	13.7	9.3	7.7

per cent of the total budgetary revenue was accounted for by profits and taxes from state enterprises. Savings pattern in the state-owned sector differed in the implicit division of labor between the large more modern enterprises and smaller regional industries. The former were allowed more flexibility in regard to capital and their primary preoccupation was with increasing output, while the latter were called upon to generate savings for the state. Since the light industry sector was about 80 per cent dependent on the agricultural sector for its needed inputs, and since it had been a major source of savings for the state, it became clear that expansion in the heavy industry sector was heavily dependent on the light industry sector, and ultimately on the agricultural sector. Thus, heavy industrial growth was predicted on expansion in agricultural output. Savings, then, became the chain which linked the various sectors together.

### 2.1.3 Population and Migration Policy

Estimates of the total population vary from approximately 650 million to 900 million. Official population data have not been announced for nearly a decade and the estimates reflect alternate projections from the 530 million figure officially reported in the 1953 census.

Population density varies strikingly within the country; the greatest concentration lying between the eastern half of China and western and northwestern lands. While Tibetan

highlands and Sinkiang-Mongolia Region comprise more than 50 per cent of the total land area in China, this vast area contains only about 5 per cent of the total population.

In the eastern half of China, where almost all the agricultural land is concentrated, population densities range upward from 130 per square mile. Major areas where this figure exceeds 520 persons per square mile are the North China plain, the middle and lower Yangtze Valley, and the Szechwan Basin. The latter two areas have in some places exceptionally high densities, of about more than 1,500 persons per square mile. Areas in eastern China with low population density usually denote marginal agricultural lands, rough terrain, limited precipitation, and short growing seasons.

Slightly more than 90 per cent of the 216 urban centers having a population of 50,000 or more are located in eastern China. Of the 15 cities with population exceeding 1 million, only Canton is located in South China. Most of the provinces in South China have been more recently settled relative to China's long history, and they possess fewer and more dispersed natural resources to support large urban agglomerations.

Four cities in Northeast China have a population of one million or more: Mukden, Ch'ang-ch'un, Fu-shun, and Harbin. This reflects the development of this region as China's first major base of heavy industry. To the northwest, the cities

of Sian and Tai-yuan, each with over a million population, have experienced very rapid growth under Communist policies to develop and expand industrial bases in the interior.

Official Chinese population policy varies with time and reflects their outspoken views on Marxist theory against Malthusian economics. Their argument is well known: population growth threatens resources only in countries under the capitalist system of production where benefits of technical development are withheld from the masses. Under socialism, with the means of production under the control of direct representatives of the masses, benefits are returned to the workers who are the source of all wealth. An increase in population means an increase in the ranks of the working class, and leads to an increase in productivity sufficient to meet the needs of an increased population and affords a rise in the living standard as well. As convenient as it may be, this postulate did not hold true in China, and official policy has been to encourage birth control and late marriages. Furthermore, increased urban in-migration, large urban population increases, and the policy of establishing industrial bases in the interior regions have resulted in forced population movements to the backward areas under development. Although data is fragmentary, there appears a relatively stabilized population growth rate in coastal urban areas and some cities have, in fact, experienced little or no urban

in-migration. The policy has been to restrict the growth rates in these cities and to expand the population of cities in the interior provinces so as to achieve a majority of Chinese Han persons over local minority groups. Table 2.5 gives the size, population sizes and growth rates from 1949 to 1956.

TABLE 2.5  
 Population Size and Growth Rates By Urban and Rural Residence  
 1949-1956

Year	Total		Urban		Rural	
	(000s)	Percent increase	(000s)	Percent increase	(000s)	Percent increase
1949	541,670	-	57,650	-	484,020	-
1950	551,960	1.90	61,690	7.00	490,270	1.29
1951	563,000	2.00	66,320	7.50	496,680	1.31
1952	574,820	2.10	71,630	8.00	503,190	1.31
1953	587,960	2.29	77,670	8.43	510,290	1.41
1954	601,720	2.34	81,550	4.99	520,170	1.94
1955	614,650	2.14	82,850	1.59	531,800	2.24
1956	627,800	2.14	89,150	7.60	538,650	1.29

Source: "Data on China's Population from 1949 to 1956,"  
T'ung-chi Kung-tso, (Statistical Bulletin), no.11, June 14,  
 1957; translated in ECMM, no. 91, July 22, 1957, pp.22-25.



## 2.2 Decentralization

Decentralization of control over various sectors of the economy, trade, and taxation, was initiated in late 1957. This decontrol enhanced immeasurably the authority of Party committees and secretaries at the local and enterprise level. Decentralization was also one of the strategic developments that made the "Great Leap Forward" possible. Not only was the effect of decentralization on planning profound, but planning itself was decentralized. Up to 1959, the process of drafting plans was known as the "single track" system, which was, in essence, a scheme of centralized planning mainly for the benefit of centrally controlled enterprises. A "double track" system devolved upon local authorities to draw up a co-ordinated plan for all the enterprises in their locale. The local plans would have to tackle the problems of balancing needs between different enterprises, different economic sectors, and different areas, of defining targets and scopes of plans, and of maintaining proportionate development between different sectors. The whole system was described as "centralized planning and decentralized control."

Under this system, the planning unit was a geographical area, a hsien, a special administrative district, a city, a province, or even an economic region. Every unit aspired

to become as self-sufficient as possible and, thus, tended to ignore the needs of other units. This resulted in serious disruption of the regular flow of supplies between areas. However, the development of localism was not unanticipated, and it was stated that these tendencies could be overcome by strengthening the Party's leadership.

But decentralization was carried to a point where even any pretence of unity in national planning and national economic development was non-existent. Therefore, a return to central control over fiscal and financial plans was ordered by the State Council in 1960. Later, it was realized that the financial control system had to be even more centralized than the system of fiscal control. A slogan of "the whole nation as one chess board" was introduced, with the establishment of six regional "central bureaux" to exercise control on behalf of the Party's Central Committee. However, with decentralization, there were changes in the proportion between local and central industries which reflected a wider dispersion of industrial locations than ever before, especially in the iron and steel industries. The central authorities controlled the larger and heavier strategic industries. Since the modern industry sector produced about three-quarters of industrial output and the centrally controlled sector produced a little over one-quarter of industrial output, about one-half of the modern industrial output must be in

the hands of the local authorities; by the same reasoning, at least half of the heavy industry output must be out of the hands of the central authorities.

In general, there has been a trend from concentration to the distribution of administrative powers from 1949 to the present. How did administrative decontrol relate to decentralization of economic activity? In Communist China, government at the regional level has a unique importance. Planners see the duality of center and region as a contradiction that has to be resolved. The First Five Year Plan period was characterized by branch-type administration and centralization; but during the Great Leap Forward, the government stressed administration by interbranch coordinative agencies and decentralization.<sup>1</sup>

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<sup>1</sup>The branch principle of organization means that all units concerned with similar operation, i.e., administration of machine building industry, form a single branch. A central point in the national capital directs a hierarchy of regional bureaux. In economic administration, this form of organization

Decentralization in the economic field meant that regional governments administered a complex array of small enterprises that could not be governed according to the strict principle of production. This decontrol could be envisaged in certain ways as a means to facilitate easier controls for the decentralization of economic activity into the less developed regions. Decentralization, however, was also intended to raise agricultural output. By putting decision-making powers into the hands of the producing units, external conditions were created for the autonomous exercise of such powers, i.e., some form of market conditions. It was assumed by Chinese planners that, where production units were not subjected to directives and regulatory controls, they would produce for self gain; they would increase their output only if they had something to gain in return. In other words, decentralization would allow material incentives and thereby increase agricultural and industrial output. In Chinese economic theory, increased agricultural output has a strong relationship to the industrial sector. The quality of industrial performance in a given year depends on the quality

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has also been called the production principle. In China, the application of the branch principle generally means centralization of command and administration. By contrast, the interbranch coordinative agencies cut across branch lines and take the form of committees. At the central level, the most important agencies are the state planning and economic committees. Alongside, decision-making powers are transferred downward from some central point, or decentralization. This parallels the type of decontrol advocated by economists such as Liberman and Sik.

of the agricultural output during the preceding year. There is an equally close relationship between light industry and heavy industry. Light industry constitutes the link between the agricultural and heavy industry sectors; light industry derives most of its raw materials from agriculture and is also one of the major sources of savings for investment in heavy industry.

Administrative decentralization was employed for increasing the outputs of both the agricultural and industrial sectors and to facilitate economic and population dispersion.

### 2.3 Organization and Political Ideology

It is difficult to over-emphasize the role of political ideology in China's development planning. Communist Chinese view politics as the concentrated manifestation of economics; no question is apolitical; an economic decision is also, by definition, a political decision. Consequently, Chinese planners are limited to a large extent by political parameters, and an understanding of China's growth strategies necessitates a brief view of her politics and organization.

The orthodox Marxist notion of class polarization is basic in Communist China's ideology. "Struggle" is defined as class conflicts and is a manifestation of the theory of opposites. Mao Tse-tung expands on this and emphasizes Contradiction, of which class conflicts exemplify. Accordingly, Communists, or Marxist Leninists, must use the law of the unity of opposites to resolve problems, economic, regional and otherwise. Major contradictions in Chinese Communist ideology include:

(A) vs. (B)

#### I. Economic Contradictions (The Dialectic of the Economy)

##### Contradiction of Sectors

modern	traditional
coast	inland
industry	agriculture
heavy industry	light industry

## Contradiction of Goals

select development  
long-term

simultaneous development  
short-term

## Contradiction of Scale

large-scale industry

medium & small-scale industry

## Contradiction of Functions

production  
production  
accumulation

consumption  
accumulation  
consumption

## Contradiction of Operation

capital-intensive

labor-intensive

## II. Political Contradictions (The Dialectic of the State)

## Contradiction of Conception

centralism  
"from the top down"

democracy  
"from the bottom up"

## Contradiction of Administration

center  
centralization  
vertical rule  
branch principle  
(vertical)

region  
decentralization  
dual rule  
committee principle  
(horizontal)

The list gives the Chinese Communist theory of the Law of Contradictions, and indicates their ideological views on economic and political questions. Needless to say, the left side of the list is regarded as the bad boy to be stood in a corner by himself.

During the Great Leap Forward period, the key economic slogan was "simultaneous development" of the various economic sectors, or the resolution by the law of the unity (simultaneous development) of opposites (select vs. simultaneous). Mao spoke on the questions of economic development in his speech "The Ten Great Relationships" and revealed his dialectical conception of the economy. The first five relationships are:

- (1) The relationship of industry and agriculture, of heavy and light industry.
- (2) The relationship of coastal industry and inland industry.
- (3) The relationship of economic construction and defence construction.
- (4) The relationship of state, cooperative, and individual.
- (5) The relationship of center and region.

A persistent train of thought in Communist Chinese economic literature is the "idea of sectoral contradictions." In his report to the Eight Party Congress in 1956, Liu Shao-ch'i spoke of the need to coordinate coast and inland, large-scale and medium and small-scale industries, central and state-owned with regional state-owned industries. Roughly, these can be considered as contradictions between the modern and traditional sectors.



## 2.4 Regional Economics

As pointed out earlier, the Communist Chinese inherited a country that did not constitute an economic entity. During the first five years, the country was administered as seven large regions. But by 1954, the political difficulties obstructing complete unification of the country had been overcome, and China for the first time in decades became truly unified. Political unification was a requisite for implementing the series of five year plans, which envisaged a steadily growing modern sector cutting across regional lines and under the direct administration of the central authorities. The decentralization of 1967 was a tacit recognition that the Chinese economy could not be directed as a single entity. This implied that regional planning and cooperation must play a vital role in propelling the economy forward.

In China, regional economic cooperation meant that the industries should rely more on materials derived from the particular given administrative region rather than on materials that had to be imported from some distant source. For example, if the needed materials were not available, they were to be developed within their own particular region or substitutes had to be found. While the earlier period of centralized administration would have presented various difficulties in administration in regional economic cooperation,

the new power and authority that came with decentralization greatly simplified intra-regional allocation of materials. However, the decentralization measure did not include any administrative mechanism between centres and provinces. It handed down decision making powers to the local provincial governments and thereby laid the groundwork for making the provinces the units of economic cooperation. Despite the fears of some members of the leadership that decentralization had gone too far, and a recentralization was necessary, a continued emphasis had been that of regional cooperation.

Enterprises were told that they must try to purchase materials and equipment within their own administrative units, and whenever possible, sell their products in the same area. To facilitate this kind of exchange, the government even went as far as to suggest that the exchanges take place directly between buyer and seller, bypassing the state-controlled commercial network. In other words, enterprises were urged to confine their economic relationships as much as possible within their own area or region.

A persistent complaint against the idea of regional economics was that it would lead to inequalities. An advanced region would move ahead faster while the poorer, less developed regions would remain behind. An essential feature of the Great Leap Forward had been the objective of overcoming the inequities which had arisen in the First Plan period by

encouraging simultaneous development of the entire economy. In spite of this, the existence of inequity has been admitted, and some China watchers claim that Chinese planners actively encouraged it.<sup>1</sup> If this is true, then regional differences may be regarded as a spur for other less developed regions to catch up with the more advanced.

The standard of living varies sharply between areas, it generally being the highest in the cities. The effect of encouraging regional economic cooperation may tend to further widen the gap between the advanced and backward areas, although the intent may be to effect the reverse. However, with a leadership concerned primarily with economic development, it can not afford to ignore the fact that the advanced regions add proportionately more to the national economy than the poorer regions.

## 2.5 The Spatial Economy

### 2.5.1 Urbanization Policy

Fundamentally, the Chinese sentiment that has underlined their urban policy can be summed up as anti-urbanism, suspicion and distrust of the big cities. In Communist theory,

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<sup>1</sup>See Franz Schurman's article, "China New Economic Policy, Transition or Beginning?" in China under Mao, op. cit., p.221.

Marx and Lenin equate the traditional city with the habitat of the exploiters, and thus regard eliminating the distinction of the city as a sine qua non for destroying class differences.<sup>1</sup> Mao Tse-tung regards the same problem in terms of contradictions:

"Economically, in capitalist society, where the town under bourgeois rule ruthlessly exploits the countryside, and in the Kuomintang-controlled areas in China, where the town under the rule of foreign imperialists, and the native big comprador bourgeoisie most savagely exploit the countryside is one of extreme antagonism. But in a socialist country and in our revolutionary bases, such an antagonistic contradiction becomes a non-antagonistic contradiction; and it will disappear when a communist society is realised." <sup>2</sup>

Indeed, this kind of ideological hostility by the Communists towards the cities amounted to sheer hatred of metropolises, of which Shanghai was the focus. The anti-urban attitude of the Communist did not diminish after their takeover; at first, the complicated urban socio-economic structure and organization of the cities were too complex for guerilla veterans to appreciate, let alone control. Later, the professionalization

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<sup>1</sup>This line from Lenin is a frequent quote in Communist Chinese literature: "For the sake of eliminating the class, we not only have to overthrow the exploiters, the landlords, and the capitalists, not only have to abolish their ownership, but also have to eliminate the difference between town and country... ." Some Problems of Transition from People's Commune to Communism, 1958.

<sup>2</sup>Mao Tse-tung, "On Contradiction," Selected Works of Mao Tse-tung, Vol. I, Peking: Foreign Language Press, 1952

and specialization prevalent, and indeed necessary, in cities for urban administration sake added to the inherent fear of class differentiation.

The Chinese also have economic arguments to depreciate the city. Despite western economists' conclusions that urban areas are relatively the most efficiently productive places, the Chinese, perhaps through political bias, hold a parasitic view towards the city. This argument is hardly effective when one recalls that Shanghai is the single most productive area in the whole of China today. But there are economic difficulties: the first is maintaining a balance between supply and demand in the areas with more than a million population. In a rigidly planned economy, production, transportation, and distribution of goods and services without the benefit (or, with due respect, the evils) of the market mechanism have apparently caused operational problems of efficiency. A persistent problem seems to be the adequate provision of foodstuff, especially perishable goods like vegetables, where incoming shipment and local distribution were badly coordinated.<sup>1</sup> Another argument advanced by Chinese economists concerns the cost of urban infrastructure. In a country where the majority of the population live on marginal subsistence level, the staggering cost needed to sustain the cities appears overwhelming. In fact, the cost of urban

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<sup>1</sup>The vegetable problem is more serious than it appears

infrastructure far exceeded the estimates of the Peking planners. In the First Five Year Plan, there was no budget allocated for housing in the urban areas under the sector of Basic Construction. There was, however, 1.6 billion yuan, or 3.7 per cent of the total investment budget in Basic Construction that was allocated to Urban Public Works.<sup>1</sup> Actual spending for housing in urban areas from 1953 to 1956 amounted to 4.0 billion yuan, or 10 per cent of the total national basic construction investments in the whole Five Year Plan. In addition, another 3.5 billion yuan were spent for the construction of 6.57 million square feet of public buildings.<sup>2</sup> The actual spending for the Urban Public Works sector, although not given, can be assumed to be at least six times the initial figure. In the face of capital shortage, big cities are

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at first sight. This problem perhaps accounted for the frequent expansion of the municipal boundaries of many big cities, so that the production, shipment, and distribution of foodstuffs like vegetable can be consolidated under one local agency. This incident has meaningful implications where the absence of a land rent mechanism results in random and inefficient land uses. See the article by Sun Chien, "Problem of Year Round Supply of Vegetables," Impartial Daily, Oct. 30, 1961.

<sup>1</sup>People's Handbook, 1955.

<sup>2</sup>People's Handbook, 1958, p.647.

are frustrating and expensive propositions. In due course, a Bureau of City Construction was established in the Central Government in 1953. Although it was later expanded to become the Ministry of City Construction the following year, the whole bureau was abolished in 1955.<sup>1</sup> Such ambivalence indeed permeates Chinese feelings on large cities.

### 2.5.2 Changes in the Economic Importance of Cities

One way of examining the spatial pattern of the Chinese economy is to ascertain the location and relative importance of the principal economic centers.

The first official census of China published in 1953 had 164 municipalities,<sup>2</sup> which included two independent municipalities, Peking and Shanghai, which are administratively on the same level as provinces. Since all urban places with more than a 100,000 population are municipalities, economic centers of importance are listed. These population statistics, which show their relative growth rates as well as changes in absolute size, provide meaningful indications of economic activity. Since consumption increases with population growth, the latter is an indication of change in the relative importance of cities as markets. Also, assuming

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<sup>1</sup>People's Handbook, 1954, 1955, 1956.

<sup>2</sup>See Morris Ullman, Cities of Mainland China: 1953 and

that temporary visitors are excluded from these statistics, population growth can be a measure of the importance of a center as an area of production. Assuming further that controlled population movement in China does not allow people to remain in an area for long periods without employment, any sustained population increase can then be inferred to be accompanied by a corresponding rise of economic activity and employment.

Population increase in a municipality could understate the importance of that area as a supply center. If there was an initial period of large unemployment, increase in employment could exceed the increase in population caused by in-migration. Similarly, decrease in population could understate the drop in employment if unemployment in the city increases. Differences in growth rates for various industries and in labor intensity per unit of output, which are determined by the production processes utilized, could also result in population changes that do not reflect the real magnitude and economic importance of changes that cities undergo. This is important especially in cities, as in China, with only a few industries or low industrial mix. With these

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1958. Washington, D.C., Bureau of the Census, Foreign Manpower Research Office, U.S. Dept. of Commerce, 1961, Series P-95, No. 59, p.2.

Moreover, in Communist Chinese terminology, a municipality is defined as an urban area designed as a separate administrative unit.



observation, we can go on to approximate the economic significance of Chinese cities from 1953 to 1958.

The years 1953 and 1958 chosen for comparison are determined by several factors. By 1953, sizeable unemployment in the urban areas has disappeared as a result of increasing economic activity during the post-Korean war initial industrial rehabilitation period. By mid-year 1958, government directives issued in 1956 and 1957 to curb immigration from the countryside and requiring unemployed to return back to the rural areas have had their effects. Furthermore, transient populations that had come to the cities during the chaotic period of intense collectivization programme were excluded from the 1958 registered urban populations. As such, these years reflect a reasonably accurate picture of the true resident populations. The data for 1953 and 1958 span a critical period, that of the First Five Year Plan and the first six months of the Second Plan. Consequently, population changes during this period reflect the impact of increased economic activity on city size distributions.

Table 2.6 shows that most of the 117 cities in the census had less than 300,000 populations. It also shows a sharp discontinuity in the frequency distribution between 200,000 to less than 300,000. Quite a few number of cities fall within the intervening intervals between 300,000 and

TABLE 2.6

Distribution of 117 Cities by 1953 and 1958 Midyear Populations

Size of Population group	Population (000 persons)	Number of cities in 1953	Number of cities in 1958	Change (#)	Change (%)
Small	Less than 100	16	2	-14	
	100 to less than 200	47	40	- 7	-16.05
	200 to less than 300	18	26	+ 8	
Medium	300 to less than 400	8	9	+ 1	
	400 to less than 500	3	5	+ 2	
	500 to less than 600	4	4	0	
	600 to less than 700	6	4	- 2	+25.93
	700 to less than 800	2	6	+ 4	
	800 to less than 900	3	4	+ 1	
	900 to less than 1,000	1	2	+ 1	
Large	1,000 to less than 1,500	3	6	+ 3	
	1,500 to less than 2,000	2	2	0	+66.67
	More than 2,000	4	7	+ 3	
Total		117	117		

Source: Wu (1967).

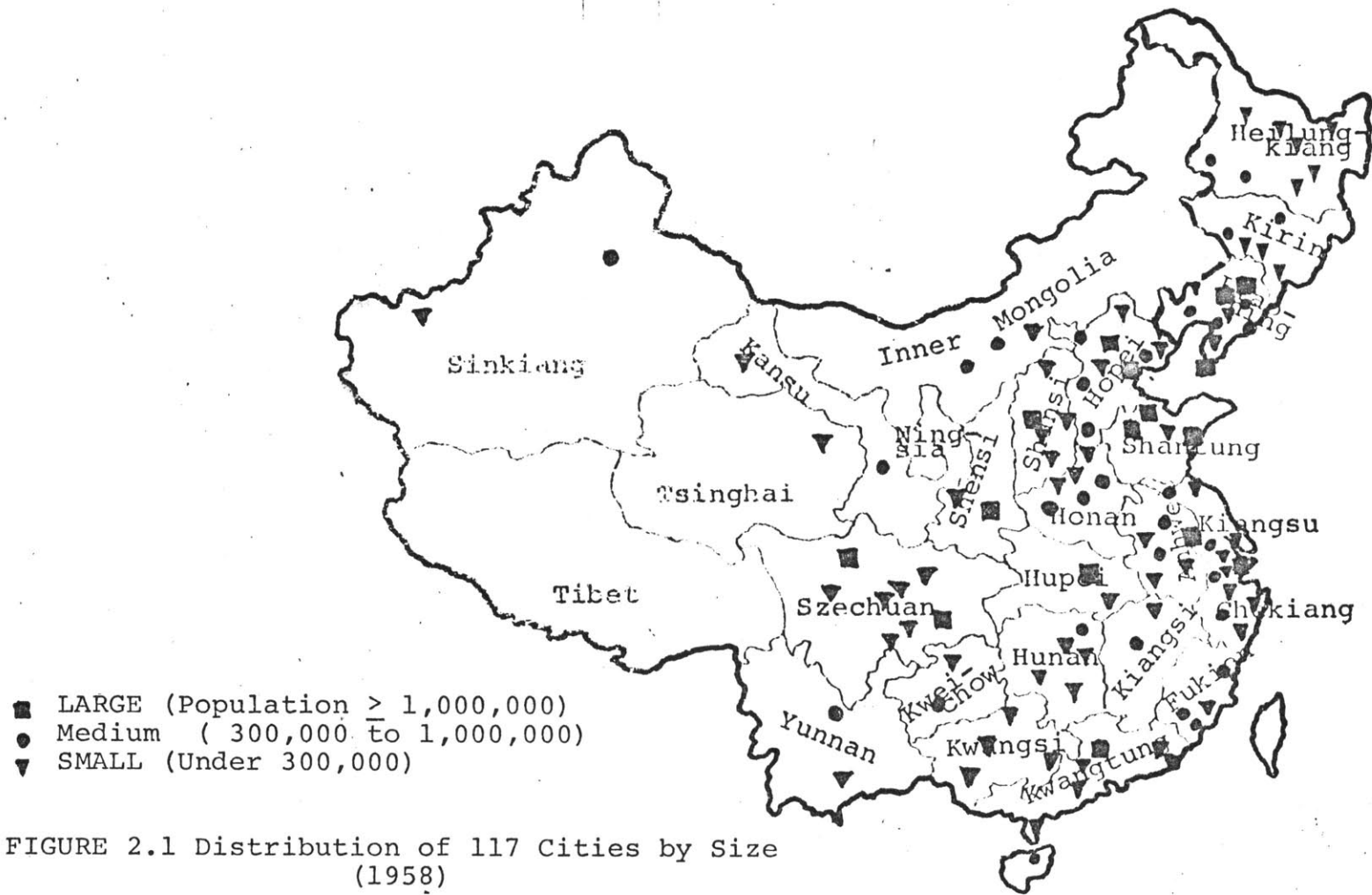


FIGURE 2.1 Distribution of 117 Cities by Size (1958)

1,000,000 at more or less decreasing frequency as the class interval in population rises. From 1,000,000 up, the frequency shows a rise again. We may then draw two arbitrary divisions of city size: one immediately above the class interval of 200,000 to less than 300,000, and the other immediately above the class interval of 900,000 to less than 1,000,000. Cities below the first division are considered small; those between the two divisions as medium; and those above the second division as large. (Figure 2.1). The 1958 frequency distribution can also be classified similarly.

Comparison of 1953 to 1958 shows a decrease in the number of small cities, accompanied by an increase in the medium, and a slower increase in the large cities group. However, the decrease in the small cities is not particularly significant; the sample size for 1953 and 1958 being consistent, an increase in the two other groups imply a decrease in the small group. The number of small cities would not have decreased if the 1958 sample size had been larger. If the 1958 distribution had been larger, small cities would experience a net positive increase rather than the decrease shown in our data. A larger distribution was not adopted for 1958 because the lack of complete data for all cities in both years would result in distortions if we compared cities with one another in measuring population growth within the city.

Accordingly, attention should be focused on the two

groups that experienced increases, mainly the medium and large groups. The number of cities in the medium group increased by seven, and the corresponding increase in the large group was six. In relative terms, the large group increased by 67 per cent compared to 26 per cent by the medium group.

A comparison can also be made between 1948 and 1953 using 98 cities for which data are available. Again, the same frequency characteristics for 1953 are evident in 1948 (pre-Communist era). During the following five years, there was an increase of 7 medium cities, as compared with an increase of only 2 in the large group (see table 2.7). The relative rates of increase are 59 per cent for medium cities and 29 percent for the large cities. As such, there was a significant increase in the number of medium cities between 1948 and 1953.

Increased urbanization is obvious. Although percentage figures vary, the overall impact appears to contrast with what might have been expected from an announced policy of discouraging growth of the large cities in preference for the expansion in number of medium and small cities. While the medium group expanded, it is, however, the conspicuous increase in the number of large cities that is most significant. Part of the answer may lie in the ambivalence of official policy beginning in 1956 when planning authorities began to deplore the over-zealousness in the establishment of new

TABLE 2.7

Distribution of 98 Cities by 1948 and 1953 Midyear Populations

Size of group	Population (000 persons)	Number of cities in 1948	Number of cities in 1953	Change (#)	Change (%)
Small	Less than 100	21	2	-19	
	100 to 200	34	44	+10	-16.21
	200 to 300	19	16	- 3	
Medium	300 to 400	7	8	+ 1	
	400 to 500	0	3	+ 3	
	500 to 600	5	4	- 1	
	600 to 700	1	6	+ 5	+58.82
	700 to 800	3	2	- 1	
	800 to 900	0	3	+ 3	
	900 to 1,000	2	1	- 1	
Large	1,000 to 1,500	4	3	- 1	
	1,500 to 2,000	2	2	0	+28.57
	2,000 or more	1	4	+ 3	
Total		98	98		

Source: Wu, (1967). Original data from Ullman, Cities of Mainland China: 1953 and 1958, p.2.

economic centers at the expense of the general rate of national economic expansion. Relatively lower rates of increase in the medium cities relative to that of the large cities may reflect a shift of policy.

The rank size distribution of Communist Chinese cities and its conformity to a system of central places may have significant implications for theoretical discussions. However, this section is limited to a graphic exposition of rank size distributions. H. W. Singer points out in his 1936 article:

"In the distribution of population among human agglomerations, there appears to be a remarkable statistical regularity which, besides being interesting in itself and affording a complete analogy to Pareto's law of income distribution, yields an exact quantitative measure for the relative roles of the smaller and larger types of human agglomerations, so to speak, an 'Index of Metropolisation.' This regularity can be characterized by the equation  $\log Y = A - \alpha \log X$ , where X is a certain number of inhabitants; Y the number of towns more than X inhabitants; A and  $\alpha$  are constants."

A regression analysis was run for the 1953 and 1958 populations for the 117 cities where linear regression lines were deduced. In this study by Professor Wu, for 1953 he had  $Y = 3.837477 - 0.924794 \log X$ , and for 1958, he had  $\log Y = 4.143997 - 0.993881 \log X$ . The linear regression lines showed an increase in the  $\alpha$  value or the Pareto coefficient between 1953 and 1958, accompanied by a concomitant increase in A. The difference, however, is not significant. The slight increase in  $\alpha$  in 1958 would still be higher than in 1953 (see Figure 2.2).

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<sup>1</sup>H. W. Singer, "The Courbs des Populations, A Parallel to Pareto's Law," The Economic Journal, Vol. XLVI, No. 182, June, 1936.



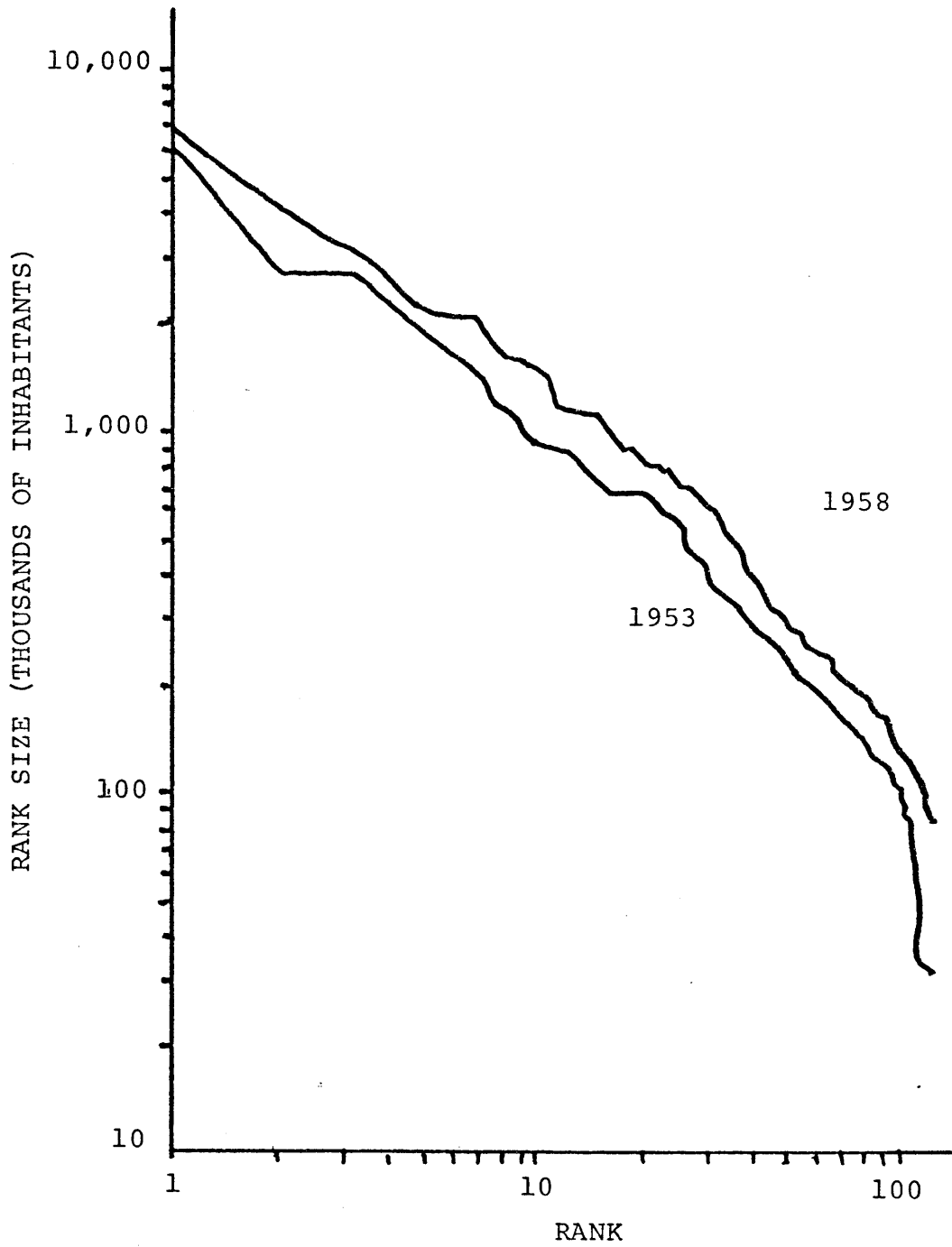


FIGURE 2.2 Rank Size Distribution of Chinese Cities in '53 &amp; '58

G. R. Allen<sup>1</sup> has pointed out that other things being equal, the highest values for  $\alpha$  should be obtained from data derived from fixed boundary definitions of town sizes since the number of large towns which have grown in recent years by over-spilling legal boundaries are many in most countries. Therefore, computation for the Pareto coefficients for Communist China was based on population statistics of towns with legal boundaries. The problem of spillover, however, is not very vital because the inadequate municipal transportation in Communist China would restrict such effects. It is interesting to compare the  $\alpha$  values just under 1 in both 1953 and 1958 with similar values in other countries. For England and Wales in 1921, the corresponding coefficients were 0.9893 and 0.9314 for Canada in 1932. It was also pointed out that the relative deviation of the data  $(Y-Y')/Y$  where  $Y$  is actual and  $Y'$  the theoretical, is small for large values of  $X$ , and tends to rise as  $X$  becomes smaller. This seems to imply that the Pareto function over-estimates the number of small towns, as Allen observes.

The population of Shanghai, China's largest city, was estimated at 4,423,000 for the year 1948, the last of Nationalist rule before the Communist liberation. The 1953 and 1958 censuses reported figures of 6,024,000 and 6,977,000 respectively. Thus, from 1948 to 1953, Shanghai's

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<sup>1</sup>G. R. Allen, "The Courbs des Population, A Further Analysis," Bulletin of the Oxford University Institute of Statistics, Vol. XVI, Nos. 5 and 6, May, June 1954.

population growth rate was 36 percent, or 5.4 percent annually; and 12 percent from 1953 to 1958, or 2.3 percent annually.

Total national urban population in 1949 was 57,650,000, which implies an annual growth rate of 7.8 percent from 1949 to 1953. From 1953 to 1958, that national growth rate of urban populations is estimated at 5.3 percent. In relative terms, therefore, Shanghai lost its dominance with respect to population weight. In fact, after 1953, Shanghai's population growth was attributed to the natural birth rates only. We can conclude, then, that Shanghai's primacy dropped.

Many writers and students of urbanization take the term primacy for a structural meaning. Professor Berry, for one, equates primacy simply with the abrupt change of lognormal straight regression lines in the city-size distribution of a country.<sup>1</sup> He presents a model to demonstrate how city-size distributions will evolve from a primate type to a smooth

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<sup>1</sup>See Berry's articles "City as Systems within Systems of Cities," in Friedman and Alonso (1964).

lognormal distribution. In other words, primacy shall tend towards a rank size relationship over time. In a sense, this implies that once a straight lognormal distribution has been reached, primacy will, in effect, be nonexistent. This implication is questionable on two points. First, a change in the slope of a lognormal regression line also can be taken to imply a relationship to primacy in the structural sense. Second, in a country where city size distribution has a lognormal straight line character, as in China, yet betrays aspects of primacy, the whole question of primacy and rank-size being mutually exclusive becomes confusing.

Primacy is perhaps best measured with references to the urban structure of a country as a whole. We, therefore, adopt El Shaks's methodology; he defines a city's primacy values as the average ratio of the difference between the given city's population size and that of each smaller city to the population size of the given city. A country's primacy index can, thus, be determined by summing the averages.<sup>1</sup>

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<sup>1</sup>While we adopt El Shaks' method, we also recognize its inadequacies. Other than the problem of a country's size, this method of determining primacy values ignores the shape of the distribution which Professor Berry regards as essential and which is implied in the usage of primacy. Furthermore, a primacy index computed from this method may be derived from two different countries with contrasting city-size distribution line, yet may result in similar values. El Shaks' method describes the average of the relative horizontal distance rather than the shape of that distribution. This point is not particularly crucial in this study as our analysis has a time dimension of only five years, hence, vertical relationships are more significant.

Formally:

$$P = \frac{1}{n-1} \sum_{i=1}^n P_i$$

$$P = \frac{1}{(n-1)C_i} \sum_{j=1}^n (C_i - C_j)$$

$P$  is the primacy index of a country;  $P_i$  the primacy value of the  $i$ th city over smaller cities;  $C$  is the city population;  $n$  is the number of cities, and  $i$  the rank

Since our data is incomplete and does not contain figures for all cities (only 117 cities are accounted for in our study), the equation has to be calibrated for Communist China. Basically, the concept remains the same, except we classify the cities into four categories. The primacy value can then be determined for each group leading to a primacy index for the whole system from 1953 to 1958. We classify the 117 cities into four class groups, each having largely the same aggregated population as of 1953. We, then, compute the average population of the four groups to obtain four representative shadow cities which function like dummy variables, and use the shadow cities as a system for computing primacy values for each group and an overall primacy index for the country (see Table 2.8). Our primary index is:

$$P_{1953} = \frac{0.83 + 0.71 + 0.69}{3} = 0.74$$

TABLE 2.8

## Urban Population and Primacy Values, 1953-1958

Size of Population	Number of Cities	Aggregate population (in 000s)		Average size (in 000s)		Primacy value (P <sub>i</sub> )	
		'53	'53	'58	'53	'58	'53
2,000,000 or more	4	13,966	16,827	3,492	4,207	0.83	0.80
750,000 to 1,999,999	10	11,466	15,866	1,147	1,587	0.71	0.71
300,000 to 749,000	22	11,398	15,248	518	693	0.69	0.69
less than 300,000	81						

$$P_{1958} = \frac{0.80 + 0.71 + 0.68}{3} = 0.73$$

According to our figures, the primary index of Communist China's urban system (of 117 major cities) decreased by 0.01 from 1953 to 1958. While the amount is extremely small, it is not insignificant; even if we take or give a few point as an error term, this result is still surprising in the face of the Communist intensive economic development programme and of increased industrial activities. In addition, despite urbanization associated with economic development, China's primacy actually dropped. Our result conforms to the rank size relationship analysis in the previous section. If we look at the 1953 and 1958 regression lines carefully, we can notice a less steep function for 1958. A flattening out of the curve would imply departure from primacy; as such, the two results are consistent and complementary.

### 2.5.3 Industrial Location Policy

Summarizing on the draft of the First Five Year Plan during the second session of the First National People's Congress on July 5, 1956, Li Fu-ch'un, chairman of the State Planning Commission, described the irrational pattern of pre-Communist development and elaborated on future locational policies (cf. Section 1.2, Chapter 1):

"The Five-Year Plan of capital construction includes a relatively rational spatial arrangement. Industrial bases in Manchuria, Shanghai, and other cities will be appropriately utilized so that they exercise their function in bringing about the rapid expansion of production to meet the demand of the economy and to support the construction of new industrial centers. This effort includes especially certain necessary construction of new industrial bases complex. On the other hand, active efforts will also be made to establish new industrial bases in North China and certain areas in Northwest and Central China, and to begin in part industrial construction in the Southwest. On the basis of this policy, 472 of the 694 above-norm industrial construction projects planned to be started during the first five years will be in the interior provinces and only 222 will be in the coastal areas.

At the same time, on the basis of this industrial policy, our present task in urban construction is not to develop the large cities on the coast, but to develop medium and small cities in the interior and to restrict appropriately the expansion of the large cities. The present blind or unplanned development of the coastal cities is a phenomenon that has to be corrected."<sup>1</sup>

The First Five Year Plan's primary emphasis on the development of heavy industry is an indication that the government planned to concentrate on heavy industry in the medium and small cities. It is important to note that urban policy in China seems to be largely determined by industrial location policies. As such, the emphasis on promoting medium and small cities can only in part be attributed to national and regional economic development strategies.

Principles of industrial location in the Chinese

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<sup>1</sup>Jen Min Shou-t'se, 1956, (People's Handbook, 1956) Shanghai: Ta-kung Pao-she, pp.59 - 60.



socialist economy are: (1) proximity to the sources of raw material supply and consumer markets to fully utilize local resources, to lower production costs, and to minimize transport inputs; (2) regional division of labor, although consideration is given to national plans for using fuel, raw materials, and transportation service, and, (3) the development of remote and undeveloped areas and the establishment of new industrial bases. These considerations point to the desired optimal spatial arrangement with a proper balance between intraregional self-sufficiency and interregional specialization and exchange.

When the First Plan years brought about an over-zealousness in developing the new inland industrial centers, they also brought about a relatively slow increase in production output.<sup>1</sup> When this became apparent, Li Fu-ch'un emphasized in his report to the third session of the First National People's Congress the necessity of placing greater reliance on the existing industrial bases on the coast and that industrial development in the coastal and interior regions should be properly coordinated and balanced. Li saw the reason for the slow industrial growth as the failure to utilize fully the existing industrial facilities. Chou En-lai gave an official position and pointed out that the movement of industrial construction toward the interior and

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<sup>1</sup>The slow increase can be seen in the changing rates

western China had to be accomplished over a realistically long period of time:<sup>1</sup>

"During the First Five Year Plan, our aim is to utilize the original industrial bases in the east in order to build new industrial centers in the middle. The cities of pivotal construction are Wuhan, Pao-t'ou, Cheng-chou, Lo-yang, Sian, and Lan-chow, all of which are situated in the central part of China. Further advance westward must be preceded by the establishment of industrial bases in the center and the completion of necessary preparations in the western region .... The Second Five Year Plan will have as its goal the beginning of construction of industrial bases and some industrial enterprises in the southwest, the northwest, and Sinkiang. As for the general development of industry in western China, this will have to await the completion of future five year plans. Those who expect the rapid and general establishment of many industrial bases in the far reaches of western China are unrealistic in their outlook."

As a result of this policy, seven Economic Coordination Regions were established. Table 2.9 lists these regions and their rankings as deduced from varied sources. The regions

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of growth of industrial production and of the GNP. The rate of increase of adjusted modern industrial output was 16 percent in 1953 - 54 and 8 percent in 1954 - 55. It later rose to 26 percent in 1955 - 66. The GNP rose 4 percent in 1953 - 54 and 5 percent in 1954 - 55; it increased 12 percent in 1955 - 56. From Yuan-li Wu et al., The Economic Potential of Communist China, Menlo Park, Calif.: Stanford Research Institute, 1963, Vol. I, PP. 220 and 241.

<sup>2</sup>Jen-min Shou-ts'e, 1957 (People's Handbook, 1957), Shanghai: Ta Kung Pao-she, 1957, p.192.

TABLE 2.9

Relative Rank of Economic Coordination Regions by Selected  
Economic Indicators<sup>a</sup>

Economic indicators	North-east	East	North	Central South	South-west	North west
Land area	5	6	3	4	2	1
Population	5	1	4	2	3	6
Number of Soviet aid projects	1	5	2	4	6	3
Total ind. production	1	2	3	4	5	6
Elec. power	1	2	3	4	5	6
Coal	2	4	1	5	3	6
Petroleum	1	4	.	5	3	2
Iron & steel	1	3	2	3	3	.
Machine bldg.	1	2	4	3	5	6
Chemicals	3	1	2	4	5	6
Textiles	5	1	3	2	5	4
Sugar	2	5	4	1	3	6
Paper	1	2	3	2	3	.

<sup>a</sup>In this table, the country is classified into six instead of seven Economic Cooperation Regions. The difference here is that the South of the official seven-region classification, which included Fukien, Kwangtung, and Kwangsi, has been reclassified accordingly: Kwangtung and Kwangsi is part of Central South, while Fukien is considered part of East.

were to be self-sufficient and were designed to reduce the expenses of long distance transport and cross-country hauls, to accomplish specialization on a regional basis and to promote complementary enterprises within each region. Each region was to have one major iron and steel complex, plus a number of secondary steel centers and machine building production sites. This concept of intraregional economic coordination meant the delineation of specific market and supply area for a subset of industries organized around the steel complex.

Location policy also had important defence considerations. Decentralization was intended in part to locate new industrial bases in the more sheltered inland regions. Although nuclear weapons would have eliminated any real distinction between peripheral and interior locations, decentralization would materially reduce the number of industrial complex vulnerable to each attack.

#### 2.5.4 Regional Distribution of Cities

An examination of the provincial and regional distribution of cities and the regional level of economic activities could indicate possible correlation between urbanization and economic development. Table 2.10 presents the change in the frequency distribution of 117 cities by

TABLE 2.10

Changes in 1953 and 1958 Frequency Distributions of 117 Cities  
By Size Groups in 24 Provinces and Autonomous Regions<sup>a</sup>

Region	Province	Number of cities								
		Large cities			Medium cities			Small cities		
		'53	'58	Change	'53	'58	Change	'53	'58	Change
North-east	Liaoning	1	3	+2	6	4	-2	3	3	0
	Kirin	-	-	-	2	2	0	3	3	0
	Heilungkiang	1	1	0	1	1	0	6	6	0
	<u>Total</u>	2	4	+2	9	7	-2	12	12	0
North	Hopeh	2	2	0	3	4	+1	4	3	-1
	Shansi	-	1	+1	1	-	-1	4	4	0
	I. Mongolia	-	-	-	-	2	+2	3	1	-2
	<u>Total</u>	2	3	+1	4	6	+2	7	8	-3
East	Kiangsu	2	2	0	4	4	0	7	6	-1
	Shantung	-	1	+1	1	2	+1	3	2	-1
	Anhwei	-	-	-	-	2	+2	5	3	-2
	<u>Total</u>	-	-	-	1	1	0	5	5	0
	<u>Total</u>	2	3	+1	6	9	+3	20	16	-4
Central	Kiangsi	-	-	-	1	1	0	1	1	0
	Honan	-	-	-	1	3	+2	6	4	-2
	Hunan	-	-	-	1	1	0	4	4	0
	Hupei	1	1	0	-	-	-	1	1	0
	<u>Total</u>	1	1	0	3	5	+2	12	10	-2
South	Kwangsi	-	-	-	-	-	-	4	4	0
	Kwangtung	1	1	0	1	3	+2	6	5	-1
	Fukien	-	-	-	1	2	+1	2	1	-1
	<u>Total</u>	1	1	0	2	5	+3	12	10	-2
North-west	Shensi	-	1	+1	1	-	-1	1	1	0
	Sinkiang	-	-	-	-	1	+1	3	2	-1
	Kansu	-	-	-	1	1	0	1	1	0
	Tsinghai	-	-	-	-	-	-	1	1	0
	<u>Total</u>	-	1	+1	2	2	0	6	5	-1
South-west	Szechuan	1	2	+1	1	-	-1	6	6	0
	Kweichow	-	-	-	-	1	+1	1	-	-1
	Yunnan	-	-	-	1	1	0	1	1	0
	<u>Total</u>	1	2	+1	2	2	0	8	7	-1
TOTAL		9	15	+6	27	34	+7	81	68	-13

<sup>a</sup>Excluding Tibet and Ningsia.

Source: Wu (1967).

the three size group and by regions. It is intended to show the most populated areas in 1953 and 1958, and where the policy of developing small and medium cities over large ones has been followed.

In 1953, the leading regions were Northeast China, North China, and East China, a ranking which corresponds to the pre-Communist ranking of regions in economic importance. Table 2.9 shows the relative rank of Economic Coordination Regions by selected economic indicators. For medium cities, Liaoning province was first, followed by Kiangsu and Hopeh. This same general order was maintained in 1958. Northeast China headed the list of regions in 1953, followed by East and North China. In 1958, East China became the leading region.

Given an increase in the number of medium cities

without any change in the large cities, we may regard the region to have increased the number of urban centers in a manner consistent with the avowed policy to develop small and medium sized centers at the expense of large ones. Alternatively, given an increase in the number of cities in the large group with a concomitant increase in that of the medium group, the region or province has increased its degree of urbanization, but in a manner inconsistent to the restriction of large cities' growth. All this indicates a general increase in urbanization in that the number of urban market and supply centers showed a net increase. There was an expansion in all the Economic Coordination Regions; most developing regions increased in urbanization according to official policy. In the 1953 to 1958 period, the three more developed regions (Northeast, North, and East) added four large cities as compared with two in the less developed regions. However, medium cities increased by three in the former group and by four in the latter (the less developed). This indicates that development was still very much concentrated in the more developed regions, although the coastal areas alone seemed to have enjoyed a slightly decreased preference (see Figure 2.3 and Figure 2.4).

It is evident from the foregoing data that the regions with the largest concentration of cities by all three size groups are also the three most important and economically

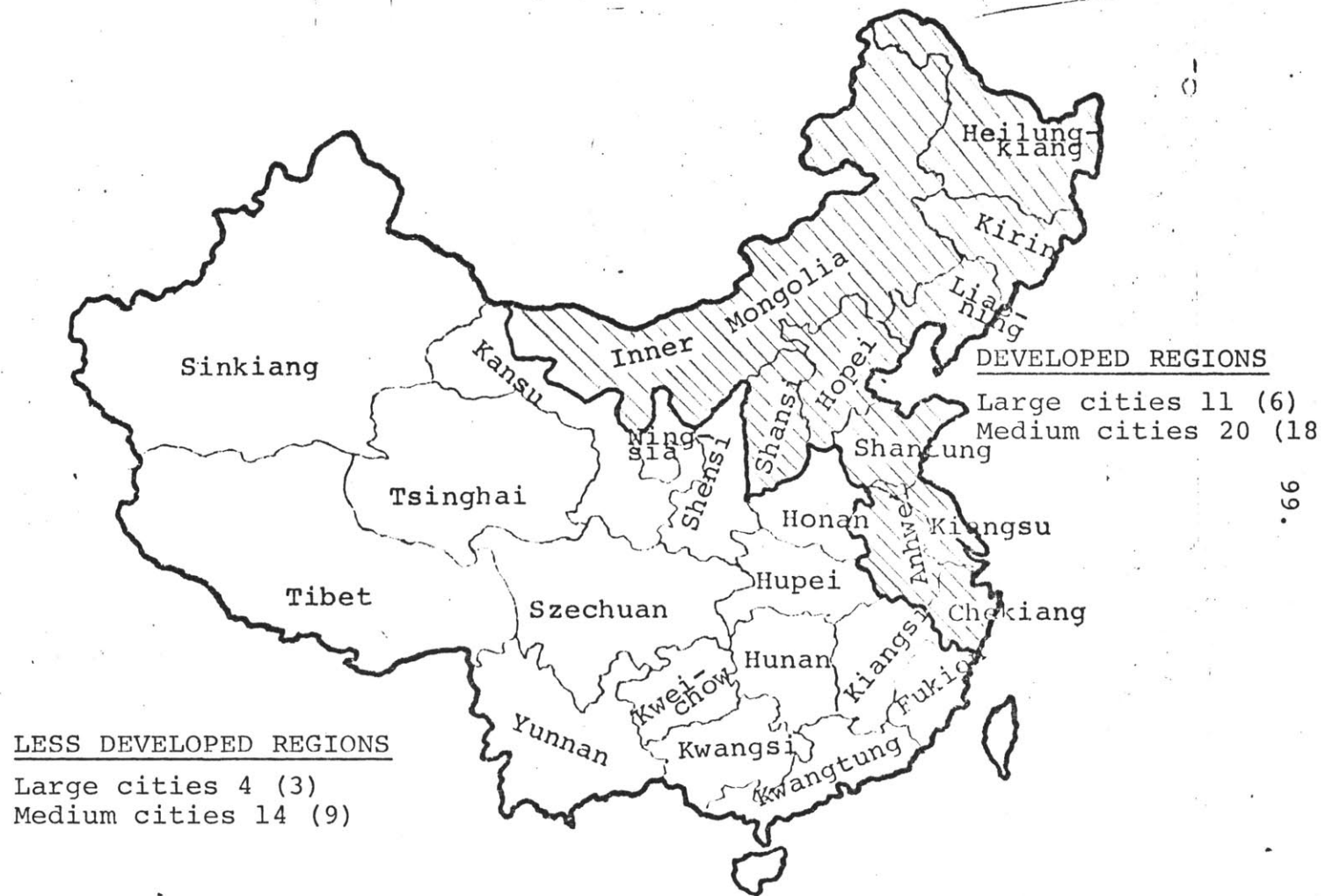


FIGURE 2.3 Distribution of Large and Medium Cities in the Developed and Less Developed Regions in 1953 and 1958 (1953 figures in paranthesis)



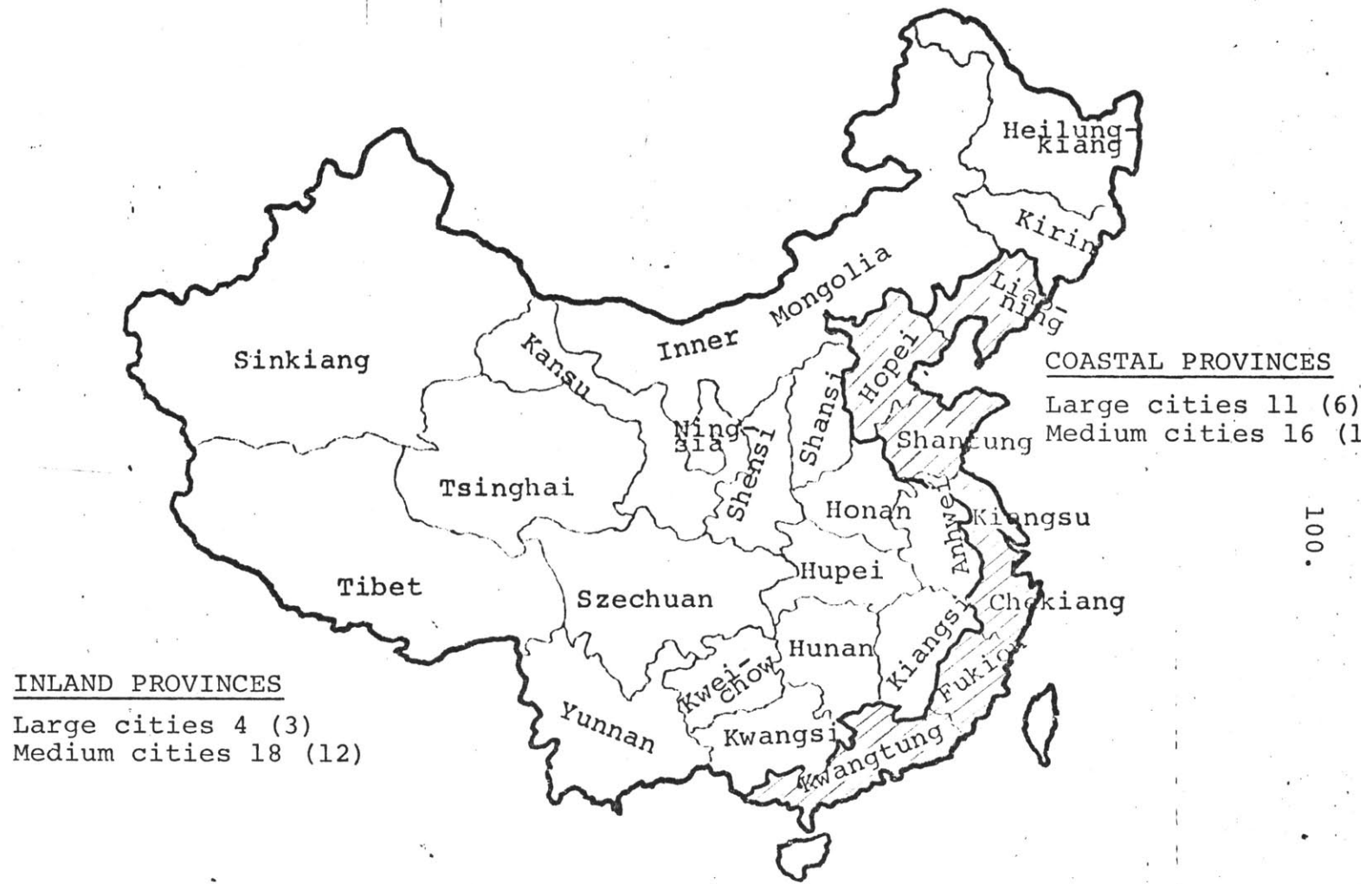


FIGURE 2.4 Distribution of Large and Medium Cities in the Coastal and Inland Provinces in 1953 and 1958 (1953 figures in paranthesis)

developed regions. Furthermore, the greater role played by inland (less developed) regions in economic development of the nation has been accompanied by a concomitant increase of new centers and the expansion of existing cities. indeed, the identification of important economic areas of Communist China can be done by determining the location of emerging urban centers alone. While this analysis is severely limited in terms of explanatory powers, it does describe the impact of increased economic activities on city size distributions.

#### 2.5.5 Pattern of Regional Industrial Concentration

The Communist Chinese economy betrays a relatively high degree of concentration of industrial capacities, especially in a few relatively developed regions (cf. Table 2.12). estimated value of annual industrial capacity in that city is more than five times that of the next largest industrial center, Tientsin, and over six times that of the third largest urban-industrial complex, Wu-han. Table 2.13 the distribution of industrial capacity by provinces Figure 2.5 shows the spatial distribution. The great disparity between Shanghai and all other industrial centers suggests that the Communist authorities had relied on Shanghai's industrial capacity to a far greater degree than they would have liked or have admitted. Furthermore,

TABLE 2.12

## Ranking of Economic Coordination Regions by Ind. Capacity

Region	Annual capacity in million '52 yuan gross value added in '58-'60 avg.	% of total capacity
East	11,563	40.77
North	4,951	17.45
Northeast	3,362	11.85
Central	3,178	11.20
Southwest	2,406	8.48
South	1,785	6.29
Northwest	1,120	3.95
TOTAL	28,365	100.00

TABLE 2.13

## Ranking of Provinces by Industrial Capacity

Province	Annual capacity in million '52 yuan gross value added in '58-'60 avg.	% of total capacity
Kiangsu	9,637	33.97
Hopeh	3,234	11.40
Liaoning	2,483	8.75
Szechuan	1,840	6.49
Hupei	1,558	5.49
Kwangtung	1,143	4.03
I. Mongolia	1,008	3.55
Shangtung	945	3.33
Anhwei	823	2.90
Shansi	709	2.50
Hunan	557	1.96
Kiangsi	536	1.89
Honan	527	1.86
Kirin	480	1.69
Kansu	431	1.52
Fukien	404	1.42
Heilungkiang	399	1.41
Shensi	327	1.15
Kweichow	311	1.10
Sinkiang	283	1.00
Yunnan	254	.90
Kwangsi	238	.84
Chekiang	158	.56
Tsinghai	44	.16
Ningsia	35	.12
Tibet	1	-
TOTAL	28,365	100.00

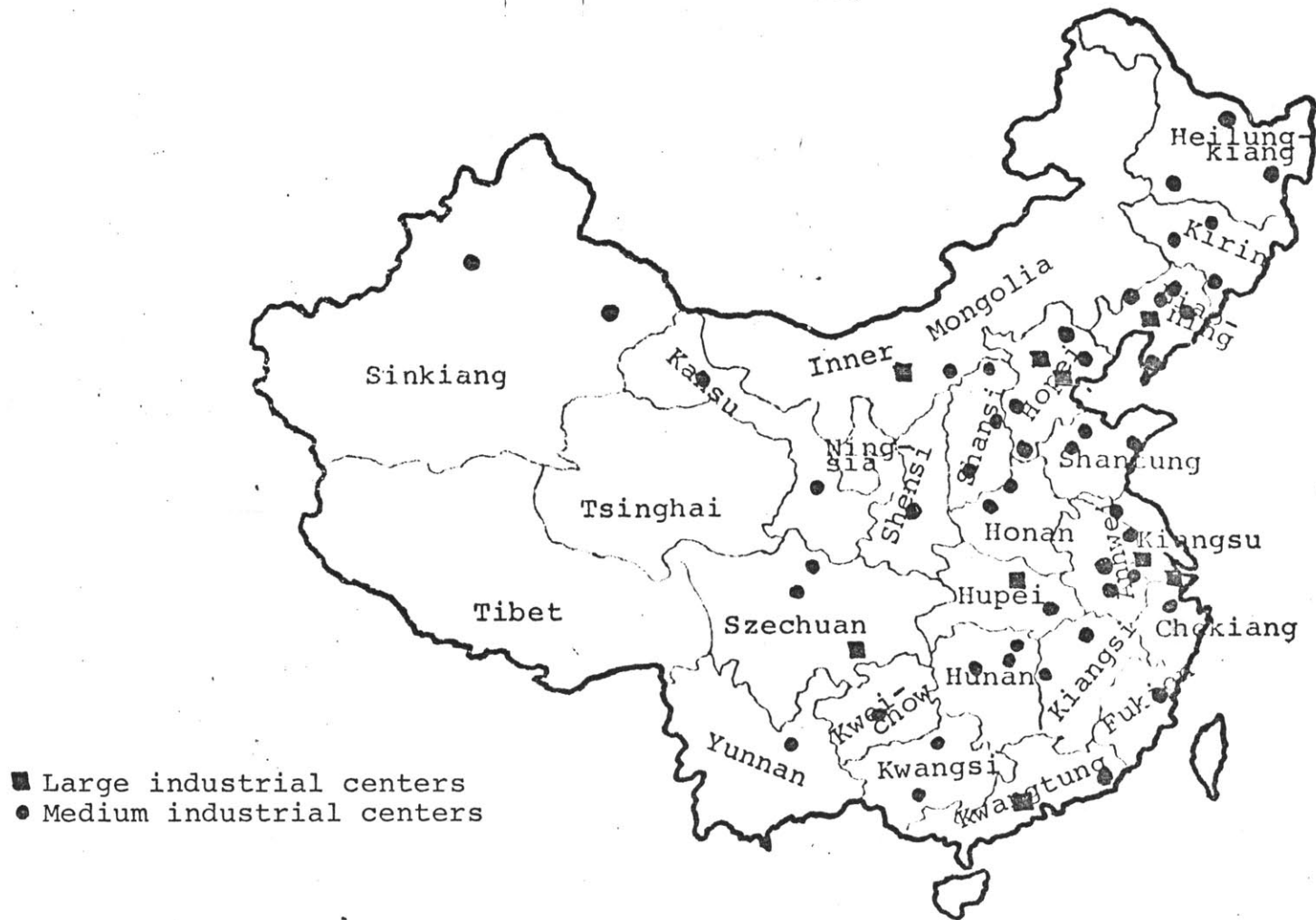


FIGURE 2.5 Distribution of 63 Large and Medium Industrial Centers in 1961

Kiangsu, Hopeh, and Liaoning provinces head the list in terms of annual industrial capacity as they did in the pre-Communist economy; over half the country's estimated industrial capacity is concentrated in these three provinces.

The seven coastal provinces contain six cities with a large industrial capacity against three in the inland regions. These coastal provinces also contain proportionately more cities of medium and small industrial capacity. The developed regions have proportionately even more medium and small capacity cities than the coastal provinces. This implies a greater relative emphasis on the establishment of industrial centers in the developed regions vis-a-vis the less developed ones than in the coastal provinces vis-a-vis the inland provinces. (See Tables 2.14, 2.15)

An explanation of the disparity between large versus medium and small industrial centers is the presence of smaller industrial production sites that might be new. Over time, the pattern of industrial location may be greatly altered in conjunction with the changing nature of Communist China's economic development. As of 1961, which is the cut-off date for most of the plant data available, the policy of industrial decentralization of the Great Leap Forward, and to a lesser extent, of the First Five Year Plan, has succeeded in establishing a large number of small industrial production centers. However, in light of the limited data

TABLE 2.14

Comparison of Coastal Provinces with Inland Provinces and of Developed Regions with Less Developed Regions in Terms of Number of Industrial Cities and Locations

Area	Number of small industrial centers	Number of medium industrial centers	Number of large industrial centers	Total number of industrial centers
Coastal provinces (seven)	88	18	6	112
Inland provinces	174	39	3	216
TOTAL	262	57	9	328
Formerly developed regions (Northeast, North, and East)	107	31	6	144
Formerly less developed regions (Central, South, Northwest, and Southwest)	155	26	3	184
TOTAL	262	57	9	328

TABLE 2.15

Comparison of Coastal Provinces with Inland Provinces and of Developed Regions with Less Developed Regions in Terms of Industrial Capacity

Area	% of large cities in total cap.	% of medium cities in total cap.	% of small cities in total cap.	% total capacity
Coastal provinces	48.8	11.5	3.2	63.5
Inland provinces	10.9	19.5	6.1	36.5
TOTAL	59.7	31.0	9.3	100.0
Developed regions	49.0	17.5	3.6	70.1
Less developed regions	10.8	13.5	5.6	29.9
TOTAL	59.8	31.0	9.2	100.0

available and presented earlier, the preponderant share of productive capacity remains concentrated in a small number of industrial cities.

#### 2.5.6 Summary of the Spatial Economy

If we compare Table 2.16 with Table 1.7., we find that three provinces (Honan, Hunan, and Anhwei) succeeded in moving from the ranks of industrially undeveloped (although agriculturally developed) into the industrially developed sector of the economy during 1949 to 1961. Shansi and Inner Mongolia both moved from the industrially and agriculturally less-developed sector to the industrially developed sector. This period shifted the distribution of provinces into a virtual diagonal, which is indicative of the industrial advances in a number of provinces. The advent of industrialization into such outlying regions as Sinkiang, Ningsia, Tsinghai, Kansu, and Inner Mongolia was the factor in this readjustment. On a different level, the relatively most developed regions in the pre-Communist period continued to retain their ascendancy in the Communist period.

A number of provinces and autonomous regions have

TABLE 2.16

Spatial Pattern of Industrial Capacity and Agricultural Development  
by Provinces and Autonomous Regions (1961)

Province	(C) if coastal	Rank in industrial capacity	Rank in agric. production
Group I (Relatively developed)			
Manchuria (C)		2	2
Kiangsu (C)		1	3
Hopeh (C)		3	8
Hupeh		5	7
Szechuan		4	2
Kwangtung (C)		6	5
Shantung (C)		8	4
Anhwei		9	11
Hunan		11	9
Kiangsi		12	12
Group II (Relatively developed in agriculture only)			
Honan		13	6
Chekiang (C)		21	10
Group III (Relatively developed in industry only)			
Shansi		10	15
I. Mongolia		7	19
Group IV (Relatively undeveloped)			
Fukien (C)		15	14
Kansu		14	20
Shensi		10	18
Kweichow		17	17
Yunnan		19	16
Kwangsi			
Sinkiang		19	23
Tsinghai		22	21
Ningsia		23	22
Tibet		24	23

Source: Wu (1967).



become industrially more developed in terms of total industrial capacity rather than in terms of the number of large industrial centers. Therefore, most of the industrial capacity must have been in the smaller industrial centers. This pattern reflects the early status of industrial development in Northwestern and Southwestern China, and it presaged efforts to decentralize (Figures 2.6, 2.7, 2.8, 2.9, and 2.10).

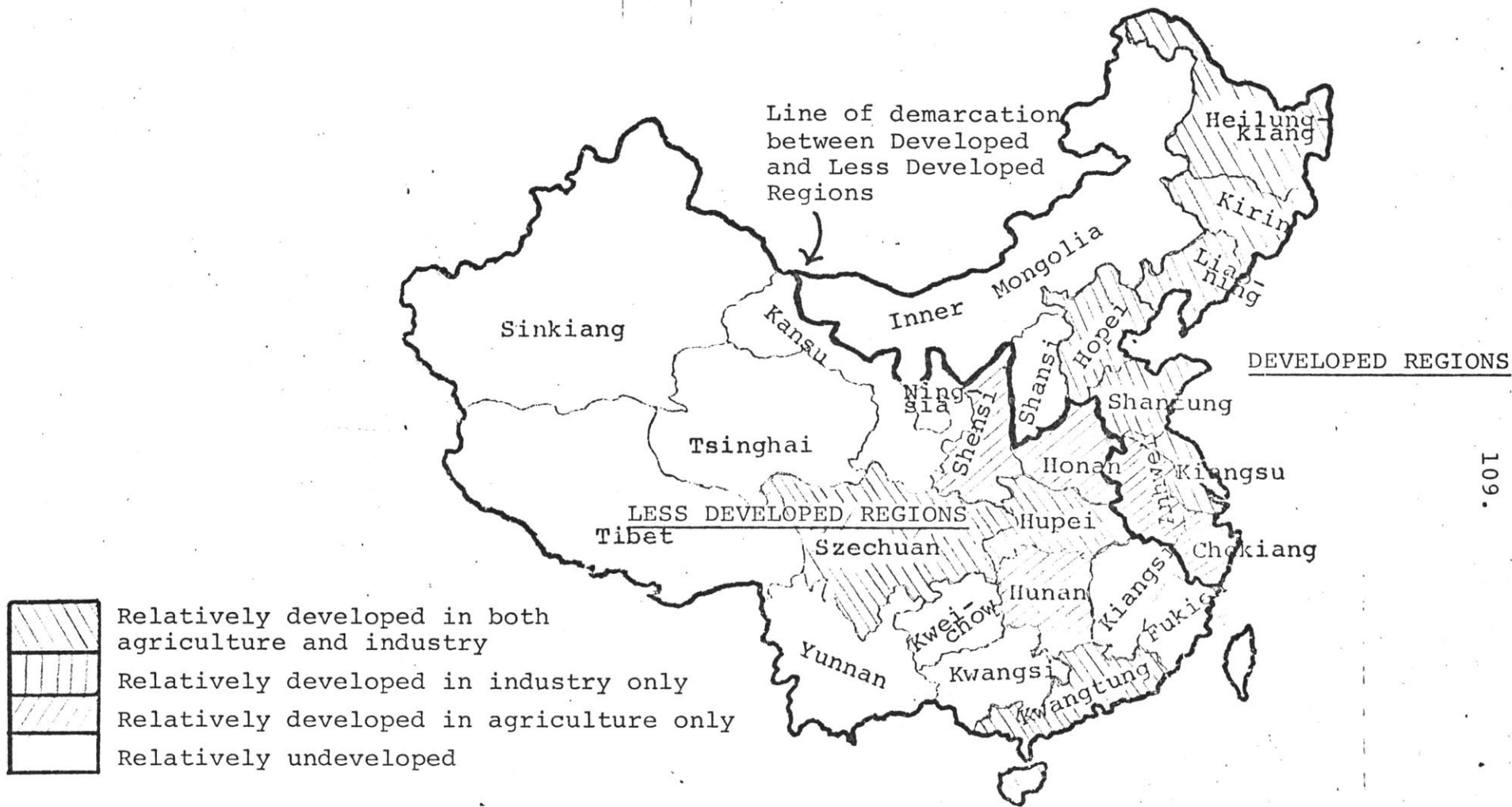


FIGURE 2.6 Relative Degree of Economic Development in Pre-Communist China (before 1949)

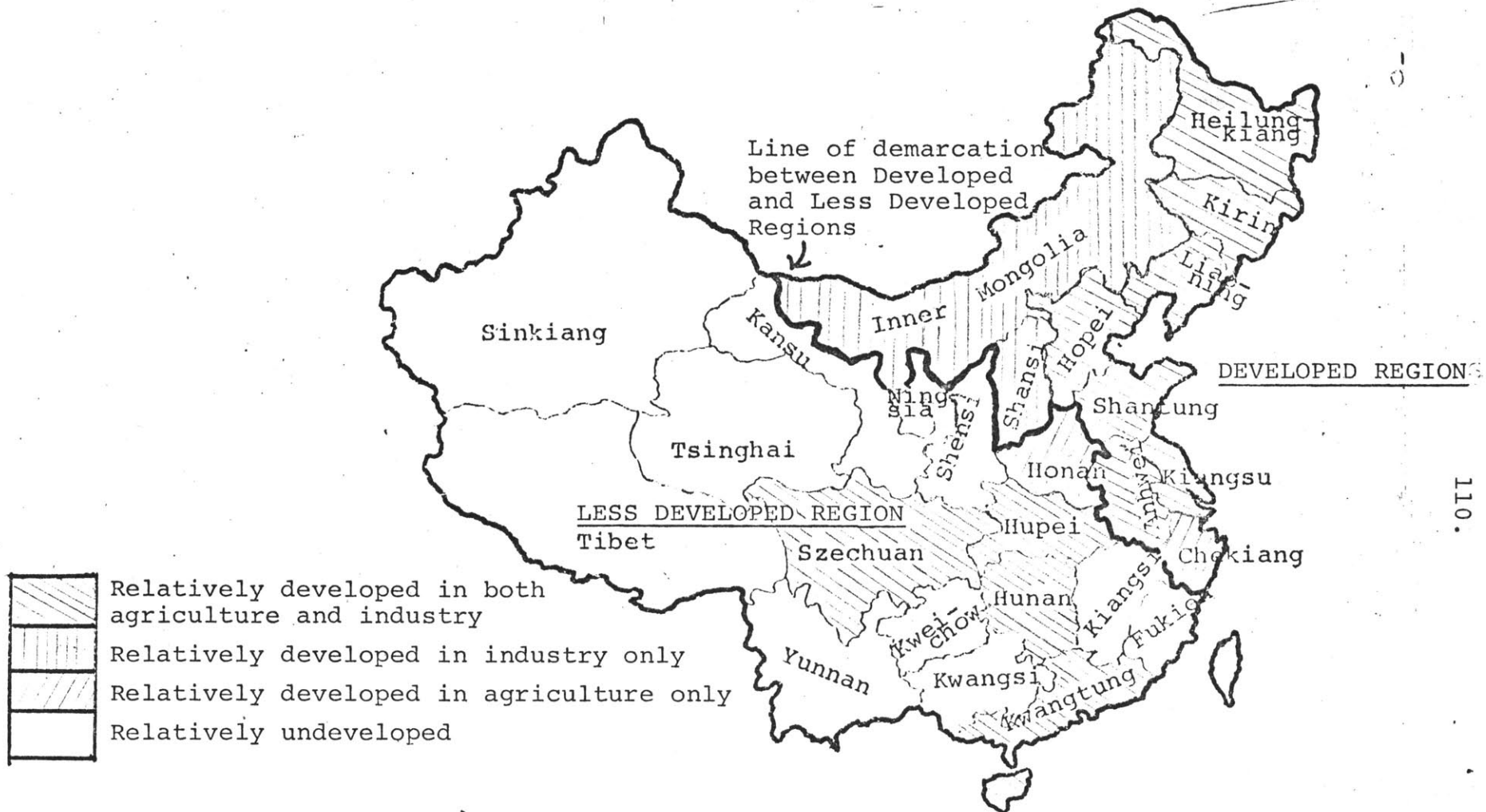


FIGURE 2.7 Relative Degree of Economic Development in Communist China (after 1949)

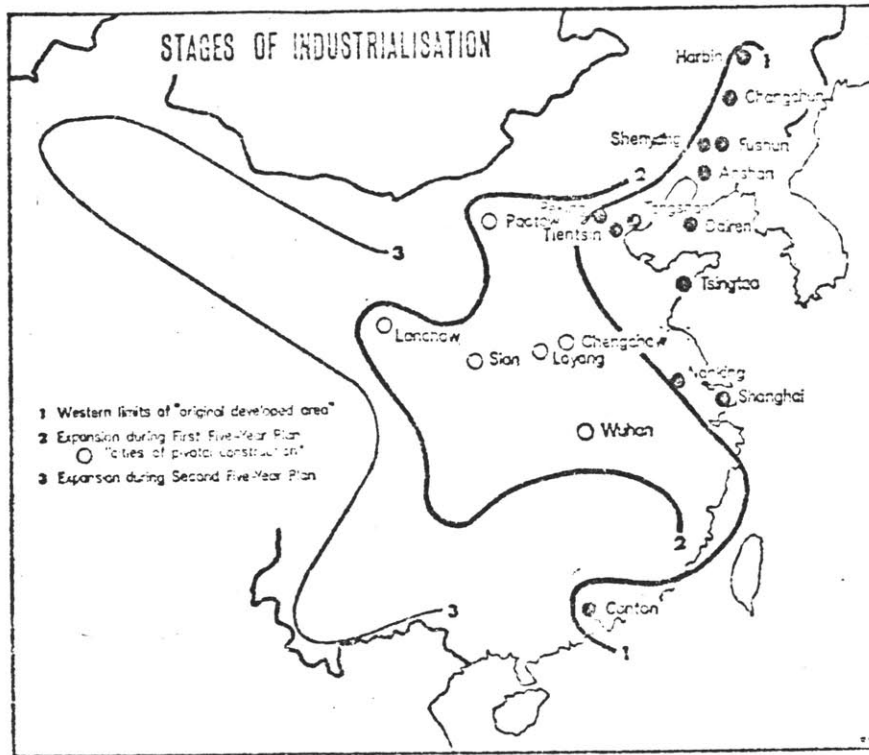


FIGURE 2.8 Stages of Industrialization

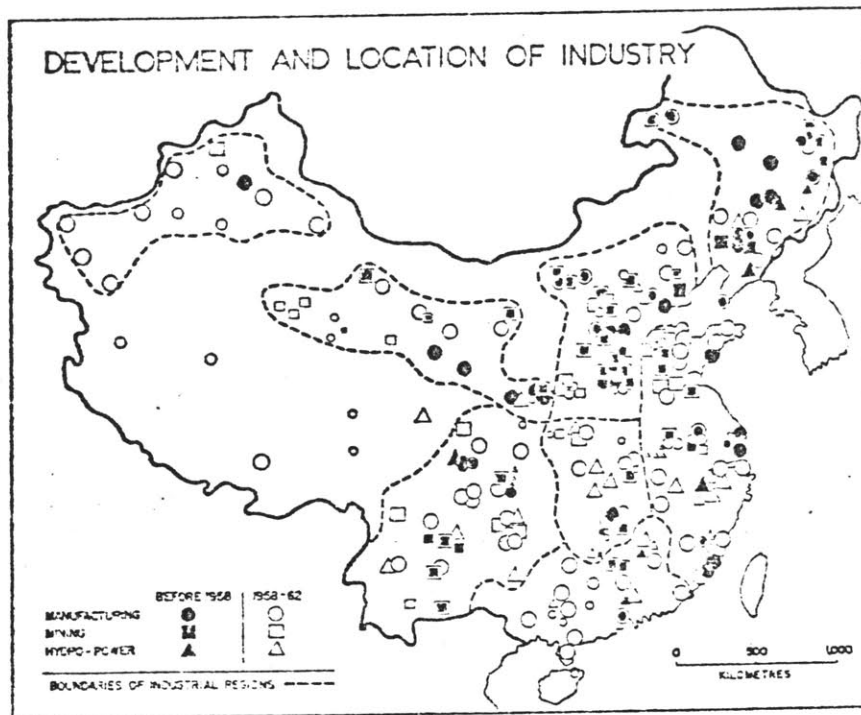


FIGURE 2.9 Location of Industry

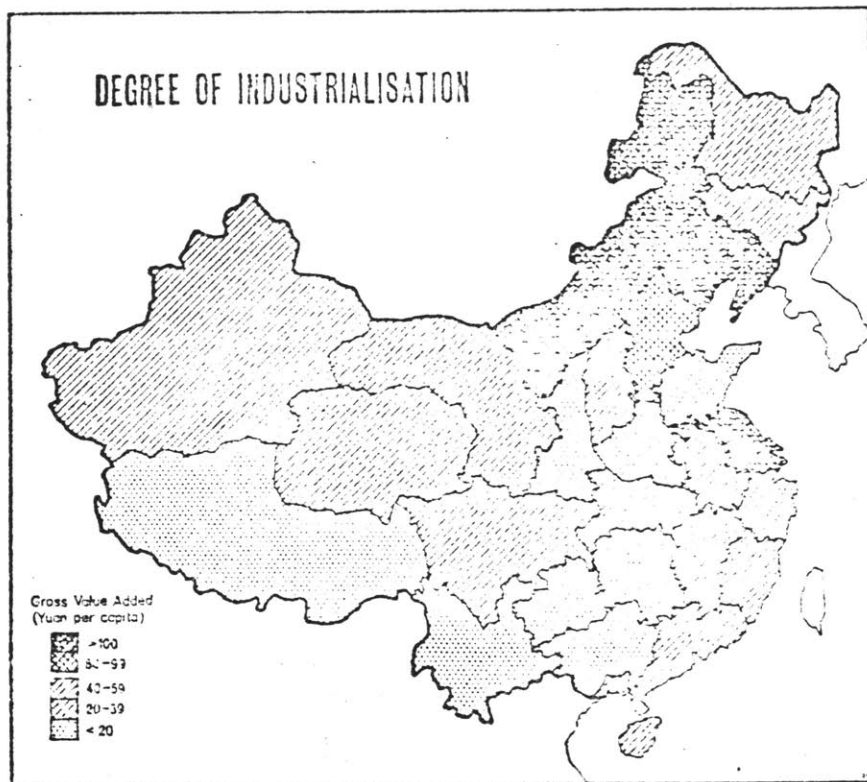
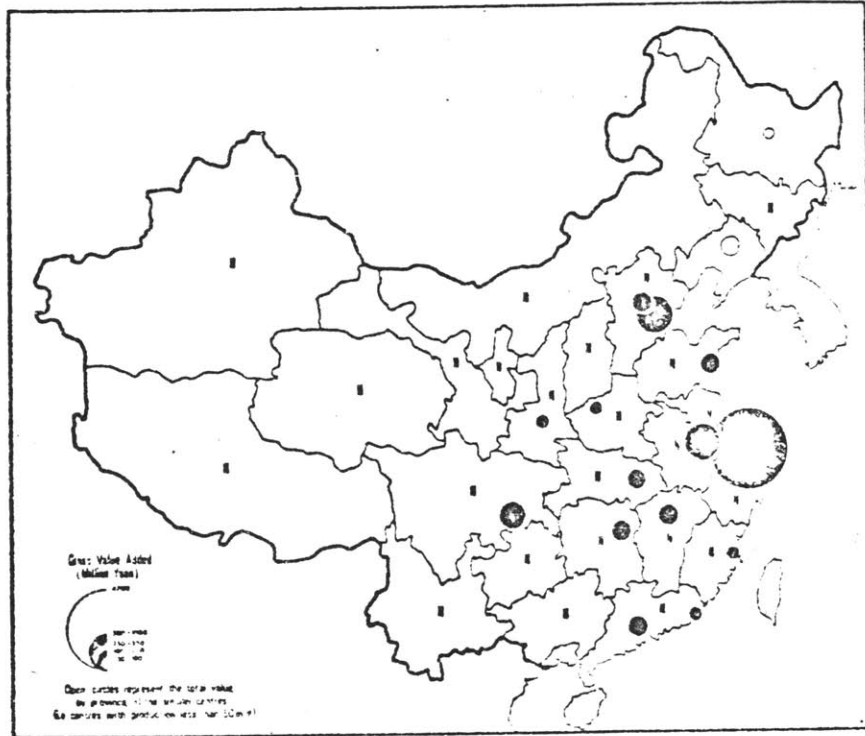


FIGURE 2.10a Degree of Industrialization by Provinces

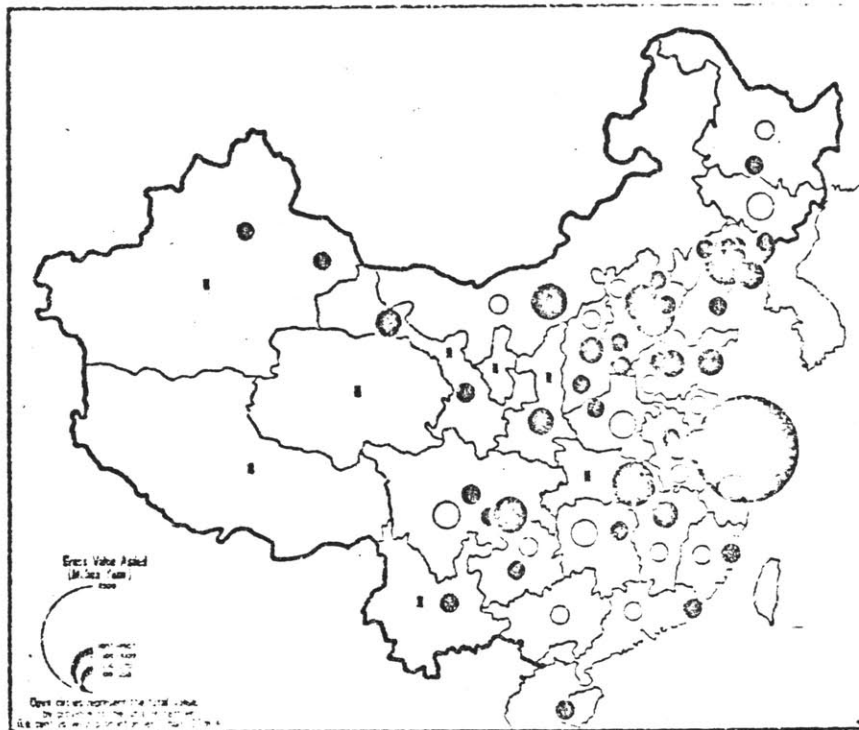
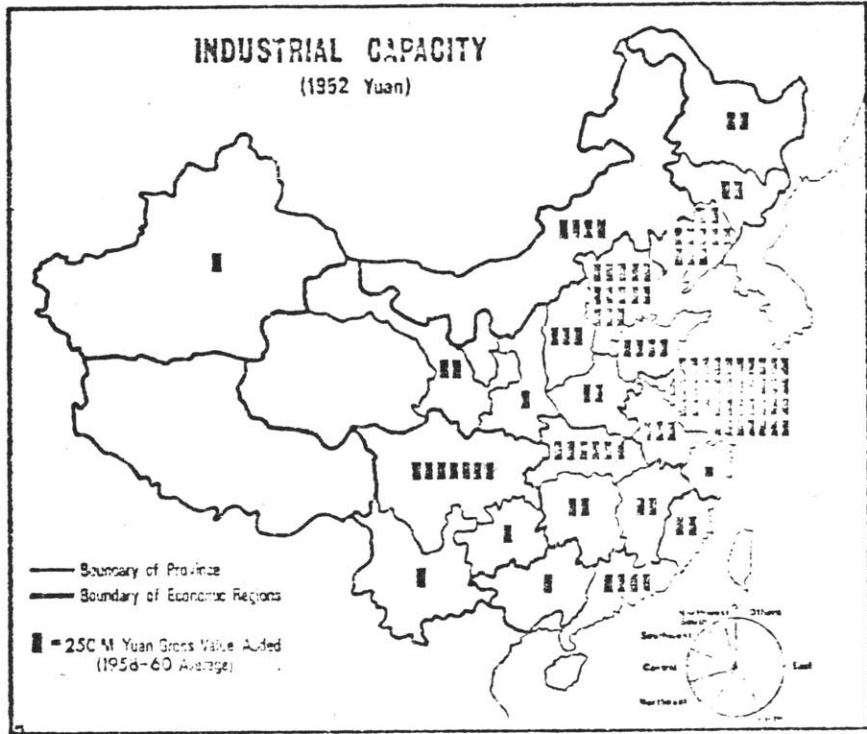


FIGURE 2.10b Industrial Capacity by Provinces

## CHAPTER THREE: THEORY AND MODELS OF REGIONAL ECONOMIC GROWTH

3.1 Introduction

As a statement of fact, and perhaps unkindly, regional economic growth theory is a highly borrowed field. It is indeed a bastard field of mixed ancestry searching for esteem on its own right; and although of humble origins, it portends of greatness.

Regional economics is a relatively new but rapidly developing branch of economics that is gaining increasing attention from both economists and urban and regional planners who share a common concern of the problems of inter-regional differences in growth rates and the implications they hold for development and planning as discussed earlier in Chapter One. Although this problem appears crucial in the developing countries, it has become pronounced in the developed countries as well. Consequently, there has been an increasing volume of specialist periodical literature in recent years. Responses to the problem, however, have been as diverse and numerous as the disciplines that comprise regional economics. The subject at once intersects economics, geography, political science, law, city planning, and civil engineering. Within the field of economics alone, specialized topics, such as development, urban economics, international

trade theory, inter-industry economics, among others, have each developed sub-topics dealing with regional economics.

Much that is classified under the heading of regional economics developed from attempts (mainly by geographers) to find useful criteria for a definition of regions, and from attempts by location theorists to explicitly consider transport costs as a determinant of the geographic distribution of economic activities. Spatial economists have developed theories of interregional trade and regional growth within a national boundary, their structural framework of a regional system taken mostly from international trade theory. Although international trade theory deals mainly with volume and aggregate value of trade between nations, location theorists and land economists have extended, or restricted, the analysis to pay particular attention to the spatial aspects of the problem, specifically the region. Significant contributions have also been made by inter-industry economists, and these have usually been applications of input-output techniques to regional analysis. This has usually been associated with the contributions of international multiplier theory, but their usefulness has suffered from a lack of data on interregional flow of goods and services. Regional economics, thus, consists of piece-meal attempts to cope with particular problems within the regional context rather than as an



extension of the oldest branch of spatial economics, international economics, to the regional field.

Despite the meteoric rise in interest and literature on the subject, theory has fallen far behind policy. Regional economics is, at best, in its "take-off" stages, and the real development of the field is yet to come. Present formulations on regional growth are highly hypothetical and inadequate. This fact derives in part from the status of its parent field: general economic growth theory. Growth economics is still fundamentally theoretical and **ascriptive rather than operational** and descriptive; it prescribes conditions and paths for growth better than it explains growth. Traditionally, modern economic growth theories have paid particular attention to capital accumulation and exports as the basis for growth. Exports have held special, and even spiritual, significance for development economists. On the supply side, exports provide the foreign exchange necessary for growth by providing the capacity to import, which, in turn, determines the level of economic activities. On the demand side, exports create demand for domestic production which leads to a chain of induced output and income. Equilibrium growth in both cases can be expressed by a multiplier relationship between income and exports. In developing countries, therefore, exports represent

the "engine" of economic growth.<sup>1</sup>

These models of export-propelled growth have, in fact, become the major weapons in the regional economists' arsenal of growth models. Indeed, much of the efforts in calibrating these and other models have been devoted to the technical and mathematical difficulties involved in reducing their analyses to a regional framework, and less attention has been paid to an independent analysis of the validity of their assumptions when applied to regional economics. These assumptions are highly restrictive and their abstractions may hold for a national economy (as comprised of a given number of regions) in the aggregate but collapse when applied to regional economies, say, within a closed national economy. It is convenient enough in the more general models to explain capital accumulation by earnings in foreign exchange from exports: the stock of capital is assumed unlimited outside the model and as long as there is exports, capital can be generated exogenously and continuously. This, in effect, means unlimited growth as long as exports continue to increase. Regional economic growth within, a national boundary is dependent, however, among other things, not on a fairy economists outside the system, but realistically on the level of economic activities and limited capital stock within the national system. It is true that one can assumed unlimited capital outside the system in national

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<sup>1</sup>See, for example, Chenery and Bruno (1962), Meier and Baldwin (1957), McKinnon (1964), Chenery and Strout (1966), and Maizels (1968). Also, see the attempts to explain growth in the Western European countries after World War II by export-propelled growth model in Beckerman (1962) and Lamfalassy (1963).

economies, but it much less plausible with regional economies. This serves to emphasize the limitations when an attempt is made to hoist models from other branches of economics onto regional economics without serious considerations of the differences.

Even given the general usefulness of these models, exports still cannot explain all growth. More poignantly, we can point to examples of economic growth without the benefit of exports: consider the case of Communist Chinese development post Russian assistance. It becomes clear that exports in China did not represent the engine of growth, and we must instead attribute China's rapid growth to internal determinants. These other factors of growth will be examined in this chapter, but the inclusion of the Chinese example brings forth some pressing points.

Regional economic growth theory as it has developed in the West has paid particular attention to such issues as factor mobility, industrial structure, and comparative advantages in their search for determinants of regional growth. Indeed, the whole system pivots on markets which perform a sectoral allocative function as well as directing the flow of goods and services between regions. It has been held that automatic market forces would maintain a spatial equilibrium (which, for our purposes here, we can take on to mean tending towards equal growth rates between regions): labor and capital would

move to places with the highest return, thus inducing an equalization of regional incomes. Reality, however, has proved contrary; regional differences persist and tend to increase. While in market economics we can attribute these to market imperfections and institutional factors, how do we explain regional differences in socialist economies?

Planning by material balances, as discussed in the Chinese example in Chapter Two, should theoretically induce an equal growth among regions. The relevant questions here become: what determines factor movement? How does it influence regional economic growth? To what extent can Western theories explain regional economic growth in Socialist-bloc countries?

The points raised in the preceding discussion are those to which this chapter will address. This chapter is an attempt to trace the development of the various theories and models of regional economic growth, as they have developed along different lines of assumptions. A by-product, of course, could be the qualitative testing of these theories when juxtaposed across a different economic system, but the main purpose of this chapter is to derive certain elementary principles and assumptions that would be useful towards the construction of a model in the Chinese context. It is, so to speak, putting eggs against the light to look for imperfections. As such, we are looking for guidelines for the research effort mentioned in Chapter One and not a critical review of

the literature.

The first section discusses theoretical formulations that have been the departure points for most of the regional economics growth theory. They are delineated by their assumptions concerning the driving force of the system:

(1) Extensions of Location Theory; (2) Export Base Theory and Interregional Income Theory; and (3) Factor Mobility.

In each of the discussions, we want to pay particular attention to the fundamental arguments in the abstract and consider their applicability to the Chinese case. They are given at length because they manifest the direction and level of analysis attainable given the present state of the art.

In the second section, we present what the writer feels are the better models that have been developed from the theories discussed in the preceding section. Being the logical extensions of the theories, they may be considered the final products of the field and can reveal the strength and weaknesses of the theories in an operational form. Both theoretical and operational models are presented but a common feature is their explicit consideration for describing growth.

### 3.2 Theoretical Formulations

#### 3.2.1 Extensions of Location Theory

In the past decades, a number of economists and regional scientist, building on the pioneering works of von Thunen (1826), Weber (1909, 1928), Losch (1954), Palander (1935) and others,<sup>1</sup> have attempted to extend Location Theory to consider regional economic growth. Early attempts to construct a general location theory must be attributed to A. Weber (1909), although it is von Thunen, the father of location theorists, who first progresses towards a general theory.<sup>2</sup> Launhardt, in his studies of market areas and industrial location, treats a narrower framework, but also fails to achieve sufficient generality in his analysis.

Weber pursues an evolutionary analysis which inquires into the mechanics of development when a given population

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<sup>1</sup>See also Laundhart (1882), MacKinder (1902), and Friedrich (1929). The best books on the subject are W. Isard's Location and Space Economy, 1956, and Losch's The Economics of Location, 1954. A good summary of the literature is given in Hoover, E. M., The Location of Economic Activity, 1948.

<sup>2</sup>A distinction here is made between general location theory and other specific location theories which are essentially applications of the general theory to particular cases. Residential locations, agricultural locations, manufacturing location, for example, would fall in the latter category. General theory, on the other hand, is the fundamental or theoretical basis of these other developments.

occupies an undeveloped country and establishes a closed economic system. An agricultural stratum would form to provide the means of subsistence and would also serve as the geographical foundation for all other strata. It determines in the first instance the location of consumption for the primary industrial stratum which produces for the agricultural stratum. In turn, the primary industrial stratum serves as the location of consumption for the secondary industrial stratum. Thus, these three major strata (there are also a number of substrata within each major stratum) represent the core of the economic system. Trade within the system also tends to strengthen proportionally the different sectors of the system. Given these developments, a fourth stratum then emerges independent of the other strata, and consists of officials and businessmen performing managerial and organizational functions. Their patterns of locations are not determined by economic forces but by a fifth stratum, the central dependent stratum which is tied to the central organizing (or fourth) stratum in the same way the secondary industrial is to the primary industrial. Therefore, the locational structures of these five strata are inter-related and their features determined by forces playing back and forth.

This analysis, as Isard points out, "does not present any general, heuristic principle by means of which one can order the spatial complexities involved in the total location



of economic activities."<sup>1</sup> Although it fails to present the specific operating characteristics of the model, the evolutionary approach, however, does provide insight into the historical sequences of locational development.

With the publication of Weber's book, Englander<sup>2</sup> came to appreciate the necessity for a general theory of location. Such a theory, according to Englander, should be a general theory of local conditionality within an economy. An economic unit choosing a site to produce or render services, considers the various supply prices existing in the various localities for the inputs that he might employ; he simultaneously considers the various prices which may be obtained in the various localities for his products and services. When he finally locates a site, he, in turn, influences the input and output prices which he employs and produces respectively at that locality. Through such interrelations, the pattern of local prices differences and the subsequent location of economic activities are determined by "local conditionality."

Somewhat earlier than Englander's work, Andreas Predohl develops a general equilibrium approach applied to location analysis employing the substitution principle. Predohl attempts to deduce a general location theory as an inherent and logical extension of it. He asks to what extent

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<sup>1</sup>See Isard (1956).

<sup>2</sup>See Englander (1926).

is the location problem a price problem; location theory, a price theory. In other words, to what extent does the location of economic activities (specifically, the distribution of production) lie within the relationships of interdependent prices. Predohl suggests that the locational problem is synonymous with the problem of the distribution of determined groups of productive factors since every economic activity uses a group of factors, or inputs. As such, a general interdependence theory can explain the distribution of productive factors by the principle of substitution. Isard, however, contends that Predohl over-estimates the scope of Walrasian-Casselian general equilibrium analysis, which, in the main, contains a one-point world and does not embrace space as Predohl overlooks. Nevertheless, his analysis has shaped many later formulations and are worth considering.

Predohl begins with a von Thunen state<sup>1</sup> and assumes all locations fixed except that of one unit. Movement of this unit towards the periphery implies that capital and labor outlays are substituted for land-use outlays. Movement in the

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<sup>1</sup>A von Thunen state implies a uniform plain of equal natural endowment everywhere with a city in the center possessing potential transport facilities of similar characteristics in all directions. Production aligns itself around the city in rings as determined by price and transport costs of each specific product.

opposite direction, or towards the central consumption point, implies a reverse in outlays and substitution. Such an analysis, Predohl states, can be extended by means of general equilibrium analysis to consider the location of all economic activities. Indeed, the application of the substitution principle can yield the site of minimum cost so far as these two groups of all-inclusive groups of expenditure are concerned.<sup>1</sup>

Hans Weigmann, a relatively unknown economist of the German school, is perhaps the first to construct a general theory of location in a dynamic context.<sup>2</sup> Weigmann attempts to formulate the foundations for an economic theory that embraces the spatial structure of economic process, the spatial extent and bonds of market, and the spatial inter-relations of all economic quantities. His first principle is that a theory of space economy should be one of limited competition. All factors and goods, regardless of natural location, face immobilities of varying degree in all directions; furthermore, in accordance with the specific nature of impediments to movement (social, economic, or political), markets are limited in scope. The point here is that competitions between different goods or services in different locations are incomplete; the existence of physical space implies immobility

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<sup>1</sup>Within these two groups, there are also other substitution points. A detailed discussion of its fuller implications is given in Isard (1956), Location and Space Economy, pp.33-35.

<sup>2</sup>H. Weigmann, (1926, 1935).

and limited competition. A second basic principle concerns the determination of a "basic form." Weigmann favors an approach of general equilibrium theory in using Gestalt analysis in place of the more traditional linear causal analysis; markets in the space economy are observed as a whole in their full array of spatial markets. As such, he aims at formulating a realistic functional picture of economic life wherein various elements are weighted with respect to their importance. Weigmann poses the dynamics problems as one of choosing that time period which would yield a resulting spatial array of markets within a competing system that could be valid as basic form. The formulation of the concept of "relative maximum" states that an increasing amount of physical space (implying spatial friction) is to be overcome in movement by an economic object; the time period necessary for such movement increases until it reaches a maximum defined as further movement which is improbable because of the overpowering force of countless obstacles.<sup>1</sup>

Competition at that maximum ends, and the competition field becomes bounded. The competition does not have the force to span a distance greater than the radius of its

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<sup>1</sup>Terms such as "basic form," "form-full," "relative maximum," and "economic object," are poorly defined concepts. Isard himself points out that Weigmann's writings are very hard to comprehend, and the problem is further complicated by Isard's own confusing style. The reader may fare better by reading the discussion firsthand: pp. 38-41, Isard (1956), op.cit..

field irrespective of the time factor, while basic form can be defined as that unit of space (i.e., a market area) of the relatively greatest time-weight, hence, of the greatest stability. Weigmann further maintains that markets for the productive factors of land and labor are primary constituencies of basic form. As such, each individual commodity market, including its labor, capital, and land orientation, possesses peculiar features which offer resistance to change; changes in each factor vary.

Weigmann's theory of location incorporates distinct features for each of the factors, land, labor, and capital, and indeed presages modern theories of regional economic growth theories that have attempted to explain growth through these factors. In Weigmann's formulations, the land market is a spatially linked area of supplied land services. Each unit of land is distinct and immobilized by natural conditions such that its supply area has no spatial extent. This "Gestalt" whole ( a space economy) exerts a hypothetical aggregate demand which, in turn, defines the boundaries of the land market, its peripheries being considered as marginal land.

The hypothetical aggregate demand is related to the labor market, which, in contrast to the land market, is much less rigid. Consequently, its conception is much more difficult and contains various forms of labor immobility

and inelasticity. Labor market must then be explained with respect to migration mobility and its spatial form. The long-run labor base is hypothesized as a dynamic process which is characterized by a movement over time from rural areas to metropolitan areas through intermediates of urban clusters of increasing size.

Capital can be distinguished between capital in substance and capital in title; the former being less mobile. It must also be classified to its utilization in the production process and respective inelasticities determined. Therefore, the Weigmann model of the space economy is pictured as a rhythmic development of a Gestalt whole comprised of markets for land, labor, and capital, superimposed or overlapping each other.

In many of the theories we have discussed, general equilibrium analysis has been employed to extend relevant economic concepts to consider space. The question then arises: to what extent are these assumptions of equilibrium in a market situation consistent with the reality of a specialist economy? As Isard points out, Palander states that "general equilibrium theory in its present form is meaningful for a locational analysis only of an economic district wherein transport costs are zero, capital and labor perfectly mobile, and technical conditions of production uniform throughout; in other words, where the district in question

can be compressed into a point market."<sup>1</sup> Furthermore, interdependence theory which has formed the basis of a general theory of a space economy is premised on the principle of pure competition. Firstly, equilibrium in Marxian economics has almost entirely different meanings, and the problem really becomes one of optimization. Secondly, depending on one's approach to the problem and the nature of the analysis employed, the existence of markets can indeed be assumed to exist in socialist economies, although of a different genre; at the very least, one can abstract from total reality and can embrace simplifying assumptions in an analytical model, which in fact is the basis of all models, even in the Chinese case as exemplified by the computations of shadow prices in Chinese planning. Competition exists where scarcity prevails, the only difference in the socialist economy being the resolution of competition demands not on an open market but a centrally determined planning process. The simplification of a socialist economy, therefore, approximates these general theories of a space economy more closely than do the complicated market economies. For example, a typical problem in locational analysis concerns the assumption of pure competition: if the various places in a region are treated as different markets (the case in a capitalistic market economy), the necessary condition of a

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<sup>1</sup>Isard (1956), pp.42.

large number of consumers and produces for each factor and commodity in each market cannot be fulfilled. The Chinese concept of regional self sufficiency with a minimum of inter-regional trade as discussed in Chapter Two, on the other hand, can treat a region as a single market, and allow the interpretation of different prices existing for a given commodity at the various localities within the region as closer to the theoretical formulations discussed.

A genuine critical analysis of the usefulness of the theories when applied to a socialist economy, such as China's, can only be obtained in a model-by-model review. Since such an effort would be beyond this paper's scope, we can instead attempt to reconcile a yet potentially more useful model to the Chinese case.

In contrast to the above models, A. Losch goes beyond partial analysis and presents a highly simplified static model of a space economy operation under conditions of monopolistic competition, which approximates very closely theoretically a socialist, centrally planned economy. The spatial element is emphasized through a formulation of market areas - a formulation that is a significant theory in its own right. Consider a homogenous plain of uniform transport features in all directions: an even endowment of resources for industrial production; a uniform distribution of agricultural population with uniform sets of tastes and



and preferences and each population unit self-sufficient; technical knowledge disseminated throughout the plain implying equal production opportunities, If, in this setting, an individual finds it profitable to produce a commodity over and above his own needs, his market area would assume a circular form. However, it is equally probable that other individuals would find it profitable to produce commodities, so competition would not only contract his market area but transform it into a hexagonal shape. Losch maintains that the hexagonal shape is the ideal economic market because it exhausts any area under consideration while circular ones would leave unused corners. Furthermore, the hexagon deviates least from circles compared with other polygons and, consequently, minimizes transport costs of given demands, or, alternatively, maximizes demand of a population of a given area. The plain is then honeycombed into a series of market areas, and a grouping can be made of market areas with respect to their sizes.

General equilibrium can then obtain if we first consider the locations of industrial productions. The location of each production site for a given commodity is designated by a set of  $x, y$ , coordinates; the boundary of the market area of each production site can be described by a set of equations. We are given the following variables:<sup>1</sup>

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<sup>1</sup>Adapted from W. Isard, (1956), p.45.

Given:

$$\begin{array}{ll}
 d^m & = f^m(\pi) \quad \text{individual demand for commodity } m \\
 \pi_q^m & = \phi(D_q) \quad \text{factory price} \\
 k_q^m & = \chi^m(D_q) \quad \text{average production cost}
 \end{array}
 \left. \vphantom{\begin{array}{l} d^m \\ \pi_q^m \\ k_q^m \end{array}} \right\} \begin{array}{l} \text{of commodity } m \text{ at} \\ \text{place } q \text{ as function} \\ \text{of total demand.} \end{array}$$

$$D_q^m = \psi(f^m, x_q^m, y_q^m, \alpha_q^m, \beta_q^m, \dots, \epsilon_q^m, \sigma, \sigma_q^m) \quad (\text{total demand})$$

$$S_q^m = D_q^m (\pi_q^m - k_q^m) \quad \text{profit on product } m \text{ at place } q.$$

$$\sigma = \text{rural population per square kilometer}$$

$$\sigma_q^m = \text{population of city } P_q^m$$

$$r = \text{freight rate}$$

$$n = \text{number of products}$$

$$G = \text{total surface area}$$

To be determined:

	Number of unknowns
(1) $\pi_q^m = \text{factory price of good } m \text{ at location } P_q^m$	n
(2) $G^m = \text{market area of location } P_q^m \text{ in square kilometers}$	n
(3) $q^m = \text{number of towns which produce good } m$	m
(4) $x_q^m, y_q^m = \text{coordinates of location } P_q^m$	2n
(5) $\alpha_q^m, \beta_q^m, \dots, \epsilon_q^m = \text{equations of boundaries of market area of } P_q^m$	N

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$$\text{Total:} \quad 4n + m + N$$

In Table 3.1, the symbols of spatial arrangement are listed.

Table 3.1 Symbols of Spatial Arrangement

Product Number	Production Places		Market Boundaries	
	<u>Position</u> <sup>1</sup>	<u>Number</u>	<u>Abbreviation of equations</u>	<u>Number</u>
1	$P_1^1(x_1^1, y_1^1); P_2^1 \dots P_a^1$	a	$\alpha_1^1, \beta_1^1, \dots, \epsilon_1^1; \alpha_2^1, \beta_2^1 \dots$	A
2	$P_1^2(x_1^2, y_1^2); P_2^2 \dots P_b^2$	b	$\alpha_1^2, \beta_1^2, \dots, \eta_1^2; \alpha_2^2, \beta_2^2 \dots$	B
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
m	$P_1^m(x_1^m, y_1^m); P_2^m \dots P_q^m$	q	$\alpha_1^m, \beta_1^m, \dots, \rho_1^m; \alpha_2^m, \beta_2^m \dots$	Q
m	(total) = a + b + ... + q	n	(total) = $\frac{A + B + \dots + Q}{2}$	N

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<sup>1</sup>Position is designated along x, y, coordinates.

There are also a number of equilibrium conditions to be fulfilled. The first condition states that each producer occupies a spatial position which maximizes his profits; in other words, he locates at the most economic site, and there would be no incentive to relocate. In terms of the variables given, the equation for such a condition can be written as:

$$\frac{\partial S_q^m}{\partial x_q^m} = 0 ; \quad \frac{\partial S_q^m}{\partial y_q^m} = 0 ; \quad (2 \text{ equations}) \quad (3.2.1.1)$$

(3.2.1.2)

Secondly, the plain under consideration must be completely exhausted by market areas for the various commodities:

$$G_1^m + G_2^m + G_3^m + \dots + G_q^m = G \quad (m \text{ equations}) \quad (3.2.1.3)$$

Thirdly, there can not exist any abnormal profits. The production cost of a given commodity must equal its factory price:

$$\phi_q^m(D_q) = \chi_q^m(D_q) \quad (n \text{ equations}) \quad (3.2.1.4)$$

The fourth condition states that changes in average price and average cost ensuing from infinitesimal change in the size of a producer's market area must be equal and consistent.

$$\frac{\partial \pi_q^m}{\partial G_q^m} = \frac{\partial k_q^m}{\partial G_q^m} \quad (n \text{ equations}) \quad (3.2.1.5)$$

A fifth condition requires any consumer on any boundary line to be indifferent to the number of possible production sources from whom he may obtain commodity at the same

minimum delivered price:

Any point  $x, y$  on boundary equation

$$\pi_q^m + r_q^m \sqrt{(x-x_q^m)^2 + (y-y_q^m)^2} = r_{q-1}^m + r_{q-1}^m \sqrt{(x-x_{q-1}^m)^2 + (y-y_{q-1}^m)^2}$$

(N equation) (3.2.1.6)

The system is determinate because the number of fulfilling conditions equals the number of unknown, such that there exists at least one solution for the unknowns.

Although this model may analyze the best locations of both industrial and agricultural places in their roles as consumption centers, the optimal location for production does not, however, necessarily coincide with the optimal location for consumption. Losch proceeds to derive a set of equations which describes spatial relations within the system. This approach minimizes elements of interdependence and regards the system not as a whole space-economy, but as consisting of several major sectors. Isard, discussing the shortcomings of Losch's model, suggests that, from a functional standpoint, one can sidestep the derivation of a set of equations and can instead "design a set of equations depicting general equilibrium in terms of input-output relations and price-cost relations, including therein transport inputs in order to give explicit recognition to the factor of space."<sup>1</sup> Furthermore, Isard suggests the application of Leontief's

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<sup>1</sup>See Isard (1956), p.49.

input-output techniques.<sup>1</sup>

We see in the Losch model a lot of potential for application to a socialist economy. The topographical assumptions are basic and indifferent to different economic systems. In place of an individual producing commodities, we can replace this with an economic unit such as the typical production unit<sup>2</sup>, e.g. the state enterprise, in China. Therefore, along the various dimensions of this model, one can visualize a realistic application to socialist economies in general, and to Communist China in particular.

So much for the theoretical foundations of location theory. Given the concepts discussed, how do we begin to extend theory to a conceptual understanding of regional economic growth? Location theory explains the location of economic activity and therein suggests growth between regions as a function of their locational advantages. It does not attempt to arrive at the causes of growth, but indicates within its theoretical framework where growth can and may occur. Locational advantages may channel growth to certain regions and deflect development from others. There are, for example, some necessary locational conditions for regional

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<sup>1</sup>The application of Leontief's input-output analyses to socialist economic systems is discussed at length in the next chapter. As we shall see, Losch model is more useful than a passing review suggests.

<sup>2</sup>A production unit could, for example, be an agricultural

economic growth. In primitive regions, a high transport costs retard the development of specialized production and require that such a region produces a wide range of commodities for domestic consumption, emphasizing local self-sufficiency. Within the region, however, trade develops to link localities, and production advantages of each locality become pronounced, inducing a relative degree of specialization by concentrating lines of production according to the principle of greatest relative advantages. With increased production resulting from locational specialization, income rises and a greater proportion of consumption goes to services and manufacturing, inducing industrialization.<sup>1</sup> Increasing industrialization will, in turn, create a distribution of economic activities influenced by locational advantages. Location theory, therefore, provides a powerful insight into regional economic growth in terms of the peculiarities, properties, and dynamics of relative locations of productions and market areas.

### 3.2.2 Export Base Theory and Interregional Income

In the last section, Location Theory seeks to describe

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commune in agricultural location analysis or an industrial production brigade in industrial location analysis.

<sup>1</sup>This sequence of consumption is often based on Engel's Law.

a sequence of development stages with differing spatial distributions of economic activities in the process of regional growth. The various spatial structures in each of the stages are explained by transport costs, and this theory has assumed a critical factor in the advancement through successive stages of growth. Improvement in transport enhances trade, which, in turn, induces specialized production at locations of relative advantages and further promotes exports. At the later stages of spatial development, therefore, exports assume a growth propelling function and lead to increased domestic economic activities and income. Where Location Theory leaves off, Export Base Theory picks up and further elaborates on the dynamics of regional economic growth.

The economic activities of a region can be divided into those that produce for domestic consumption and those that produce mainly for exports, and the latter group of activities are often termed basic. The theory of regional economic base states that the main factor determining the level of residential, or non-basic, activities is determined by the level of basic activities. In other words, the growth of a region depends upon the development and growth of its export industries, implying that expansion in demand external to the region is the crucial initiating determinant of growth in the region. Increase in export activities, thus, sets off a multiplier effect on the regional economy where the



multiplier is the ratio between export and residentiary activities measured in terms of either income or employment. Base theory derives essentially from the theory of regional income determination, and the base multiplier, a crude form of regional income multiplier which ignores the repercussionary effects of an expansionary process of imports and indirect exports.

The arguments of base theory can be presented through a simple model.<sup>1</sup> Let  $Y$  represent a region's disposable income,  $D$  the domestic net absorption (non-basic income),  $X$  the total exports (inclusive of commodity exports, tourist earnings, net wage payments, property income received by region's resident from outside the region, and net transfer payments). If our economic base is  $X$ , then the region's disposable income is:

$$Y = D + X \quad (3.2.2.1)$$

Let the region's current account balance be expressed by  $B$  and regional imports by  $M$  such that:

$$B = X - M \quad (3.2.2.2)$$

Output in the region may be allocated in three ways: consumed domestically ( $D$ ); exchanged for imports ( $M$ ); or invested outside the region ( $B$ ).

Therefore,

$$Y = D + M + B$$

or alternately:

$$\frac{D + M + B}{Y} = 1 \quad (3.2.2.3)$$

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<sup>1</sup>This model is adapted from Richardson (1969).

Substituting equation (3.2.2.2) into the base ratio  $D/X$ , or non-basic income over economic base, we obtain:

$$\frac{D}{X} = \frac{D}{M + B} \quad (3.2.2.4)$$

Assuming that  $D$ ,  $M$ , and  $B$  are functions of regional income  $Y$ , and that exports ( $X$ ) are autonomous and independent of  $Y$  (meaning in effect that  $X$  is determined endogenously), we can show the effects of changes in the regional economic base by first determining the relevant marginal propensities. Let  $d$ ,  $m$ , and  $b$  represent the marginal propensities to spend on domestic products ( $\Delta D / \Delta Y$ ), to import ( $\Delta M / \Delta Y$ ), and to invest abroad ( $\Delta B / \Delta Y$ ) respectively. Given an increase of  $\Delta X$  in the base and holding  $d$  constant, the equilibrium level of regional income will rise by:

$$\Delta X \frac{1}{m + b}$$

If local income changes have negligible effects on income changes outside the region. The increase in domestic activities  $\Delta D$  induced by increases in the base  $\Delta X$  can be expressed by:

$$\Delta D = d \Delta Y = \frac{d}{m + b} \Delta X \quad (3.2.2.5)$$

Depending on the relationship between average and marginal propensities to spend domestically, and assuming that  $(M + B)/Y = m + b$ , changes in base ratio activity can be evaluated. From equation (3.2.2.4), we know that

$$D = \frac{D}{M + B} X \quad (3.2.2.6)$$

also, dividing equation (3.2.2.5) by equation (3.2.2.6), we obtain:

$$\frac{\Delta D}{D} = \frac{d}{n + b} \frac{M + B}{D} \frac{\Delta X}{X} \quad (3.2.2.7)$$

Since  $(M + B)/Y = m + b$ , and  $d = D/Y$ :

$$\frac{\Delta D}{D} = \frac{\Delta X}{X} \quad (3.2.2.8)$$

This identity states that both basic and non-basic income increases by the same proportion with the base ratio unchanged. This, however, holds only when  $d = D/Y$ . If  $d > D/Y$ , the base ratio will increase over time; if  $d < D/Y$ , the base ratio will decrease.

In Figure 3.1, the characteristics of these relationships are illustrated. Both expenditures on domestically produced goods and imports are linear functions of  $Y$ , and with the export base constant, the equilibrium income level  $Y_1$  is given by the intersection of  $(D + X)$  with the 45 degree line, where total effective demand equals total output. If the export base increases by  $\Delta X$ , it will raise the new equilibrium income level to  $Y_2$ . Since  $D$  is a linear function, then  $d = D/Y$  and the base ratio  $FY_2/CF = EY_1/AE$  (cf. Fig.3.1) remains unchanged. An increase in the export base leads to an increase in the region's current account balance ( $B$ ) by an amount equal to  $b\Delta Y$ . In other words,  $Y_2$  will be the new equilibrium level if  $B$  increases by  $b\Delta Y$ . Alternatively, the balance of payment gap may also be closed by an upward shift in the import

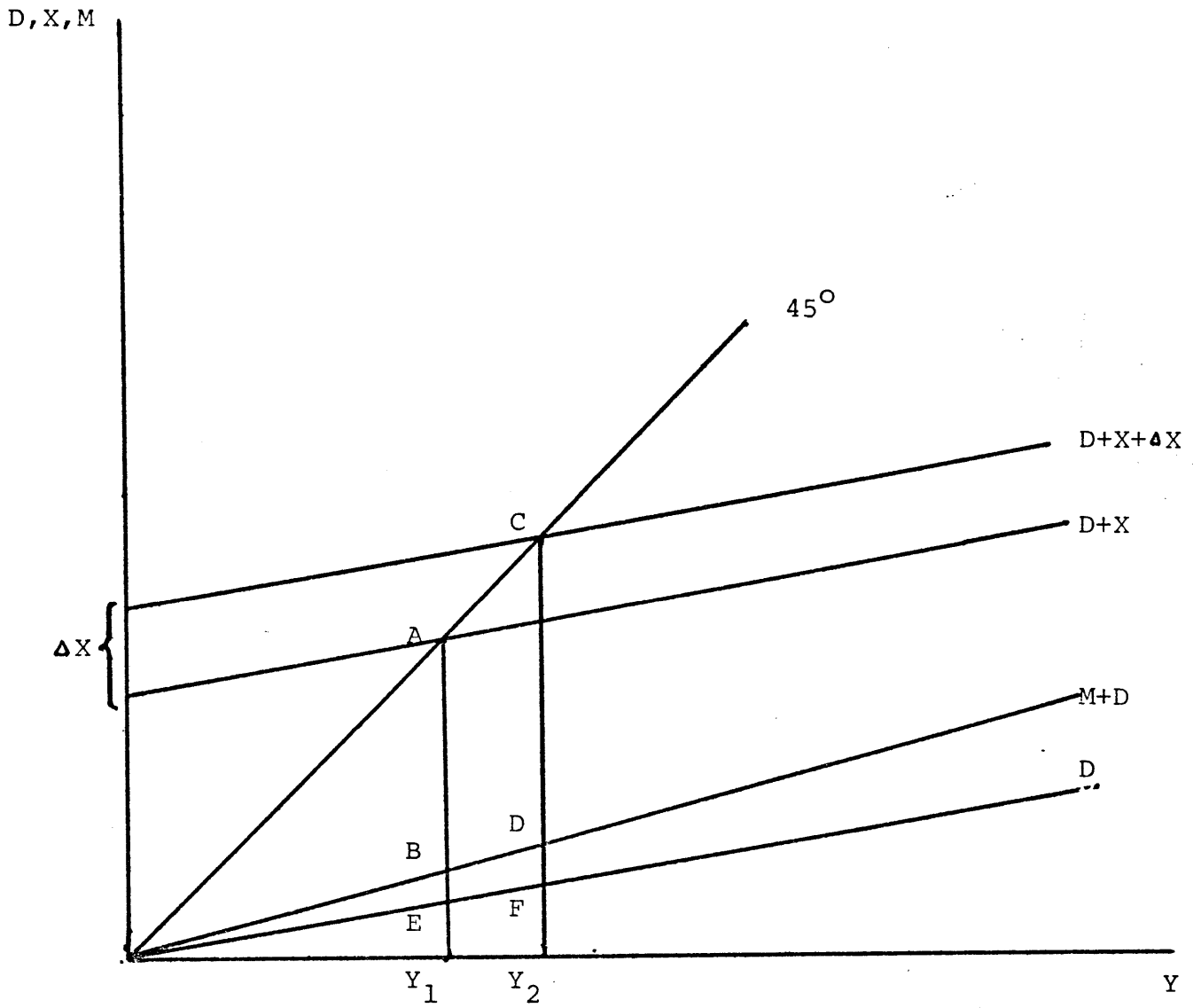


FIGURE 3.1

function. If these forces do not operate, there will be a reversion to the original income  $Y_1$  through a drop in the export base acting to equilibrate the balance of payments.

The theory of the base multiplier as discussed above poses a number of difficulties in applying the concept to the Chinese economic system. The most fundamental concerns the central assumption of base multiplier theory: that the size of the export base is the single determinant of the level of regional income. This contradicts the Chinese principle of emphasizing regional self sufficiency and of discouraging interregional trade.<sup>1</sup> In a situation where regions are forced to self-reliant, the critical determinants of growth are internal and not external, such as an autonomous demand for exports. The consideration of this fact points to other shortcomings of the theory. In dismissing the residentiary sectors as passive elements of growth, base multiplier theory ignores the possibility of rising income due not to expansion in basic activities, but to other relevant economic concepts, such as changes in consumption, investment, taxes, government expenditures,

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<sup>1</sup>See Chapter Two. A poor network of transport facilities makes interregional trade prohibitively high, thus, Chinese planners in discouraging expensive imports automatically limits expansion of export activities and the possibilities of export-propelled growth.



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etc.. Indeed, what base multiplier theory fails to consider, in effect emphasizes the internal determinants of growth. Improvements in efficiency in residentiary activities may reduce factor costs of basic production, thereby raising regional income. Alternately, growth could also be a result of reallocation of resources if a transfer of factors to residentiary activities approximates more closely to an optimal allocation of factor use.

Residentiary activities may also expand independently of changes in the export base. For example, changes in consumption behavior or expenditure patterns could create effective demand for specific types of products and lead to an increased level of residentiary activities. Indeed, higher regional income as a consequence of increased residentiary activities in import replacement industries is a more general case and is discussed at length by North (1956) and Tiebout (1956). An export base could remain unchanged and with given level of total expenditures on domestically produced goods and imports, one can have an upward shift in income due to increased demand for domestically produced goods.

Aside from these limitations, a major drawback of the base multiplier theory is that it is difficult to extend the analysis to a multi-region system, as in the case of China. In the model presented above, only two regions are considered: that under study, and the rest of the

world outside the region. The critical importance of this limitation stems from the fact that not all regions have the same marginal propensities to import; otherwise, the simplification of a two region system does not pose a ridiculous abstraction from reality. Since multiplier effects of increased export activities on income depend in part on the drain into imports and investments outside the region, different marginal propensities to import between regions would mean that the overall multiplier effect will be determined by regions affected by increased import demand and by the values of the marginal propensities of the expanding region to import from one another.

In a multi-region system, the appropriate multiplier would not be the crude export base multiplier but a general one which accounts for feedback effects. A rise in imports in the  $i$ th region in a  $n$ -region system would, through multiplier effects, raise the incomes of the other regions. The other regions with higher incomes, in turn, would increase their demand and import from the  $i$ th region, thereby raising its regional income, and the sequence continues. In this context, one region's exports can be expressed as a function of the other regions' income, and vice versa. This means that, in a multi-region system, exports are not independently and autonomously determined; they depend in part on the internal propensities to import and on regional income.



Another assumption of base multiplier theory that has to be relaxed in a multi-region system concerns the repercussionary effects of increases in the export base on interregional trade. While previously these effects were considered negligible, we now have to account for the effects far beyond the initial import or external lending leakages associated with a rise in the region's income.

Metzler (1950), in recognizing these limitations, has developed an interregional multiplier by introducing interdependence into a system of many regions. Net income of a region is defined as consisting of consumption expenditure plus net investment plus exports minus imports:

$$Y = C + I + (E - I)$$

Consumption, investments, and imports are assumed to be dependent on domestic income. Exports are considered a linear function of the  $n-1$  regions, implying an ancillary assumption that the import content of a region's exports are similar to the import content of domestic goods. Prices and costs are held constant. With the system initially in equilibrium, a disturbance in one region has effects that can be traced through the  $n$  region system. In other words, if domestic investment in one region rises, demand for goods and services in the whole system rises. If the system is stable, a new equilibrium will obtain in all regions.

We can trace the disturbances through a system of

a system of equations for  $n$  regions: let  $M_1(Y_1)$  be the import function representing the relationship of total imports from other regions to net income of region 1. If  $M_{n1}(y_1)$  represents imports of region 1 from region  $n$ , we may write:

$$M_1(y_1) = M_{21}(y_1) + M_{31}(y_1) + \dots + M_{n1}(y_1) \quad (3.2.2.9)$$

With the whole system closed, one region's import is another region's exports. All interregional trade can be expressed in terms of import functions so that a specific export function is unnecessary. Region 1's export can be thus expressed in terms of imports by region 2, 3, 4, ...,  $n$ .

Since both the consumption and investment are assumed to be functions of income, we can combine both in a total expenditure function. For region 1,  $E_1(y_1)$  shows the relationship of expenditures on consumption and investment to net income. To show how expenditures by the region affect the region's net income, we subtract total imports  $M_1(y_1)$  from  $E_1(y_1)$ . Since the region's income  $y =$  total expenditures - imports + exports, the  $n$  equations for a general economic system of  $n$  regions can be described as follows:

$$\begin{aligned} y_1 &= E_1(y_1) - M_1(y_1) + M_{12}(y_2) + M_{13}(y_3) + \dots + M_{1n}(y_n) \\ y_2 &= E_2(y_2) - M_2(y_2) + M_{21}(y_1) + M_{23}(y_3) + \dots + M_{2n}(y_n) \\ y_3 &= E_3(y_3) - M_3(y_3) + M_{31}(y_1) + M_{32}(y_2) + \dots + M_{3n}(y_n) \\ &\vdots \\ &\vdots \\ &\vdots \\ y_n &= E_n(y_n) - M_n(y_n) + M_{n1}(y_1) + M_{n2}(y_2) + \dots + M_{n,n-1}(y_{n-1}) \end{aligned} \quad (3.2.2.10)$$

There are  $n$  equations for our system of  $n$  regions, so the system is determinate, and we can determine the level of income for each region, given constant prices.

Stability in the region can be determined algebraically if the marginal propensities to spend (on investment and consumption) are less than unity in each and every region ( $e_1, e_2, \dots, e_n$ ). Should the marginal propensities exceed unity, then the system becomes unstable. In situations where some regions' marginal propensities exceed unity while others' are less than unity, stability will exist if the weighted average of the  $\Sigma e$ 's for all regions does exceed unity:

$$\sum_{i=1}^n a_i E_i(y_i) < 1$$

If the system is stable, a sustained increase in investment will result in a new equilibrium corresponding to the higher rate of investment. An analysis of the disturbance to the equilibrium of the system imparted by an autonomous investment, say, in region 1 (represented by  $A_1$ ) can be given through the interregional multiplier. Given such an increase, the first equation in our system described above becomes:

$$y_1 = E_1(y_1) - M_1(y_1) + M_{12}(y_2) + M_{13}(y_3) + \dots + M_{1n}(y_n) + A_1 \quad (3.2.2.11)$$

The income expansion effects induced by increased autonomous

investment in region 1 ( $A_1$ ) depend on the interregional multiplier  $K_1$ . The stimulus  $A$  will increase expenditures in the region and lead to higher regional income, although magnitude of income expansion will depend on the extent of leakages through imports and the secondary rise in region 1's exports induced by higher incomes and import demand in other regions spurred by import leakages from region 1.

We can now calculate the multiplier  $k$ . Let:

$e_1$  = marginal propensity to spend of region 1

$m_{21}, m_{31}, \dots, m_{n1}$  = the marginal propensity to import of region 1 from regions 2, 3, ..., n.

$m_{12}, m_{13}, \dots, m_{1n}$  = the marginal propensities of region 2, 3, ..., n to import from region 1.

$k_2, k_3, \dots, k_n$  = interregional multipliers for regions 2, 3, ..., n.

$$\begin{aligned}
 k_1 = \frac{dy_1}{dA_1} &= \frac{1}{1 - e_1 + m_1 - (dm_{12} + dm_{13} + \dots + dm_{1n}) / dy_1} \quad (3.2.2.12) \\
 &= \frac{1}{1 - e_1 + m_1 - (m_{12} dy_2 / dy_1 + m_{13} dy_3 / dy_1 + \dots + m_{1n} dy_n / dy_1)} \\
 &= \frac{1}{1 - e_1 + m_1 - (m_{12} m_{21} k_2 + m_{13} m_{31} k_3 + \dots + m_{1n} m_{n1} k_n)}
 \end{aligned}$$

Region 1's income increase is equal to  $A$  multiplied by the multiplier. Consequently, import leakages from region 1 will total  $mAK$ , and are distributed through the system according to the disaggregated marginal propensities of region 1 to

import from each of the other region. In turn, import leakages from region 1 will raise region 2's (3,4,...,n) exports by:

$$m_{21}(m_{31}, m_{41}, \dots, m_{n1})A_1K_1$$

Thus, any increase in exports in one region will have a multiplier effects on the income of that region equivalent to a rise in domestic investments. For the whole system, increase in income of n-1 regions following the rise in autonomous investment  $A_1$  in region 1 can be described by:

$$\begin{aligned} dY_2/dA_1 &= m_{21}A_1K_1K_2 \\ dY_3/dA_1 &= m_{31}A_1K_1K_3 \\ &\vdots \\ dY_n/dA_1 &= m_{n1}A_1K_1K_n \end{aligned} \quad (3.2.2.13)$$

The basic regional trade multiplier is smaller than  $K_1$  described above because it permits leakages through imports; the region's exports are given and assumed autonomous of imports.  $K_1$  is however smaller than the Keynesian multiplier because it does not allow for leakages through imports nor return of leakages through exports.<sup>1</sup> Therefore, if all regions satisfy the stability condition that their marginal propensities to spend do not exceed unity, and that the multiplier  $K_1$  lies between the upper limit of the Keynesian investment multiplier and the lower limit of the basic

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<sup>1</sup>Secondary rise in exports is usually smaller than imports such that a closed economy multiplier will be greater than  $K_1$ .

regional trade multiplier.

The dynamics of income expansion through the multiplier process has important implications for regional balance of payments. When a new equilibrium obtains, some regions will have more favorable balances while other regions less favorable than in the preceding period. Effects of income expansion in region 1 on the balance of payments between it and another region may be delineated into two components: (1) primary effects: imports by region 1 from region n rises as the former's income rises, causing a temporary surplus in region n and a deficit in region 1; (2) secondary effects: income expansion in region n associated with increased export earnings will spur regional demand for exports, resulting in expanded income in region 1 from exports to region n. Since the secondary effects cancel some of the primary effects, net effect of each region's balance of payments will then depend on the relative size of the primary and secondary effects. Therefore, regional balance of payments depend on the determinant of the magnitude of the changes.

An alternative approach is to treat a region's trade balances in terms of its own income. When a region's exports is greater than its imports, one can alternately say that its total income exceeds total expenditure on consumption and net investment. Further, the direction of change in region n's balance of payment depends on its

marginal propensity to spend.

### 3.2.3 Factor Movements

In the preceding sections, we have attempted to view regional growth through the dynamics of locational (push and pull) factors and the multiplier effects on income induced expansion of the export base. We must now focus on the movement of factors of production and the implications it holds for growth.

Although space was originally introduced into economic theory by international trade theorists, the explicit consideration of space as an important determinant of growth has been developed mainly by regional economists adapting international trade concepts to the regional context. Mundell (1957) showed that in cases of perfect factor mobility and immobile commodity, inequality in factor prices would lead to factor movements equalizing factor prices. This is basically the reciprocal of the classic Heckscher-Ohlin factor price equalization theorem in which commodity trade would eventually lead to factor price equalization. The same result was obtained by Samuelson (1948, 1949, 1952) through a more sophisticated analysis where in the simple case of a two good two factor economy, factor price equalization could obtain as a result of trade in the absence of factor movement through a relationship between relative

factor and commodity prices. This unique relationship was however realized by assuming a series of restrictive assumptions.<sup>1</sup>

Samuelson's analysis assumed free trade in goods but factor immobility while Mundell's considered factor mobility but no free trade. The same results could obtain from either free trade or perfect factor mobility since both eliminate price differentials in product and factor markets. But this does not mean that they are perfect substitutes for one another because although both may equalize prices, they do not necessarily equalize at the same levels. In situations where multi-equilibrium possibilities exist, one can not be sure that free trade would result in the same equilibrium reached through factor movements. In a n region system, one would indeed find higher mobility of factors and a closer approximation to free trade than between nations. This point is important in the Chinese context where the economy is characterized by strict policies concerning interregional factor and commodity movements.

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<sup>1</sup>Samuelson assumed: (1) identical, linear homogenous production functions for every good; (2) diminishing returns along each good's isoquant; (3) irreversible factor intensities; (4) perfect competition, and; (5) zero transport costs. The last assumption ensures commodity price equalization under conditions of free trade. As such, commodity price equalization results in factor price equalization.



Under conditions of perfect competition, an optimal allocation of resources is defined as that which maximizes national output. As such, any shift in resource utilization would only decrease output. In such a model, there are three equilibrium conditions: (1) equal factor prices between regions; (2) equal marginal physical products of each factor of each good in every region; and; and (4) zero transport costs, implying equal prices of identical goods in all regions. This model approximates a regional system because regional production functions are more similar than between nations, and further, danger of reversals in factor intensity is less likely in regional production analysis.<sup>1</sup> Demand functions between regions are also more identical. The shortcoming of the model, however, remains the assumption of zero transport costs, -- a crucial assumption ensuring factor and commodity price equalization but which also denies the existence of space.

Although the assumptions of factor price equalization may not deviate from the reality of a regional economic system, it is still not clear that factor price equalization will in fact occur. A number of cases exist which could

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<sup>1</sup>If the production function has a constant elasticity of substitution with differing elasticities between industries, then relative capital/labor ratios could reverse for any two given commodity as factor prices change. Factor price differentials between regions are however quite small.

prevent price equalization. One problem stems from the fact that these analyses are framed in static terms while factor movements occur in a dynamic regional framework. Further, in dynamic analysis, factor flows and regional growth rates interact upon each other in a highly complex manner that will not necessarily result in equilibrium; as such it may tend toward a long-run equilibrium only.<sup>1</sup> Secondly, the assumption that prices are uniform throughout the regional system denies the existence of space that is essential in regional analysis. Transport costs of factors will in reality impose peculiar constraints on factor movements in response to regional factor price differentials. Thirdly, interregional trade is intimately related to the consumption of transportation, and production of these services require factors that may be utilized in other production processes. In fact, transport costs often create price differentials between regions.<sup>2</sup> Fourthly, there may not be constant returns to scale. External and scale economies, agglomeration could in fact tend to increase regional price differentials. These

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<sup>1</sup>See, for example, the discussion in Richardson (1969).

<sup>2</sup>Lefebvre (1958) demonstrated that in perfectly competitive equilibrium, not only do factor prices equal their marginal products, but factor prices differ between regions by the marginal cost of transporting one unit of factor from one region to another.

differences may be manifested by the regional variation in the level of urbanization. The existence of such centers could then act to impede market forces and accelerate price differential between regions.

Fifthly and lastly, although factor mobility between regions may be more perfect than between nations, it is not perfect. Non-economic forces and institutional barriers may exist to retard factor movements, especially in the case of labor.

### 3.3 Theoretical and Operational Models

#### 3.3.1 Harrod-Domar Model Adapted to a Regional System; A Neo-Classical Model of Equilibrium Growth

This section reviews current efforts at adapting classical and neo-classical models of equilibrium growth to a regional context.

Macroeconomic growth models to be presented below are primarily concerned with equilibrium growth, -- a concept which is not necessarily useful in regional analysis because equilibrium conditions for a regional system may be more variable and complex than for a national economy. For example, transmission of impulses across regions may result in disequilibrating tendencies in certain regions because regional economies usually lack the instruments for corrective measures against external disturbances.

Equilibrium growth in regional analysis assumes one of two interpretations: (1) that poor regions grow at a faster rate to catch up with the more advanced regions, leading to a convergence of incomes; or (2) that all regions grow at the same rate such that despite steady state growth, regional income differential is allowed to increase. In cases of dynamic equilibrium, however, there is an additional stipulation that not only should growth rates increase at the same level, but that they further be equal:  $g_1 = g_2 = \dots = g_n$  equals a constant. Therefore, these models are useful only

to the extent that their meaning of equilibrium is consistent with one's interpretation of the term.

The rationale of considering the Harrod-Domar group of model in regional analysis derives from their Keynesian demand-oriented theory. It has been postulated that growth in lagging regions is more likely due to the lack of effective demand rather than to supply shortages. Poorer regions in developing countries are often characterized by unused or underemployed factors, and this fact is accounted for in Harrod-Domar models, in contrast to the full-employment assumptions of classical models.

The model can be framed in a one-good economy, the good used for consumption or as an input in production. Homogenous labor is the only other input. There are constant returns to scale and no technological progress. It assumes (1) constant propensity to save; (2) fixed production coefficients; (3) labor force growth is equal to the natural population growth rate =  $n$ . For steady growth, equilibrium conditions must be met for both inputs and the growth must be one which assures full capacity and full employment. Further, capital stock growth rate must be equal to output.

In this model, an open regional economy would permit interregional movement of commodity and factors to maintain equilibrium even where internal conditions for equilibrium are not met.

The static equilibrium condition for the model is that Savings plus Imports must equal Investment plus Exports:

$$S + M = I + X$$

For the  $i$ th region, the equilibrium condition for steady growth is described by:

$$g_i = \frac{s_i + m_i - (X_i/Y_i)}{v_i}$$

where  $g$  is the capital stock growth rate,  $s$  the marginal propensity to save,  $Y$  output, and  $v$  the capital stock output ratio.

Since the capital output ratios and the propensities to save are assumed equal in both regions, steady growth requires that the balance of payments of both regions remain continuously in equilibrium. When both regions' income level are the same, this condition requires only that their marginal propensities to import are equal; where their incomes are not equal, then the poorer region must have a higher marginal propensity to import to maintain equilibrium. That is, their balance of payment must be equal.

The same analysis holds true for labor input. When population growth rates in the two regions are not equal, then equilibrium growth requires that migration must flow from the region with the higher growth rate to the slower.

In this model therefore, equilibrium is maintained through movement of factors except in cases where labor growth rate and the marginal propensities to save are equal.

While the Harrod-Domar model is demand-oriented, the neo-classical model which follows is in contrast supply-oriented.

The assumption of fixed production coefficients is dropped in this model and in its place is replaced a continuous function relating output to inputs of two factors: labor and capital. Growth rate in this model is determined by three elements: (1) capital accumulation; (2) labor supply increase; and (3) technological progress expressed as a function of time. Assuming that (1) factors receive their net marginal product; and (2) constant returns to scale, the rate of growth in each region can be described by the following equation:

$$y_i = a_i k_i + (1-a_i) n_i + T_i \quad (3.3.1.3)$$

where  $y$  is growth rate of output or income,  $k$  and  $n$  the rates of capital and labor respectively,  $T$  technological progress,  $a$  the marginal product of capital, and  $(1-a)$  the marginal product of labor.

This model also requires a continuous full employment of the capital stock, requiring a further necessary instrument for equating investment to full employment savings.<sup>1</sup> Discounting risk and uncertainty, the equilibrium rate of interest will equal the rate of profit, which under our assumptions equals the marginal product of capital. Thus, for the  $i$ th region, the condition for equilibrium is:

$$MP_{K_i} = a_i \frac{Y_i}{K_i} = r \quad (3.3.1.4)$$

In other words, the rate of capital accumulation must equate

the marginal product of capital to the national interest rate. When the interest rate is given, then  $Y$  and  $K$  must grow at the same rate for  $a$  to remain constant, i.e.,  $y_i = k_i$ .

In this model, when all three determinants of growth are constant and equal, there will be steady equilibrium growth. However, if labor supplies are not equal but with their marginal product equal, equilibrium could still be maintained if the region with a faster labor growth rate has a lower technological progress rate. Also, even with unequal marginal product of capital, a flexible capital-output ratio could still lead to equilibrium. In other words, each of the three determinants could offset each other's effects to maintain dynamic equilibrium.

In equilibrium, total investment must equal total savings for the system as a whole, but this does not mean that savings for each region will satisfy the condition of equal growth rates between output and capital; since regions may import capital from other regions, this condition may be redefined as imports minus exports ( $M-X$ ). For each region the equilibrium condition is that  $M_i - X_i = I_i - S_i$ . Capital imports into a region may be determined by comparing the rate of investments with the rate of savings in the region. It will be imported if:

$$k_i K_i > s_i Y_i, \text{ or } k_i > \frac{s_i Y_i}{K_i} \quad (3.3.1.5)$$



This inequality must exist for capital to flow from one region to another and to maintain equilibrium in steady growth.

Abstracting from steady growth, the main factor influencing capital imports is the regions's rate of growth: the higher its growth rate, the likelier it will import capital.

Thus, the requirements for steady growth in the neo-classical model in the regional context are quite similar to that of the Harrod-Domar model, and lead to similar results.<sup>1</sup>

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<sup>1</sup>Both of these models are presented in great detail in Richardson (1969).

### 3.3.2 Models of Spatial Equilibrium: Lefebvre's Allocation in Space

In his book Allocation in Space, Lefebvre presents theoretical and formalized models of spatial equilibrium which focus on the problems of optimal resource allocation and commodity distribution over the spatial dimension.<sup>1</sup> Of particular interest to us is his model of General Equilibrium: Competitive Determination of Market Price Ratios in Geographically Separated Markets.<sup>2</sup> The analysis is framed on the following set of assumptions: prices of final goods in different markets (or welfare relations for spatially separated consumer groups) are given; there exists a fixed number of discrete locations; both production and consumption can take place at any of these locations; each location is endowed with resources of productive factors in non-negative quantities; resources of one location may be utilized at another location.

The last assumption means in effect that the location of production does not necessarily have to coincide with either the sources of inputs or with the location of markets. Furthermore, assume that potential production locations are connected by transport routes. Coefficients denoting the required

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<sup>1</sup>Lefebvre (1968)

<sup>2</sup>Ibid., pp.141-146.

units of transportation services needed to haul factors or commodities between any pair of points may be computed.<sup>1</sup> A feasible distribution of goods and the simultaneous allocation of factors imply a corresponding total demand<sup>2</sup> for transportation services:

$$T = \beta_1^2 X_1^2 + \beta_2^1 X_2^1 + \dots + \beta_n^m X_n^m \quad (3.3.2.1)$$

where  $\beta_n^m$  are transportation coefficients defined for any pair of location;  $X_j^i$  the goods to be transported.

Equation (3.3.2.1) can also be expressed in the more general form where it is a function of the quantities to be transported:

$$T = \tau(X_1^2, X_2^1, \dots, X_n^m) \quad (3.3.2.2)$$

Transportation service in this model is provided by a separate transportation industry whose required inputs do not have to be transported.

The model is framed in a purely competitive setting such that no individual firm or owner of resources can affect the market in which he is dealing. Conditions for maximization is, in general, restricted to situations where the "convexity of the feasible region defined by the transformation surface

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<sup>1</sup>This coefficient multiplied by the amount of goods to be hauled between any specific pair of locations gives the total amount of transportation service required to perform that task.

<sup>2</sup>The parameters of transportation demand defined here are technological data and are function of weighted distance only.

is established."<sup>1</sup> When convexity of the re-transformation is established, then the existence of a maximum is also established.

The determinate competitive solution is obtained through a set of balance of payments equations (one for each individual) which equate the expenditures of each individual on consumption goods with his income derived from hiring out of his factors. Factors of production are institutionally, e.g. exogenously, determined. Service flows are fixed; convexity on the production side is assumed and quasi-convexity on the utility side.

Notation for the model is as follows: (All variables  $\geq 0$ )

Data:

$r$ : number of consumption locations  
 $n$ : number of production locations  
 $m$ : number of final goods  
 $s$ : number of transportable factors  
 $d$ : number of consumers summed over all locations  
 $k^\gamma$ : number of consumers at location  $\gamma$   
 $\bar{V}_{\delta\mu}$ : total amount of factor  $\delta$  in pool at location  $\mu$   
 $\bar{v}_{\delta\mu}^{\rho\gamma}$ : amount of factor  $\delta$  in pool at location  $\mu$  owned by consumer  $\rho$  residing at location  $\gamma$   
 $W_\gamma^\alpha$ : arbitrary weight (market price) for good delivered at market  $\gamma$

Functions:

$W$ : social welfare function  
 $\tau$ : transport demand function  
 $\psi^{\alpha\beta}$ : production function of good  $\alpha$  produced at  $\beta$   
 $\psi^{m+1}$ : production function of transportation  
 $\mu_{\rho\gamma}$ : utility function of consumer  $\rho$  residing at  $\gamma$

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<sup>1</sup>Convexity here is defined such that if any two or more program falls within the same feasible region, then a normalized weighted average of the two program also falls in the same region. Lefebvre, op. cit., p.11.

Variables:

- $X_Y^{\alpha\beta}$ : good  $\alpha$  produced at location  $\beta$  and delivered at location  $\gamma$   
 $V_{\delta\mu}^{\alpha\beta}$ : factor  $\delta$  originating from location  $\mu$  employed in the production of good  $\alpha$  at location  $\beta$   
 $V_{\delta\mu}^{m+1}$ : factor  $\delta$  originating from location  $\mu$  employed in the production of transportation  
 $Y_{\rho\gamma}^{\alpha}$ : good  $\alpha$  consumed by consumer  $\rho$  at location  $\gamma$

Lagrange Multiplier:

- $\lambda^{\alpha\beta}$ : f.o.b. price of good  $\alpha$  at production location  $\beta$   
 $\lambda^{m+1}$ : price of a unit of transportation service  
 $\lambda_{\delta\mu}$ : rent of factor  $\delta$  at location  $\mu$   
 $\lambda_Y^{\alpha}$ : price of good  $\alpha$  at market of consumption at location  $\gamma$   
 $\psi_Y$ : price of transportation in terms of first good delivered (consumed) at location  $\gamma$ , i.e.,  $\lambda^{m+1}/\lambda_Y^1$

The following holds unless otherwise stated:

$$\begin{aligned}
 \alpha &= 1, 2, \dots, m \\
 \beta &= 1, 2, \dots, n \\
 \gamma &= 1, 2, \dots, r \\
 \delta &= 1, 2, \dots, s \\
 \rho &= 1, 2, \dots, k^{\gamma} \\
 \mu &= 1, 2, \dots, n
 \end{aligned}
 \quad \sum_{\gamma} k^{\gamma} = d$$

Satisfaction maximizing relationships:

$$\frac{\partial U}{\partial Y_{\rho\gamma}^{\alpha}} - \frac{\lambda_Y^{\alpha}}{\lambda_Y^1} \frac{\partial U}{\partial Y_{\rho\gamma}^1} = 0 \quad (3.3.2.3)$$

$\alpha = 2, 3, \dots, m$

(a total of  $d(m-1)$  satisfaction relationship)

Each market has a separate set of price ratios, such that with  $m-1$  independent ratios at each market,  $r(m-1)$  price ratios for final goods must be determined.

The balance of payments equations are:

$$\sum_{\alpha} \frac{\lambda_Y^{\alpha}}{\lambda_Y^1} Y_{\rho\gamma}^{\alpha} = \sum_{\delta} \sum_{\mu} \frac{\lambda_{\delta\mu}}{\lambda^{m+1}} \psi_Y \bar{V}_{\delta\mu}^{\rho\gamma} \quad (3.3.2.4)$$

Distribution-supply of final goods at markets:

$$\sum_{\rho} Y_{\rho\gamma}^{\alpha} = \sum_{\beta} X_{\gamma}^{\alpha\beta} \quad (3.3.2.5)$$

Transport inequality:

$$\tau(X_{\gamma}^{\alpha\beta}, V_{\delta\mu}^{\alpha\beta}) \leq \psi^{m+1}(\sum_{\mu} V_{1\mu}^{m+1}, \dots, \sum_{\mu} V_{s\mu}^{m+1}) \quad (3.3.2.6)$$

$\beta \neq \mu$

Distribution-supply of final goods at production locations:

$$\sum_{\gamma} X_{\gamma}^{\alpha\beta} \leq \psi^{\alpha\beta}(\sum_{\mu} V_{1\mu}^{\alpha\beta}, \dots, \sum_{\mu} V_{s\mu}^{\alpha\beta}) \quad (3.3.2.7)$$

Allocation-supply of productive factors:

$$\sum_{\alpha\beta} V_{\delta\mu}^{\alpha\beta} + V_{\delta\mu}^{m+1} \leq \sum_{\rho\gamma} \bar{V}_{\delta\mu}^{\rho\gamma} = \bar{V}_{\delta\mu} \quad (3.3.2.8)$$

Differential inequalities with respect to variables that correspond to the production side:

w.r.t.  $X_{\gamma}^{\alpha\beta}$ :

$$\frac{\lambda_{\gamma}^{\alpha}}{\lambda_{\gamma}^1} - \psi_{\gamma} \frac{\partial \tau}{\partial X_{\gamma}^{\alpha\beta}} - \frac{\lambda^{\alpha\beta}}{\lambda^{m+1}} \psi_{\gamma} \leq 0 \quad (3.3.2.9)$$

w.r.t.  $V_{\delta\mu}$ :

(for local utilization)

$$\frac{\lambda^{\alpha\mu}}{\lambda^{m+1}} \frac{\partial \psi^{\alpha\mu}}{\partial V_{\delta\mu}^{\alpha\mu}} - \frac{\lambda_{\delta\mu}}{\lambda^{m+1}} \leq 0 \quad (3.3.2.10)$$

(for utilization abroad)

$$\frac{\lambda^{\alpha\beta}}{\lambda^{m+1}} \frac{\partial \psi^{\alpha\beta}}{\partial V_{\delta\mu}^{\alpha\beta}} - \frac{\partial \tau}{\partial V_{\delta\mu}^{\alpha\beta}} - \frac{\lambda_{\delta\mu}}{\lambda^{m+1}} \leq 0 \quad (3.3.2.11)$$

(for utilization in transportation production)

$$\frac{\partial \psi^{m+1}}{\partial V_{\delta\mu}^{m+1}} - \frac{\lambda_{\delta\mu}}{\lambda^{m+1}} \leq 0 \quad (3.3.2.12)$$

We determine the following in the competitive solutions:

r(m-1) market price ratios for final goods in terms of the first good at each market  $(\lambda_Y^\alpha / \lambda_Y^1)$

r price ratios of transportation in terms of the first good at each market  $(\psi_Y)$

mn f.o.b. prices in terms of transportation  $(\lambda^{\alpha\beta} / \lambda^{m+1})$

sn factor rents in terms of transportation  $(\lambda_{\delta\mu} / \lambda^{m+1})$

md consumption variables  $(Y_{\rho\gamma}^\alpha)$

mnr distribution variables  $(X_Y^{\alpha\beta})$

sn(nm+1) factor variables  $(V_{\delta\mu})$

A total of  $m(r+m+d+nr)+sn(nm+2)$  variables, with:

d(m-1) satisfaction equations

d-1 balance equations

mr market distribution equations

1 transport inequality

mn production-supply relationships

sn factor-supply relationships

mnr market-f.o.b. price relationships

sn(nm+1) factor allocation relationships

This model deals with a closed national economy. The locations of production and consumption in this model may be reformulated for our purposes to denote regions; hence, we may

derive a model of interregional spatial equilibrium. At equilibrium, rent differential between mobile factors in any two locations cannot exceed the marginal cost of transportation between the two points. Furthermore, the marginal rate of substitution between two factors is equal to ratios between their local prices and to the ratios between their marginal productivities. The price of immobile resources is equal to their local marginal productivity, but price variations would be limited by the possibilities of substitution with mobile factors. In other words, a low transport cost would imply a greater price homogeneity over space.

### 3.3.3 Regional Growth Models: Miernyk's Dynamic Regional Input-output Model; Bell's Econometric Forecasting Model and Mera's Equilibrium Model of Regional Growth.

The model employed by Miernyk and his associates in their study Simulating Regional Economic Development<sup>1</sup> derives basically from the input-output analyses for a national economy formulated by W. Leontief (1953, 1966) and expanded on H. Chenery and P. Clark (1959). The general dynamic model has the basic balance equation:

$$X_i - \sum_{j=1}^n X_{ij} - \sum_{j=1}^n D_{ij} - \sum_{j=1}^n S_{ij} = Y_i \quad (i=1,2,\dots,n)$$

(3.3.3.1)

where  $X_i$  is the total output of the  $i$ th industry;  $X_{ij}$  the total

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<sup>1</sup>Miernyk, et al., (1970).



current input requirement by the  $j$ th industry from the  $i$ th industry;  $D_{ij}$  the capital needed by the  $j$ th industry from industry  $i$  to maintain capital stocks at current levels;  $S_{ij}$  the expansion of capital goods stock produced by the  $i$ th industry and held by industry  $j$ ;  $Y_{ij}$  the final deliveries by the  $i$ th industry.

Sales by the  $i$ th industry to the  $j$ th industry on current accounts are proportional to the output of the  $j$ th industry:

$$X_{ij} = a_{ij}X_j \quad (3.3.3.2)$$

Sales of replacement capital and changes in the stocks of industry  $i$ 's capital output held by the  $j$ th industry are both subject to the same proportionality specifications; respectively:

$$D_{ij} = d_{ij}X_j \quad (3.3.3.3)$$

$$S_{ij} = b_{ij}X_j \quad (3.3.3.4)$$

The coefficients of proportionality are organized into three matrices:  $A$ ,  $D$ , and  $B$  respectively.

Substituting the latter three equations into equation (3.3.3.1), the dynamic input-output equation becomes:

$$X_i - \sum_{j=1}^n a_{ij}X_j - \sum_{j=1}^n b_{ij}X_j = Y_i \quad (i=1,2,\dots,n) \quad (3.3.3.5)$$

and in matrix notation:

$$X - AX - DX - BX = Y \quad (3.3.3.6)$$

In estimating the rate of change in output over time to obtain

a solution to the dynamic model, output (X) can be equated to  $X_t - X_{t-1}$ . The coefficient A can also be represented by linear interpolation to account for technological changes and changing trade patterns. Equation (3.3.3.6) thus becomes:

$$X_t - A_t X_t - D X_t - B(X_t - X_{t-1}) = Y_t \quad (3.3.3.7)$$

and by rearranging terms:

$$(I - A_t - D - B) X_t + B X_{t-1} = Y_t \quad (3.3.3.8)$$

The solution for X is therefore:

$$X_t = (I - A_t - D - B)^{-1} (Y_t - B X_{t-1}) \quad (3.3.3.9)$$

To extend the dynamic input-output model to a simulation framework, the balance equation (3.3.3.1) can be revised to become:

$$X_t - A_t X_t - D_t X_t - B_t (X_{t+1} - X_t) = Y_t \quad (3.3.3.10)$$

with the associated solution:

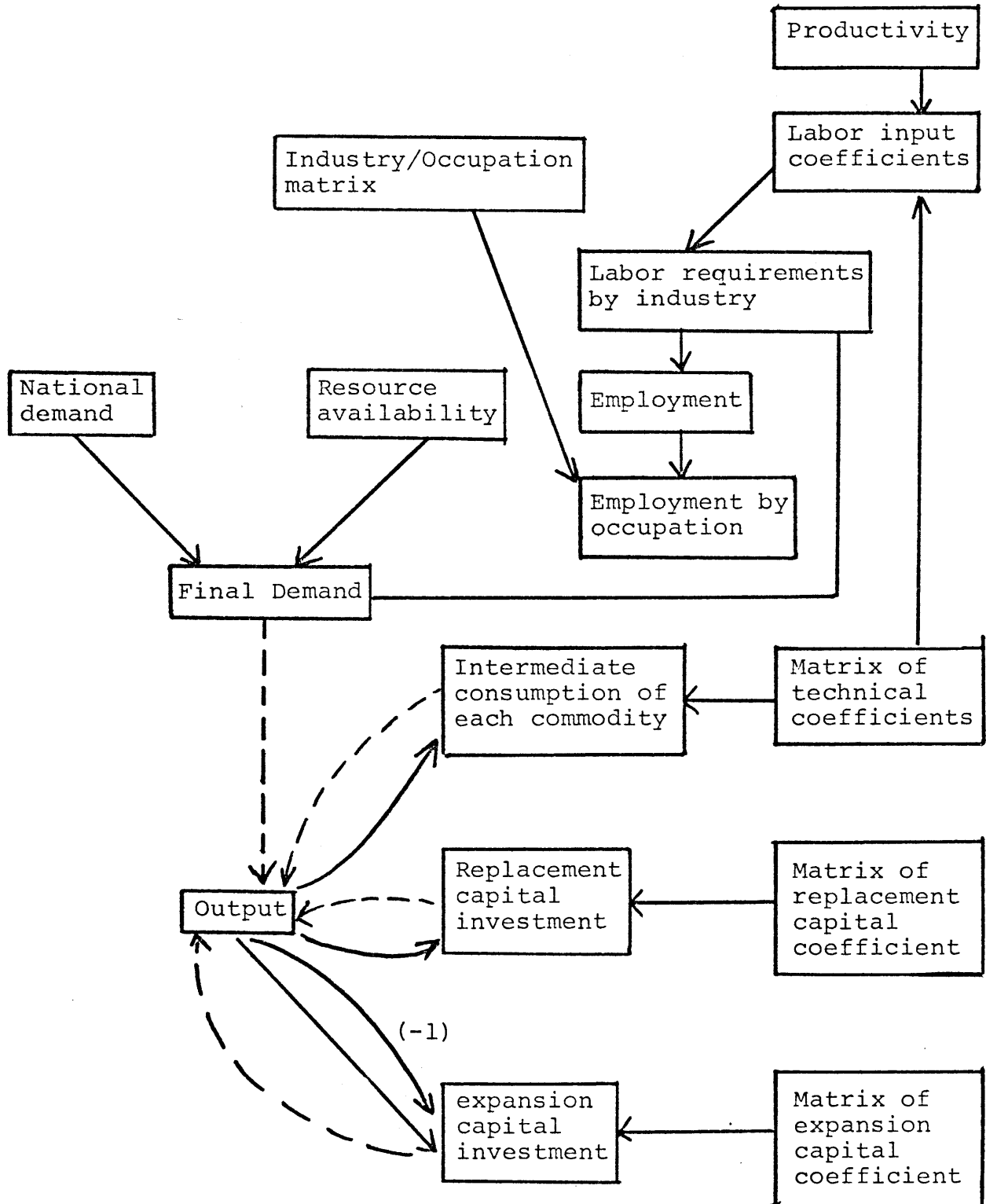
$$X_t = (I - A_t - D_t + B_t)^{-1} (Y_t + B_{t+1} X_{t+1}) \quad (3.3.3.11)$$

Final demand in the model is derived from (1) projections of national final demand, and (2) considerations of resource availabilities for the final year and interpolated linearly for intermediate years. Current output is a function of technology, final demand, output of both the current and the previous periods. Current productivity of the various industries, in turn, determines labor requirements.

Since the region under study (West Virginia) is assumed to have a constant share of all markets, exports are not well

FIGURE 3.1a.

Miernyk's Regional Dynamic Input-Output Study<sup>a</sup>



<sup>A</sup>From A. Bloch (1971).

explained. Projected employment and population are not fed back to consumer expenditures and final demand; the internal dynamic element is the feedback loop of capital expansion. Increased output requires net capital investment, which, in turn, increases output. As such, the driving force of the model is the changes in final demand, technology, and productivity.

Bell's "Econometric Forecasting Model for a Region"<sup>1</sup> is a formalized, theoretical, regional macroeconomic model intended to be linked to national forecasting models. This model explicitly relates national forecasts of GNP to regional economic growth. In contrast to Miernyk's inter-industry analysis, Bell attempts to examine simultaneously regional investment functions, technological change, migration, wage behavior, and unemployment. The model is a dynamic extension of the export base theory of regional growth discussed in Section 3.2.2.

Regional export income is a direct function of the national GNP which represents markets and actions outside the local region. In the model, this represented by:

$$X_t = a + bGNP_t \quad (3.3.3.12)$$

Local service income is generated by export sales and other sources of foreign income where the marginal propensity to import is assumed to be less than unity. Local service

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<sup>1</sup>Bell, F. W., (1967).

income and total received income (e.g. income generated by export earnings and foreign sources) are related by:

$$S_t = c + d(V_1)_t \quad (3.3.3.13)$$

The regional investment function is:

$$K_t/K_{t-1} = f^g (V_1)_t^{gm} (1+gp)^{-t} K_{t-1}^{-g} \quad 0 < g \leq 1 \quad (3.3.3.14)$$

where  $g$  is the percentage gap between desired ( $K_t^*$ ) capital stock in year  $t$  and the actual stock ( $K_{t-1}$ ) at the end of the previous year.

A Cobb-Douglas production (of the Constant elasticity of substitution type) is specified:

$$(V_2)_t = A(1+r)^t K^h L^{1-h} \quad (3.3.3.15)$$

where  $r$  is the rate of natural technological changes and  $h$  and  $1-h$  are the capital and labor production elasticities respectively.

Labor supply changes are primarily dependent on the natural regional population increases:

$$(P_e)_t = (P_o)_{t-1} + (B-D)(P_o)_{t-1} \quad (3.3.3.16)$$

where  $B$  is births and  $D$ , deaths. The actual supply of labor is the sum of the expected labor supply and migrations:

$$(N_o)_t = (N_e)_t + kM_t \quad (3.3.3.17)$$

In other words, migration in this model acts as a regulatory mechanism to allow regions to adjust to shifts or differential growth rates in export demand.

Migration is based on the current year's divergence

between the expected labor supply and the demand for labor:

$$M_t = S - M(N_e - L)_{t-1} \quad (3.3.3.18)$$

Real wage is considered a function of time and increases secularly on the basis of technological change and capital-labor substitution:

$$W_t = B(1+W)^t \quad (3.3.3.19)$$

As stated earlier, total received income is the sum of local service income plus export income:

$$(V_1)_t = S_t + X_t \quad (3.3.3.20)$$

The difference between the actual labor force and the demand for labor determines unemployment:

$$U_t = (N_o)_t - L_t \quad (3.3.3.21)$$

Total regional capital stock is the sum of manufacturing and non-manufacturing capital stock:

$$K_t = (K_m)_t + (K_{nm})_t \quad (3.3.3.22)$$

Demand for labor may be solved to obtain:

$$L_t = \left[ \frac{A(1-h)(1+r)^t K_t^h}{W_t} \right]^{1/n} \quad (3.3.3.23)$$

Received regional income solved in terms of GNP:

$$(V_1)_t = \frac{c+a}{1-d} + \frac{b}{1-d} \text{GNP}_t \quad (3.3.3.24)$$

and the combined investment function for both local and export sectors may likewise be expressed in terms of GNP:

$$\frac{K_t}{K_{t-1}} = f^g \left[ \frac{c+a}{1-d} + \frac{b}{1-d} \text{GNP}_t \right]^{gm} (1+gp)^{-t} K_{t-1}^{-g} \quad (3.3.3.25)$$

TABLE 3.2

Notations of Bell's Econometric Forecasting Model for a Region

Exogenous and Predetermined Variables

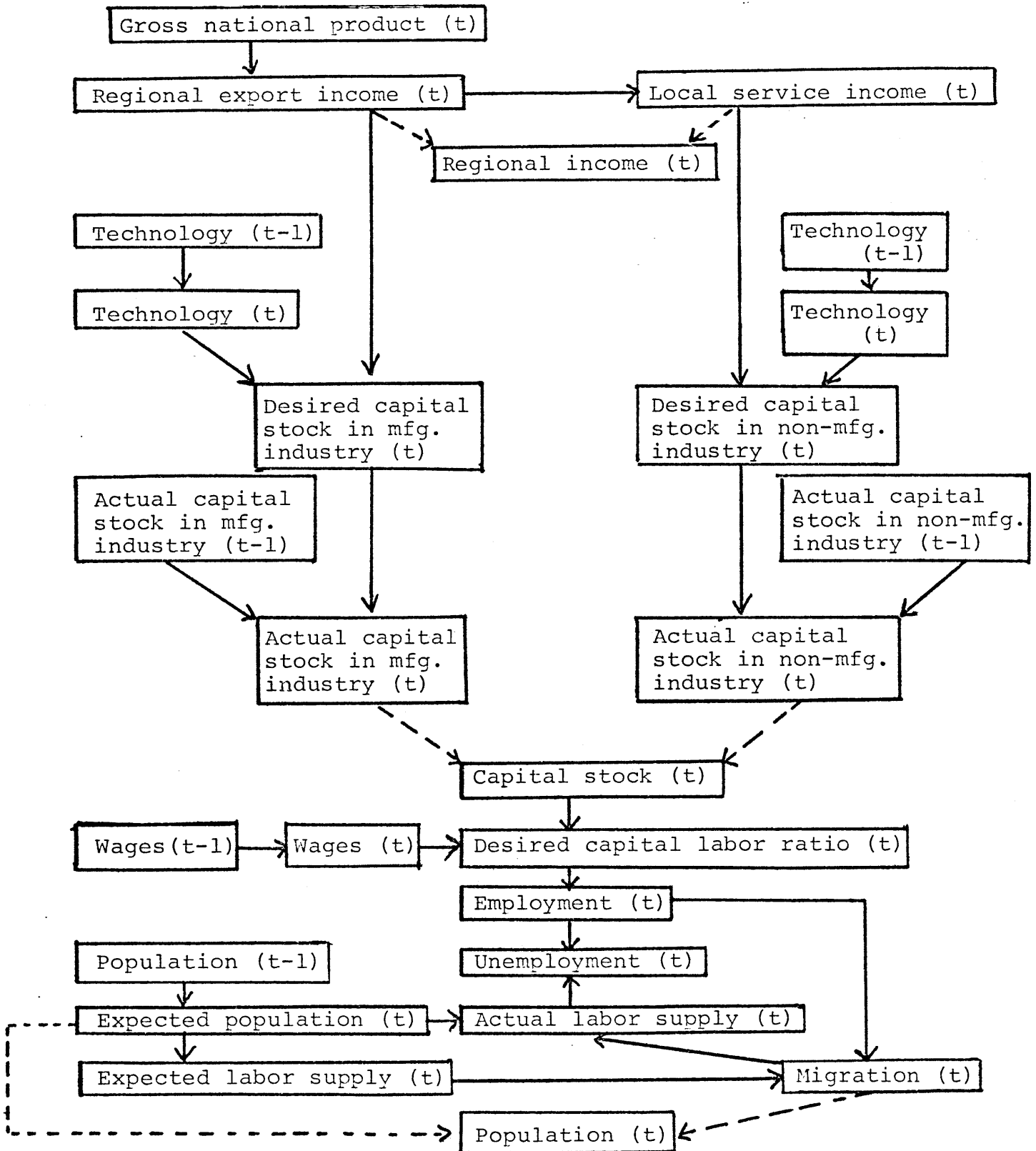
GNP	gross national product
$(B-D)_t$	birth rate (per 1,000) minus the death rate (per 1,000)
$(N_e - L)_{t-1}$	prospective unemployment (difference between national increase in labor force and labor demand)
$(K_m)_{t-1}$	capital stock in manufacturing
$(K_{nm})_{t-1}$	capital stock in non-manufacturing
t	time

Exogenous Variables

$X_t$	export income
$S_t$	local service income
$(V_1)_t$	total received income
$(V_2)_t$	total produced income
$K_t$	total capital stock
$(K_m)_t$	manufacturing capital stock
$(K_{nm})_t$	non-manufacturing capital stock
$(I_m)_t$	investment in manufacturing sector
$(I_{nm})_t$	investment in non-manufacturing sector
$L_t$	employment
$(N_o)_t$	labor supply (actual)
$(N_e)_t$	expected labor supply (national increase)
$(P_o)_t$	actual population
$(P_e)_t$	expected population (national increase)
$W_t$	annual wage per employee
$M_t$	migration
$U_t$	unemployment

FIGURE 3.2

Bell's Regional Econometric Forecasting Model.-Flowchart 1<sup>a</sup>

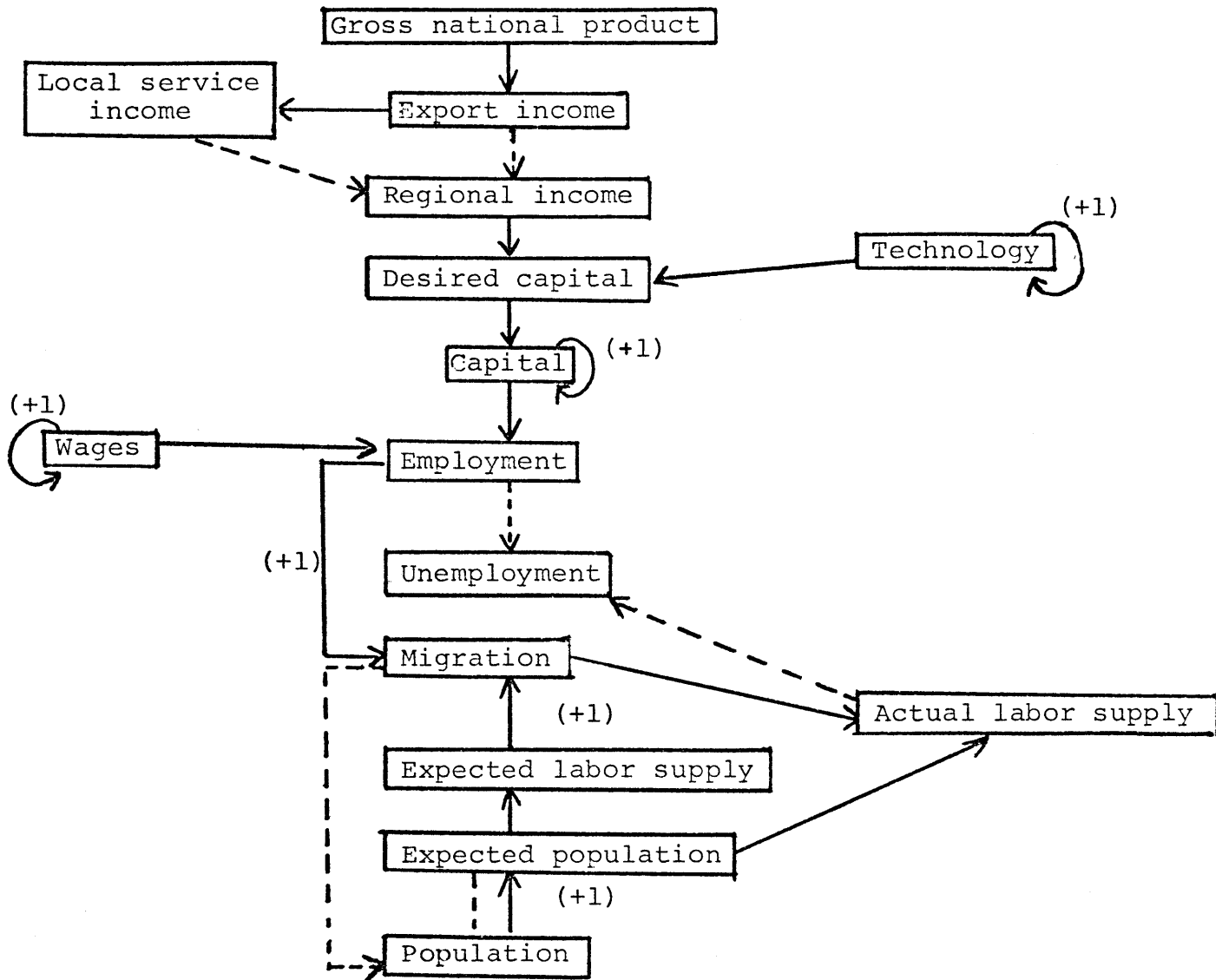


<sup>a</sup> A. Bloch, (1971).



FIGURE 3. 3

Bell's Regional Econometric Forecasting Model.-Flowchart 2<sup>a</sup>



<sup>a</sup>A. Bloch, (1971).

In this model, export and other income received from foreign sources generate demand for local services which creates a multiplier effect; thus, local service income is a linear function of total regional income and, therefore, a linear function of export income; as such, regional income in the model is driven by demand which simultaneously determines labor and capital requirements through the investment and labor supply-migration submodels.

Despite the feedbacks of the investment and labor supply-migration conditions, only exogenous GNP growth, technology, the average wage rate, and national population increase determine regional income.

#### 3.3.4 Equilibrium-Disequilibrium Models: Olsen's Model of Regional Income Differences and Williamson's Equilibrium Disequilibrium Model.

Olsen's model (1967) is a theoretical model of regional income differences in per capita income which attempts to integrate the general equilibrium theories of the Heckscher-Ohlin school with the theories of the Social Physics school within the framework of Myrdal's (1957) principle of circular and cumulative causation. While the Heckscher-Ohlin and Social Physics school hold that regional income differences will tend to disappear over time as a result of equilibrating forces outweighing disequilibrating forces, Myrdal maintains that,

through the principle of circular and cumulative causation, regional income differences will instead tend to widen over time because disequilibrating forces will, in fact, outweigh equilibrating forces.

Regional income differences are seen as the net result of a complicated interaction between equilibrating and disequilibrating forces. Regional income is regarded as a function of capacity and labor stocks in the region, and of a regional efficiency parameter. For each time period, returns to capital and labor (the two factors in this model) are assumed equal to their respective marginal productivities. The model is structured on equations expressing equilibrium forces, capital stock growth rate, labor force growth rate, and an efficiency parameter which varies with urbanization, educational levels, and income potential linked through an interlocking positive feedback loop.

Equilibrating forces in the model tend to equalize the returns of the factors of production while disequilibrating forces manifest themselves in the speed of response to inter-regional differences in the rates of return to these factors. The aggregate production function is of the CES group which, in this particular model, has the property that if a factor becomes relatively more abundant, its marginal product declines; this property in situations where we allow for interregional factor movement, together with the production functions, are

the most important equilibrating forces in Olsen's model. The aggregate production function is given as:

$$Y_i^t = \gamma_i^t [\delta_i^t (K_i^t)^{-\beta_i^t} + (1-\delta_i^t) (L_i^t)^{-\beta_i^t}]^{-1/\beta_i^t} \quad (3.3.4.1)$$

where:

$Y_i^t$  = flow of regional income from time  $t$  to time  $t+1$  in region  $i$  ( $i = 1, 2, \dots, n$ )

$K_i^t$  = stock of capital at time  $t$  in region  $i$

$L_i^t$  = labor stock at time  $t$  in region  $i$

$\gamma_i^t$  = efficiency parameter from  $t$  to time  $t+1$  in the aggregate CES production function of region  $i$

$\delta_i^t$  = distribution parameter from time  $t$  to time  $t+1$  in the aggregate CES production function of region  $i$

$\beta_i^t$  = substitution parameter from  $t$  to time  $t+1$  in the aggregate CES production function of region  $i$

The capital stock of the  $i$ th region at time  $t+1$  is considered a function of: (1) the region's capital stock at time  $t$ ; (2) the net savings; (3) capital movements. In other words, capital stock in a given region depends on the following: (1) the regional index of the rate of return to capital, (2) the regional index of income per capita in which it is assumed that the savings rate varies directly with per capita income, (3) the relative level of interaction between the given region and the rest of the system measured in terms of potential ratios. Capital stock at time  $t+1$  is given, therefore, by:

$$K_i^{t+1} = K_i^t e^{\Gamma} \left( \frac{Y_i^t}{Y^t} \right)^{\xi} \left( \frac{r_i^t}{r} \right)^{\mu} \left( \frac{iV^t}{V^t} \right)^{\nu} \quad (3.3.4.2)$$

where:

$$Y_i^t = \frac{Y_i^t}{P_i^t}$$

$$P_i^t = aL_i^t$$

$$Y^t = \frac{\sum_{i=1}^n Y_i^t}{\sum_{i=1}^n P_i^t}$$

$$r^t = \frac{\sum_{i=1}^n r_i^t k_i^t}{\sum_{i=1}^n k_i^t}$$

$$iV^t = \sum_{j=1}^n \frac{Y_j^t P_j^t}{d_{ij}} = \sum_{j=1}^n \frac{Y_j^t}{d_{ij}}$$

$$V^t = \frac{\sum_{i=1}^n iV^t}{n}$$

$Y_i^t$  = flow of regional income from time  $t$  to time  $t+1$  in region  $i$  per inhabitant at time  $t$  in region  $i$  ( $i = 1, 2, \dots, n$ );

$Y^t$  = flow of national income from time  $t$  to time  $t+1$  per inhabitant at time  $t$  in the nation;

$P_i^t$  = stock of inhabitants (population) at time  $t$  in region  $i$ ;

$r_i^t$  = flow of return on capital from time  $t$  to time  $t+1$  in the nation per unit of capital employed at time  $t$  in region  $i$ ;

$r^t$  = flow of return on capital from time  $t$ ;

$_i V^t$  = gross economic population potential at time  $t$  in region  $i$ ;

$V^t$  = average of the nation's  $n$  regional gross economic population potentials at time  $t$ ;

$d_{ij}$  = distance between region  $i$  and region  $j$  ( $i=1,2,\dots,n$ ;  $j=1,2,\dots,n$ );

$e$  = base of natural log.

( $\Gamma > 0$ ,  $\xi > 0$ ,  $\mu > 0$ ,  $\nu > 0$ , constants)

( $a > 1$ , constant)

Labor force at time  $t+1$  in the  $i$ th region is a function of: (1) labor force at time  $t$ ; (2) the natural increase in the labor force, and (3) the migration of labor. The characteristic is considered dependent on the wage rate index, the income potential index in which the influence of migration is manifested, and the regional income per capita index. Labor force at time  $t+1$  is thus given by:

$$L_i^{t+1} = L_i^t e^{\theta} \left( \frac{Y_i^t}{Y_i^t} \right)^z \left( \frac{W_i^t}{W^t} \right)^{\lambda} \left( \frac{{}_i V^t}{V^t} \right)^{\eta} \quad (3.3.4.3)$$

where:

$W_i^t$  = flow of wage payments from time  $t$  to time  $t+1$  in region  $i$  per worker at time  $t$  in region  $i$  ( $i = 1,2,\dots,n$ )

$W^t$  = flow of wage payments from time  $t$  to time  $t+1$  in the nation per worker at time  $t$  in the nation

( $\theta > 0$ ,  $z > 0$ ,  $\lambda > 0$ ,  $\eta > 0$ , constants)

Disequilibrating forces are derived, on the capital stock side, from the assumption that the savings ratio varies directly with per capita income because it may increase relative abundance of capital in the richer regions. When this happens, wages will grow relatively faster in the richer regions and thus tend to widen regional income differences. On the labor side, disequilibrium may be obtained as a consequence of labor becoming relatively more abundant and wages relatively lower in the poorer regions, and from the assumption that birth rate varies inversely with per capita income.

The principle of circular and cumulative causation is expressed in the following equation:

$$\gamma_i^{t+1} = \gamma_i^t e^{\Lambda} \left( \frac{E_i^t}{E^t} \right)^{\psi} \left( \frac{U_i^t}{U^t} \right)^{\pi} \left( \frac{V_i^t}{V^t} \right)^{\tau} \quad (3.3.4.4)$$

where:

$E_i^t$  = average number of years of school completed by the labor force at time  $t$  in regio-  $i$  ( $i = 1, 2, \dots, n$ )

$E^t$  = average number of years of school completed by the labor force at time  $t$  in the nation

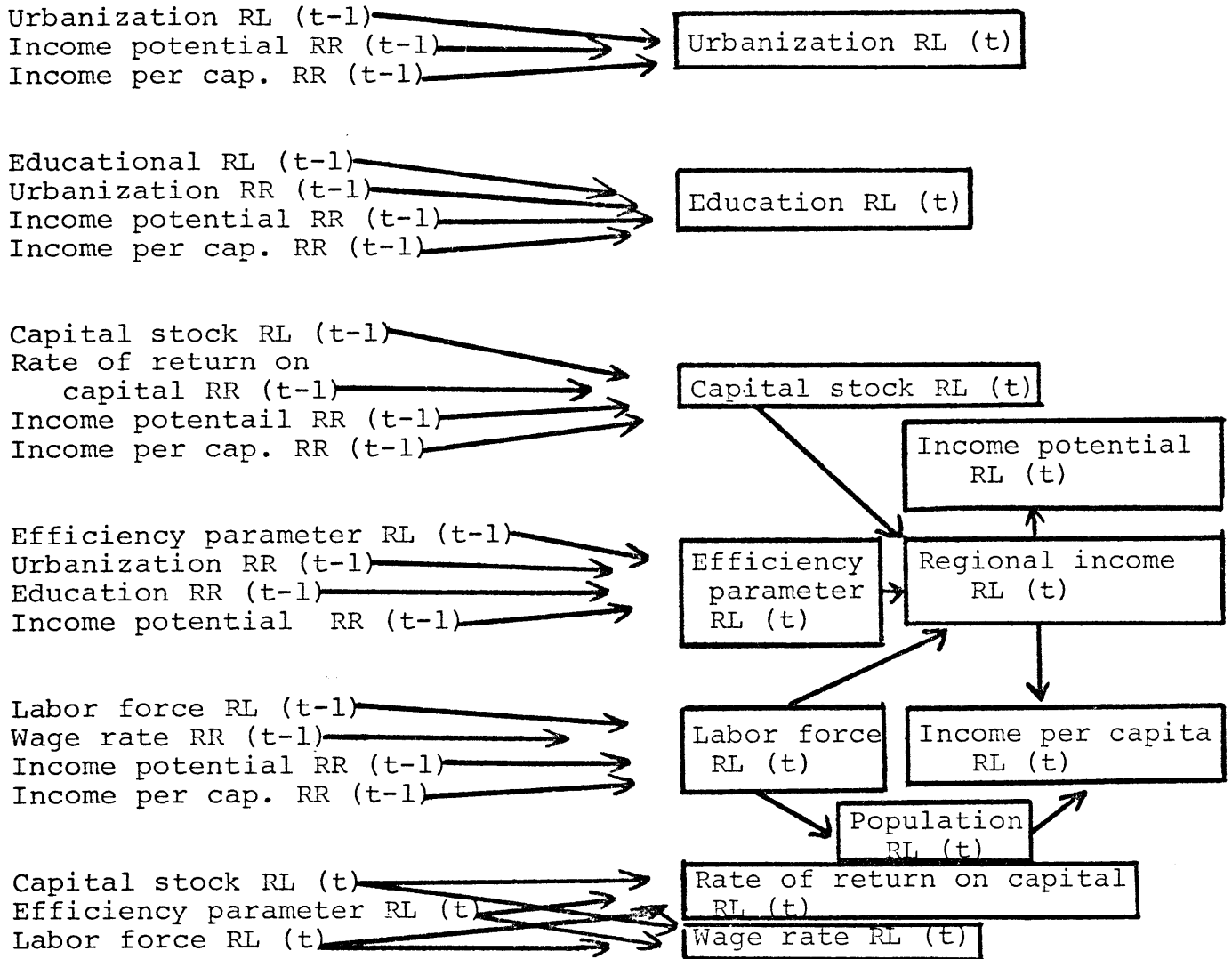
$U_i^t$  = percentage of population at time  $t$  in region  $i$  living in urban communities with more than a given number of inhabitants

$U^t$  = percentage of population at time  $t$  in the nation living in urban communities with more than a given number of inhabitants

( $\Lambda > 0$ ,  $\psi > 0$ ,  $\pi > 0$ ,  $\tau > 0$ , constants)

FIGURE 3.4

Olsen's Model - Flowchart 1

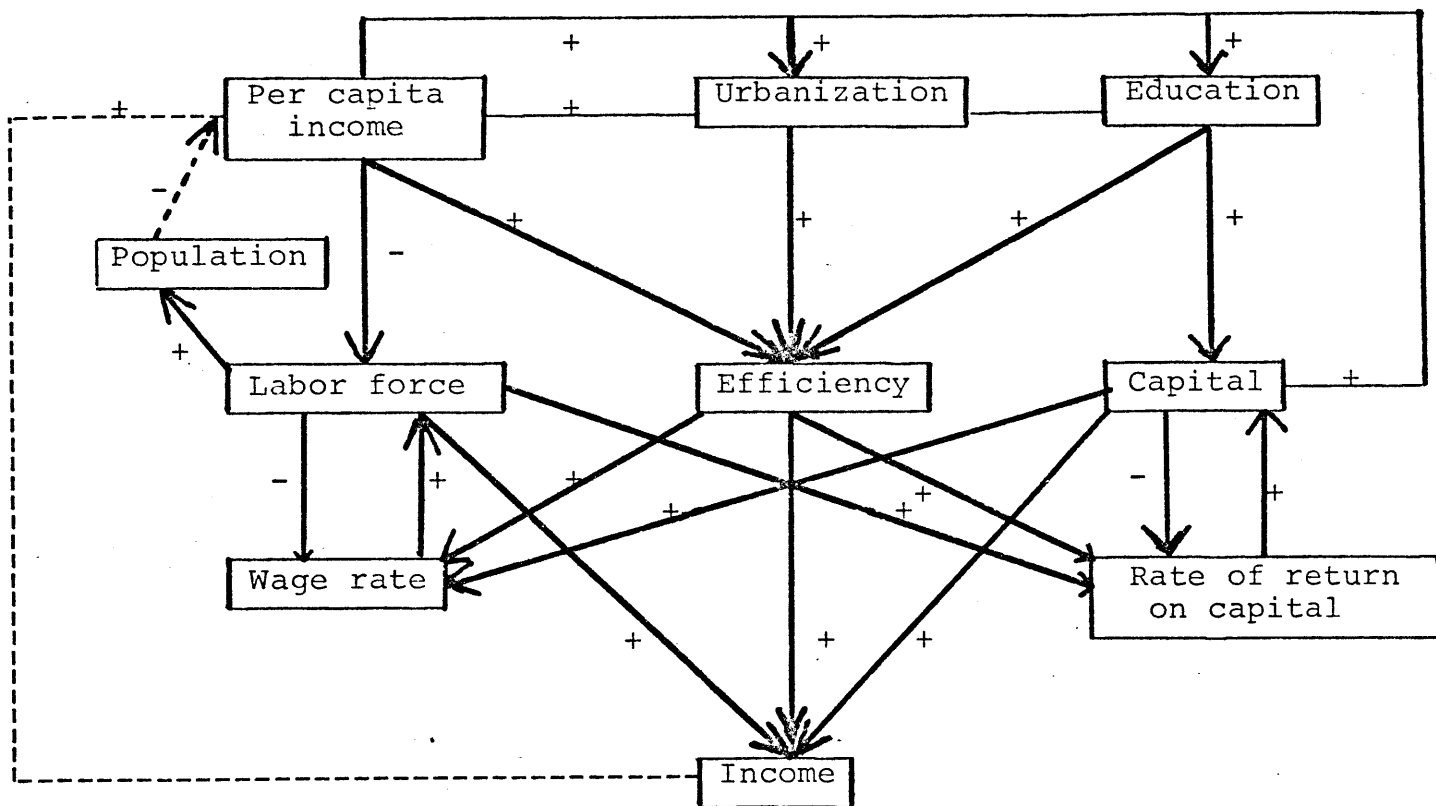


RL = 'regional level'

RR = 'regional ratio', i.e. ratio of a regional level to the corresponding national average.



FIGURE 3.5  
Olsen's Model.- Flowchart 2



Thus, the efficiency parameter which affects disequilibrating forces is a function of (1) the regional efficiency parameter from time  $t$  to time  $t+1$ ; (2) the national overall increase in productivity; and (3) the different factors of importance for the inventive activity and the diffusion of innovations.

In the discussion that follows, the model described is taken in its entirety from Williamson; our purpose here is to underline the assumptions, parameters, and equations that could be used in the construction of a similar simulation model of the Chinese economy. Furthermore, and perhaps more importantly, we want to point out the changes that have to be incorporated to account for the structural economic differences between the American and Chinese economic systems.

The production function is continuous, twice differentiable and single-valued. Production is assumed to have constant returns to scale and diminishing marginal rates of substitution. A Cobb-Douglas specification is adapted for both regions, and exogenous rates of total factor productivity growth are allowed to diverge between sectors and regions. This shall be our basis for examining differential rates of technological progress by sector on development. This, however, implies two weaknesses: (1) there are no biases in the form of technical progress, and (2) no factor intensity reversal is possible. Let us examine these assumptions in more detail.

The model is capable of replicating the high Chinese rate of agriculture mechanization, a particularly important fact which holds significant implication for both migration and the locational distribution of economic activities. It, nevertheless, specifies that agricultural mechanization can never be more rapid than in the industrial sector in the long run. If the substitution elasticities are identical or close to identical in both agriculture and industry, and if one is initially more capital intensive than the other, then capital intensity ordering cannot be reversed over time as the wage-rental ratio rises. In the Williamson model, the elasticity of substitution is assumed unity in all sectors, and this means that agriculture can not mechanize more rapidly than the industrial sector. Thus, in the construction of our model, it is important to investigate the possibilities of some factor intensity reversals.

Given a constant returns to scale and common efficiency levels, the industrial sectors co-exist in the two regions by virtue of the protective effects of interregional transport cost. Our machinery for determining differential growth rates between the two regions will be commodity price differentials between regions. Per unit transport costs for interregional movement of goods and factors are treated like exogenous tariff rates. Percentage differential in regional prices is attributed to these transport costs. Declining transport rates have impacts

on regional specialization, trade, migration, and per capita income growth which we will want to evaluate.

Since we are concerned with long term growth, we can ignore cycles in factor utilization rates and assume full employment. Assume further that marginal product pricing rules are met in all regions and sectors. Factor prices need not be equalized between regions nor between sectors, such that both interregional and intraregional disequilibria are possible. Thus, wage and gross rental rates in the West may exceed those in the East.

Interest payments and depreciation requirements per unit of capital investment exhaust real gross returns to physical assets at the margin. Investors receive interest on the value of their investment minus a transaction cost.

Williamson's model attaches importance to the fact that, in the early phases of regional growth in the West, industrial development was largely financed by Easterners and thus Western assets were claimed by Eastern interests. In the centrally planned economy of China, all investment decisions are made by the state and, thus, this issue is minor in our case. While Williamson specifies that Western regional income will always be less than its regional product because of factor income payments to the East, in our case, we do not have to account for this condition; it may accelerate growth in the West.

Transportation costs are introduced exogenously and fully exhaust regional commodity price differentials, yet revenue from transport activities must generate factor payments in the two regions.

We now go to migration rules for our model. This is one area where we encounter considerable difficulties. First, population movement in China is rigidly control by the state; therefore, market resolution or determination of migration via wage differentials is inapplicable here. Second, even if we were to incorporate some semblance of migration induced by wage differentials, we would still be limited by an appropriate determination of wage differential between sectors and between regions. In the highly politicized society of China, wages are controlled by state agencies and jobs are assigned by a central bureau. While this has characterized Chinese population movement from 1940 to the present, recent articles in the Chinese magazine, *China Reconstruct*, have indicated a gradual departure from forced population movement towards a more lenient policy of wage incentives.

Despite the assumptions of traditional neo-classical general equilibrium models, regional factor price differentials do not necessarily result in instantaneous factor reallocation. Indeed, we are interested in whether growth under factor market disequilibrium is a concept that reflects Chinese regional development. Disequilibrating forces associated with industria-

lization, land augmentation in Western expansion, and cost of living differentials may be too powerful to allow a tendency towards equalization to assert itself. More importantly, how do real wages influence migration behavior? In our migration specification, we assume that regional cost of living differentials are produced when the expenditure bundle is significantly weighted by the presence of non-traded services, or by bulk commodities with high transport costs. As such, the real regional wage rates deflated by a cost of living index will be the real income variables relevant for migration decisions. Therefore, migration is determined solely by the expected East-West real wage differential.

In Williamson's model, the regional investment allocation decision is based on partial adjustment during a unit of time and on the formation of interest rate expectations based on the immediate past. This allows the possibility of high variance in regional interest rates and disequilibrium in the national capital market. The expected East-West interest rate differential determines interregional transfer subject to a fixed per unit cost of search or information incurred with an intersectoral transfer of claims.

Lastly, the model can now be closed by adding some remaining dynamic equations. Labor force growth is determined by the rates indigenous to each region. The regional rates are exogenous but are assumed to be constant. They will be

estimated from Chinese data. The observed rate of regional labor migration functions and by the exogenously determined natural rates of growth.

The last remaining characterization of the Chinese economy concerns the capital accumulation and aggregate savings rate. Differential savings rate according to the functional source of income is common in growth literature; in our model, the savings rate is assumed equal across sectors and regions,

## CHAPTER FOUR: ELEMENTS OF A SOCIALIST ECONOMIC FRAMEWORK

In the last chapter, we reviewed at length what this writer felt were the better models of regional economic growth developed in the West. We did so in a research effort aimed at understanding, explaining, and simulating regional development in China because progress in this research area in the Socialist-bloc countries lags behind the West. Our purpose is to forego ideological justifications for extending Western concepts to the Marxist domain and to instead concentrate on the technical qualifications of adapting useful theories and techniques regardless of their philosophical premises to benefit development efforts in the developing countries, in our case, China.

If our purpose in the last chapter had been to derive elements and principles from Western economic theory, then this chapter is designed to take the logical next step of establishing the economic framework, i.e., the Chinese economic system, in which our projected final output, a regional economic planning model for China, will have to be housed.

This chapter has a dual purpose: firstly, to describe the principle and philosophical basis of Socialist economic organization and planning that have influenced Chinese economic development; and secondly, to use this information as a possible measure of the usefulness and consistency of the models described in Chapter Three within the Chinese context.



#### 4.1 The Marxist Model of Economic Growth

Our first task, therefore, would be to determine what the Western economist should carry with him in his professional luggage when he crosses over to the Socialist frontier.

The marginal analysis employed in the various models covered in Chapter Three would be of less than marginal use; equilibrium analysis, likewise, must be reformulated to approximate the Socialist empirically developed system of "material balances," a concept described in later sections. Individual economic behavior, or micro-economics, is anathema and only macro-economics is permitted. Questions, such as imperfect or monopolistic competition, full employment and the trade cycle, the multiplier and acceleration principle, that refer to the market economy, are ignored. Indeed, Socialist economists preoccupied with practical problems have led to a scarcity of analytical work, and the Socialist model of development still awaits its General Theory.

What the Western economist must bring with him is a familiarity with the Marxist model of economic growth which has guided Socialist thinking and rethinking in growth strategies. Marx's model, which he termed the Tableau Economique, is a schema of "expanded reproduction" that combines a complete process of reproduction. The model implies a critique of the Smith-Ricardian

treatment of profit, but seems to have originally been conceived as a refutation of the Malthusian thesis of linear growth of resources in a world of exponentially expanding population.

Marx divides the physical output of an economy into two departments (sectors), producer goods ( $i_g$ ) and consumer goods ( $c_g$ ), produced respectively by sector I and sector II. Output is equated to depreciation plus raw materials used ( $c$ ), wage bill ( $v$ ), and surplus value ( $m$ ). Under this schema, output is equal to:

$$\begin{aligned} c_1 + v_1 + m_1 &= i_g \\ c_2 + v_2 + m_2 &= c_g \\ \hline c + v + m &= i_g + c_g \end{aligned} \quad (4.1.1)$$

Where repetitive stationary conditions prevail, output of sector I must match the capital consumption and raw materials used by both sectors ( $c_1 + c_2$ ), while sector II's output must equal the grand total of wages and of all surpluses. Consequently, the necessary and sufficient condition for simple reproduction is that the demand for investment goods of sector II must equal the demand of consumer goods of sector I:

$$\begin{aligned} c_1 + c_2 &= c_1 + v_1 + m_1 \\ \text{or} \\ c_2 &= v_1 + m_1 \end{aligned} \quad (4.1.2)$$

To realize growth, sector I's output must be larger than replacements ( $\Delta c > c_1 + c_2$ ).

In the second (expanded) cycle of production, total demand for producer goods ( $c'$ ) must equal sector I's output in the first (preceding) cycle:

$$\Delta c = c_1 + v_1 + m_1 - (c_1 + c_2)$$

or

$$\Delta c = v_1 + m_1 - c_2 \quad (4.1.3)$$

Another condition for growth stipulates that the surplus ( $m$ ) must be allocated three ways:  $m_c$  set aside for purchase of additional capital goods and raw material ( $\Delta c$ );  $m_v$  distributed for wages ( $\Delta v$ ) of additional workers needed for expanded production;  $m$  spent on consumption of the non-productive sphere. Demand for consumer goods in the second cycle (wages  $v'$  and consumption outlays of the non-productive sphere  $m_r$ ) must equal the output of consumer goods produced in the first cycle:

$$v'_1 + v'_2 + m_{r1} + m_{r2} = c_2 + v_2 + m_2 = c_g$$

or

$$c_g = c_2 + v_2 + \Delta c_2 + \Delta v_2 \quad (4.1.4)$$

Thus, the basic Marxist equation for balanced growth in the two sectors becomes:

$$c'_2 = v'_1 + m_{r1} \quad (4.1.5)$$

The weaknesses of the model have been widely noted by Soviet writers on the subject, but one technical flaw presents a

significant impediment to our research effort: and that is the absence of a motive force for the growth of the system. Growth rate is uniquely determined by the legacy of the past and the rate of capital formation; history plus accumulation, thus, propel an exponential growth which Marx's celebrated numerical example was 9.53 percent per annum. While Marx may have exorcised the Malthusian evils, his equilibrium of expanded production pivots on his "Law of Value" which links up the two departments (i.e., sectors) of produces and consumer goods and secures an equalized growth throughout the system but, more importantly, brings into focus the significance for society's class organization.

Lenin includes into this framework, the impact of technological change. Marx regards growing capital intensity as a reflection of labor-displacement trend promoted by social economic forces or the relations of productions. If competition equalizes throughout the system, and, in a secular trend, profit is lowered, i.e., ratio of  $m$  (unpaid-for labor to total capital engaged), or  $m/(c + v)$ . In other words, this schema describes the rate of profit as a function of increasing exploitation of labor. In a situation of circular causation, competition encourages more efficient techniques to increase the "organic composition of capital," or the rising ratio of constant to variable capital, i.e., increased value of plant and materials employed

relative to wages. Consequently, capital intensity is considered a rising function of investment while technological change has a labor-saving bias. In Lenin's words:

"Growth in the production of means of production as means of production is the most rapid; then comes the production of means of production of means of consumption; and the slowest is the rate of growth in the production of means of consumption."<sup>1</sup>

To restate the Marxist model of growth with Lenin's modifications: the model is guided by two sectoral pairs of parameters, organic composition and the sectoral rates of accumulation. A. Zauberman (1967) describes a model pursued by two Soviet econometricians, Plyukhin and Mazarova, along these lines.<sup>2</sup> Consider the growth of two departments, 1 and 2, and assume some parameters as constant, which are, for the  $i$ th sector, three coefficients: (1) ratio of surplus product to variable capital in the  $i$ th sector  $Q_i = M_i / V_i$  fixed a priori; (2) incremental ratio of fixed capital to surplus-product,  $R_i = M_{ci} / M_i$  as determined by planner; (3) incremental ratio of fixed to variable capital,  $P_{mi} = M_{ci} / M_{vi}$  also fixed by planner.

In a situation where a sector can obtain products or inputs from other sectors without equivalent counter supply, the growth rate of variable capital ( $S_{vi} = R_i Q_i / P_{mi} T$ ) could

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<sup>1</sup>As quoted in A. Zauberman (1967), from Lenin, Collected Works, Moscow: 1960, Vol. I, p.87.

<sup>2</sup>Ibid., p.20.

differ between departments with the ratios constant because of their four elements being constants. These ratios are called the sectoral accelerators. Plyukhin-Mazarova demonstrate that, under certain conditions, the production growth rate  $S_i$  tends toward the value of the sectoral accelerator.

The model is then transformed to permit proportionate development, a concept which defines that, in a closed system, output of the two departments is partly a function of availabilities of producer and consumer goods produced in the preceding cycle (note the similarity to Marx's history plus accumulation motive force). The system's proportionality coefficients are defined as partial derivatives of the two departments' outputs in terms of the inputs of fixed and variable capital ( $\epsilon_{ik} = X_i(t) / d_{ik} X_k(t-T)$ ) where  $X_i$  is the output of the  $i$ th department,  $d_{ik}$  the fraction of output of department  $k$  supplied to the  $i$ th department in the following period. Fundamental equations for the system are:

$$X_1(t) = a_1(t) + \epsilon_{11} d_{11} X_1(t-T) + \epsilon_{12} d_{12} X_2(t-T) \quad (4.1.6)$$

$$X_2(t) = a_2(t) + \epsilon_{21} d_{21} X_1(t-T) + \epsilon_{22} d_{22} X_2(t-T) \quad (4.1.7)$$

It is shown that when this system of difference equations is approximated by one of linear differential equations whose solutions define the departments' output as a sum of exponentials:

$$X_1 = X_{10} + c_{11} / \lambda_1 (e^{\lambda_1 t} - I) + c_{12} / \lambda_2 (e^{\lambda_2 t} - I) \quad (4.1.8)$$

$$X_2 = X_{20} + c_{21} / \lambda_1 (e^{\lambda_1 t} - I) + c_{22} / \lambda_2 (e^{\lambda_2 t} - I) \quad (4.1.9)$$

the relative sectoral growth rates tend toward both convergence and stability (note the importance of this implication for regional disparities where regional growth could be disaggregated by sectors or industries!).

Without belaboring the discussion further, let us conclude this section by presenting O. Lange's (1961) formalized theory of reproduction and accumulation. His condition for the equilibrium growth of a system is given as:

$$P_1/P_2 = (a_{2c} - \alpha_{2c})(I - a_{1c} - \alpha_{1c}) \quad (4.1.10)$$

This means that the equilibrium output ratio of the two Marxian departments (P) depends on the sectoral parameters of capital formation ( $\alpha$ ) and the sectoral parameters of the efficiency of the capital (a).

The basic elements of Marxist analysis of economic growth presented above thus provide us with a starting point for constructing a regional economic growth planning model in China.

#### 4.2 The Chinese Formulation of Economic Equilibrium

Communist Chinese research in economics, and specifically in general equilibrium theory, is marked by a dearth of theoretical and quantitative formulations. Economic theory in China is practically non-existent as a science; what research there is focuses on two levels. Firstly, there is a preoccupation with the practical problems of controlling and planning the economy. Methods of achieving a "dynamic balance" in the economy, problems of data collection, institutional frameworks for decentralizing basic economic decisions, centralization of decision making on basic economic targets for the country, mechanisms for the efficient allocation of resources and an effective distribution system, etc., fall under this category. Secondly, there is a small but increasingly important body of research that is concerned with determining ideological justifications for any economic decision followed or proposed.

It is in the second category where this writer feels the economic fate of China will be decided, not only for the near future, but for the next generation of leaders. Two important factors would determine this trend: (1) the increasing complexities of the economy and the implications of a relatively abundant mature economy on the politically sensitive issues of the distribution of wealth, professional specialization, and the labor-saving bias of technological progress; and (2) the increasing



divergence between the Soviet Union's and China's economic system and priorities. Where previously China could rely on the lessons of the Soviet experience, they soon will have to derive guidance from their own economic research apparatus.

It is also in the second category where the problems of general equilibrium have been investigated. General equilibrium is defined to stem from the objective demands of the development of a socialist economy. Chinese economists are apt to quote Lenin:

" [The task of socialist revolution] is to convert the entire economic mechanism of the state into a set of mammoth machinery, an economic organism whereby hundreds of millions of people can work according to plan."<sup>1</sup>

From this dictum, Chinese economists infer an implication that general economic equilibrium in keeping with the demands of socialist economic laws and under party guidance, methods for balancing supply and demand should be adopted in accordance with the intrinsic links between the various phases of social reproduction (e.g. economic development) and the different sectors of the economic system.

Even of more significance to us is the assigned role of general equilibrium in planning. In national economic growth, equilibrium is posited to be always relative and temporary while disequilibrium is always absolute and regular. This dialectic has been pointed out by Mao:

"Objectively, there will always be a contradiction between social production and social demand, and consequently, the people must adjust it through state planning. In China, economic planning is made every year to arrange the proper proportion between accumulation and consumption as well as to obtain equilibrium between production and demand. The so-called equilibrium means the temporary and relative unity of the opposites. After one year, speaking of the process as a whole, the equilibrium will be upset again by struggles of contradiction; the unity will be broken into fragments. Thus, the equilibrium becomes disequilibrium, and the unity becomes transformed into disunity. This in turn calls for the restoration of equilibrium and unity for the second year. Such is the superiority of our planned economy. In fact, this kind of equilibrium and unity is being partially destroyed each month and each quarter, thus, making it necessary to effect partial adjustments."<sup>1</sup>

In other words, it is insufficient merely to plan for an equilibrium, but we must instead realize the need for maintaining equilibrium regularly.

Aside from its philosophical premise, general equilibrium in China concerns the rate and proportion of national economic growth. Of particular importance is the intimate relationship between growth rates and the maintenance of the correct ratios of growth among various sectors of the economy (and among various growth rates of regions!). In macro terms, this interrelationship is manifested in the rates of growth; in micro terms, it is reflected in the proper ratios of growth among the sectors. That is, general equilibrium means that sectors should grow in the right proportions.

Conversely, in their determining of a proper ratio among various sectors of the economy, their relation must be such that they maximize their rates of growth. These relation-

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<sup>1</sup>Mao Tse-tung. (1957). p. 12

ships are broken down into seven working categories:

- (1) The correct ratios of growth between the two great categories of the production of means of production and the means of consumption.
- (2) The proper relationship between industry and agriculture.
- (3) The proper relationship within the industrial sectors and within the agricultural sector. For instance, in the industrial sector, correct ratios of growth must be maintained between heavy industry and light industry, between the extracting industry and the processing industry, between the industry which serves **the industrial sector itself** and the industry which serves other sectors. In the agricultural sector, proper relations must be maintained among agriculture, forestry, animal husbandry, subsidiary industry, and fishery, etc..
- (4) The correct ratios of growth between production and capital construction.
- (5) The proper distribution of national income among the state sector, collective sector, and individuals; for instance, the ratios between the income of state enterprises and wages, between the accumulations that go to the people's commune and its members, etc..
- (6) The relationship between the supply of consumer goods and the people's purchasing power.
- (7) The ratios between accumulation and consumption.

Given then the Chinese concept of economic equilibrium, the most important implication for our study of regional growth is the dialectic process. Disparities in regional growth rates or income levels are not necessarily as serious a "problem" when viewed in terms of the relative unity of opposites. In the short run, for example, divergence in regional growth rates may not only be not "bad," but actively encouraged if the cumulative and additive result in the long term is a convergence. This,

then, in contrast to Western theories on the topic, allows us a flexibility in planning. Realization of the dialectic process, e.g. bipolar development, suggests that planning should be geared towards a more dynamic process in which regional disparities should not be "planned out" but instead be guided along a path which would result in some form of regional equality that is greater than the preceding convergence in a continual process of parity-disparity, convergence-divergence.

### 4.3 Planning by Material Balance

The Chinese instrument for attaining a dynamic balance in the economy is the material balance. Although there is little information on how it is done, the Soviet model has presumably been used as a guide. Basically, future requirements of raw materials and capital equipment are calculated on the basis of technical coefficients. This demand is then compared with supplies available in the area for which balancing is being done, and decisions are made on imports and exports and the transfer of supplies within the country. This technique is called "balance transfer" (ch'a-e tiao-p'o).

Material balances are compiled for various commodities, both final and intermediate, by the various authorities at each bureaucratic level of the planning machinery. In each compilation is set, in quantity terms, all the proposed uses (both intermediate and final) of the commodity in the national economy against supplies from all sources, e.g: production, inventories, and imports. Such a schema can be represented in Table 4.1.

TABLE 4.1

## Schema of Material Balance

Product X	
Sources	Distribution
1. Production	1. Production needs <ul style="list-style-type: none"> <li>(a) Current inputs into other sectors</li> <li>(b) Capital repairs in other sectors</li> <li>(c) Other uses</li> <li>(d) Needs of the construction industry for investment</li> </ul>
2. Imports	2. Market allocation
3. Other sources	3. State reserves
4. Stocks with suppliers at beginning of plan period	4. Reserves of the Council of Ministers 5. Increases in stocks 6. Exports

In such a schema, which is copied here from the Soviet model, 1. (a) is computed by multiplying planned production targets for the other sectors by their input norms, or coefficients. Furthermore, balances of centrally allocated equipment and manpower are compiled.

This input-output relations on which balancing is premised are determined by progressive technological standards, derived

historically or calculated and projected for the plan period. A weakness of this process is that complete information as to the inputs required for postulated outputs is not provided. It also fails to provide for an "automatic" method for the computation of full inputs. However, such an inter-industry flow system may be harmonized, e.g. balanced, by a process of iterative approximation. If we let  $[A]$  be defined as the matrix of input norms, and

$$[I - A]^{-1} = [I + A + A^2 + A^3 + \dots + A^n] \quad n \rightarrow \infty$$

then the first attempt is to let:

$X_s$  = vector of originally planned supplies

$Y$  = vector of planned final outputs

$X_d$  = vector of calculated demand

with:

$$[A]X_s + Y = X_d \quad \text{where } X_d \geq X_s \quad (4.3.1)$$

Now if  $\Delta X$  is the unknown vector of changes in  $X_s$  necessary to obtain a consistent set of material balances, then

$$\begin{aligned} [I - A]\Delta X &= (X_d - X_s) \\ \Delta X &= [I - A]^{-1}(X_d - X_s) \end{aligned} \quad (4.3.2)$$

If we add  $\Delta X$  to  $X_s$  to get a new level of planned supplies, the plan will be balanced:

$$[A](X_s + \Delta X) + Y = (X_s + \Delta X) \quad (4.3.3)$$

To place the process of material balances into perspective, let us consider the chronological sequence in which it is

undertaken. In the typical planning process, a sequence of decisions are made accordingly:

- (1) A statistical analysis of the base period of the plan's time horizon is made.
- (2) Drawing up of control figures (preliminary notes of the economic plan) which represents a set of aggregate output targets. The objective here is to equate supply with demand through material balances.
- (3)
  - a. Order of materials (forms) is solicited; materials are calculated by the "direct method," or output targets multiplied by input norms or coefficients.
  - b. Tentative output targets are set.
  - c. Release of control figures, broken down by ministry and enterprises, determines their production targets.
  - d. Determination of the necessary amount of inputs to fulfill production targets.
  - e. Orders for inputs are sent out.
  - f. Bargain process of supplies and counter-supplies.
- (4)
  - a. The plan is brought down to the enterprise level and transformed into detailed operational form.
  - b. Delivery plan on order, e.g. funds.
  - c. Funds are received.
  - d. Determination of production and shipment schedules.



#### 4.4 Capital Formation and Investment Criteria

Again due to lack of firsthand information on capital formation and investment criteria in China, we resort to secondary sources: in this case, we look at some theoretical work on the subject by Russian writers as discussed in A. Zauberman (1967).

Much of recent Russian writings on the subject have the criterion propounded by S. G. Strumlin as their basic philosophy.<sup>1</sup> In Strumlin's one factor world, efficiency of investment is expressed in terms of the productivity of labor. Since Strumlin, however, the rate of actualization of investment has been regarded as one of the planner's two factors macro-production function relating dynamically use intensities to efficiencies of labor and capital stock employed and accompanied by assumptions in the trend of technological progress.

A. L. Lurie (1963) has explicitly related the normative rate of capital efficiency to capital-labor intensity. In his model, the rate of differentiated return on assets  $\delta_i$  is a partial derivative of a function describing the dependence of maximum volume of output on the availability of labor and capital:

$$\delta_i = \partial f_i(L_i, K_i) / \partial K_i \quad (4.5.1)$$

Novikov (1964) assumes a full employment equilibrium but puts total labor costs as dependent on capital invested per unit

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<sup>1</sup>S. G. Strumlin, "Faktor vremeni v proyektiroykekh kapitalnykh vlosheniy," in A. Zauberman, (1967), p.154.

of output ( $L = f(K)$ ), with the normative efficiency rate as:

$$P_t = - \frac{dC}{dK} = -[I - f'(K)] \quad (4.5.2)$$

where  $C$  is the total cost and capital cost  $K$  is expressed as  $L/K$ , factor intensity.

To translate this into the language of a conventional production function, take the expression of technical possibilities as a dynamic linear homogenous function of the Cobb-Douglas type. By differentiation, the equilibrium price of capital for period  $t$  expressed in terms of the economy's relative factor intensity and labor productivity ( $\alpha$ ), is a certain  $r = (I - \alpha)(L_t/K^t)^\alpha$ , where  $L$  stands for manpower and  $K$  for capital stock at time  $t$ .

In the search for a rate of actualization of capital outlay corresponding to an equilibrium in the two-factor markets, capital and labor, Fiszal (1961) and Siwinski (1963) formulate the problem in matrix terms. A sum of matrices of investment outlays and running costs discounted to the initial period of commissioning of capacities is represented as follows:

$$\begin{aligned} & I_{11} + (C_{11}^M + L_{11}W_1)\alpha, \quad I_{12} + (C_{12}^M + L_{12}W_1)\alpha, \dots, \quad I_{1R} + (C_{1R}^M + L_{1R}W_1)\alpha \\ & I_{21} + (C_{21}^M + L_{21}W_2)\alpha, \quad I_{22} + (C_{22}^M + L_{22}W_2)\alpha, \dots, \quad I_{2R} + (C_{2R}^M + L_{2R}W_2)\alpha \\ & \cdot \qquad \qquad \qquad \cdot \qquad \qquad \qquad \cdot \\ & \cdot \qquad \qquad \qquad \cdot \qquad \qquad \qquad \cdot \\ & \cdot \qquad \qquad \qquad \cdot \qquad \qquad \qquad \cdot \\ & I_{m1} + (C_{m1}^M + L_{m1}W_m)\alpha, \quad I_{mR} + (C_{mR}^M + L_{mR}W_m)\alpha, \dots, \quad I_{mR} + (C_{mR}^M + L_{mR}W_m)\alpha \end{aligned}$$

(4.5.3)

where  $I$  is the matrix of investment,  $C^M$  of current material cost,  $L$  of manpower employed, and  $W$  of average wages, in a total of  $m$  sectors under  $R$  variants of technology. The output target is described by the vector  $(p_1, p_2, \dots, p_n)$ . The actualization coefficient  $\alpha = [(I+r)-I][r(I+r^n)]$ , where  $r$  is the unknown rate of discount. The problem is to find  $r$  and thereby the  $\alpha$  for minimizing:

$$\sum_{n=1}^m [I_{nx} + (C_{nx}^M + L_{nx} W_n)] = \min \quad (4.5.4)$$

subject to an availability of factors constraint:  $\sum_{n=1}^m I_{nx}$

and  $\sum_{n=1}^m L_{nx}$ .

#### 4.5 A Projection Model for a Regional Economy

In this section, we shall review a long-term projection model of the Chinese national economy formulated by S. Ishikawa (1966). Our objective here is to adapt the framework of the model to a regional context.

Ishikawa's model is the first that this writer has come across that attempts to quantify the relationships of the Chinese economic system. The scarcity of models along this line is easily explained by the fact that with so little data available, modelling of the Chinese economy becomes ex ante a futile exercise. Indeed, the only useful approach is to construct in the abstract a structure, or framework, reflecting the Chinese economic system with its attendant relationships and parameters, and to await the availability of data. This, in fact, has been Ishikawa's purpose, and it is also ours in this research effort. With increasing exchange of information between the West and China, this approach in retrospect has not been unwise.

Although Ishikawa's model is not well suited to our purpose, it is very valuable approximation of the framework in which our own model will have to be framed. Furthermore, the model is the only explanatory tool of Chinese economic development in operational form.

The most serious drawback of the model is the number

of simplifying assumptions on which the model is based. It has also been limited by the lack of available data necessary with which to derive equations for the model by econometric methods.

The model is based on the following assumptions: input-output relation of each commodity (a material and technological relationships among various economic quantities) is aggregated for each production sector of the regional economy; the balance-relation of supply-demand among commodities is shown as the balance-relation among production sectors (also a material-technological relationship). Total demand for final goods (i.e., investment goods and consumer goods) depends on the wage rate, the farm income level, and the investment ratio.

The regional economy is differentiated between the organized and the unorganized sectors, as can be seen in Table 4.2. Labor is reflected in the sectorial relations. The foreign sector is likewise treated.

Capacity to produce investment goods embodying modern technology forms the technological basis for the growth of the modern sector.

Capacity of consumer goods and agricultural subsectors to produce and sell surplus products serves as an additional source of employment in the modern sector.

The modern sector is broken down into investment goods and consumer goods subsectors. The agricultural sector is treated

TABLE 4.2

## Breakdown of the Regional Economy by Production Sectors

---

Organized or Modern Sector	}	Investment-goods subsector	}
		Consumer-goods subsector	
Unorganized Sector	}	Agricultural subsector	
		Traditional subsector	Consumer-goods
			Investment-goods

---

in the unorganized sector explicitly.

Interregional trade in this model is not considered a basic determinant of growth. Objections to the exclusion of export earnings as a source of growth is valid; nevertheless, with restrictions on interregional trade enforced in China, the assumption becomes less objectionable. In the future, some level of reconciliation between export as the basic determinant of regional growth, on the one hand, and export playing a negligible role where interregional trade is retarded, on the other hand, must be formulated.

Of concern to us are the increases or decreases in surplus labor in the unorganized sector, as they will have an inverse effect on additional agricultural products marketed in the organized sector.

Planning authorities are assumed to determine (1) savings rate in the organized sector and (2) the inter-sectoral distribution of investment goods.

An investment-inducement coefficient is introduced to account for induced investment in capital accumulation on the agricultural sector; that is, investment undertaken by individual farm households or group of farm households utilizing local materials and labor otherwise left unused.

The government in determining savings ratio and investment distribution coefficients among sectors is assumed to have as

its objective, maximization of the regional growth rate.

The model consists of 37 equations and identities, five inequalities or maximization formulae to represent the development mechanism. Given the values of predetermined variables (e.g. output targets, total labor, etc.), parameters (labor productivity, critical capital coefficients, etc.), and the policy variable (savings ratio, coefficients of investment distribution in the organized sector), values of the unknowns can be uniquely determined.

A prime mover of development is the amount of investment goods ( $I_{xt}$ ) in the region. Its flow determines the magnitudes of important variables in the various sectors. If the region is considered a closed one, then investment goods become identical to the production of the investment goods sector ( $X_{1t}$ ), and the savings ratio ( $s$ ) becomes a function of the coefficient of allocation of investment goods to the investment goods sector ( $\gamma$ ). In the long run, a high ( $\gamma$ ) will imply a high rate of growth.

If, however, the region is opened, then expansion of the investment goods subsector induces managerial and technical skill improvements, thus promoting development.

Another prime mover is the surplus of consumer goods production  $\{[1-(1-\epsilon_x)C]X_{2t}\}$  and that of agricultural production  $\{A_t - \epsilon_A C_{At}\}$  within their respective sectors. These surpluses enable additional employment in other sectors  $\{N_{1t}, N_{2t}, \text{ and } N_{At}\}$ .



For growth to occur, increase in fixed capital must be accompanied by an increase in employment. This is because output in each sector ( $X_{1t}, X_{2t}$ ) is not just restricted by the amount of labor guaranteed by the means of consumption ( $C_{xt}$ ) that is necessary to sustain it. The lower the consumption level ( $W_1, W_2$ ) relative to the productivity of unit employment ( $L_1, L_2$ ), the more rapid the increase in employment ( $N_{1t}$ ) in the investment goods sector results in a higher growth rate.

Planners utilizing the model as a planning tool must be guided by the following considerations: (1) in any given period  $A'_x$  is an inverse function of  $s$  or  $\gamma$ . As such,  $s$  or  $\gamma$  must not exceed certain values beyond which  $A'_1$  falls below a social minimum. In other words, the planner must choose the highest value of  $s$  or  $\gamma$  possible without causing  $A'_x$  to fall below the minimum subsistence level.

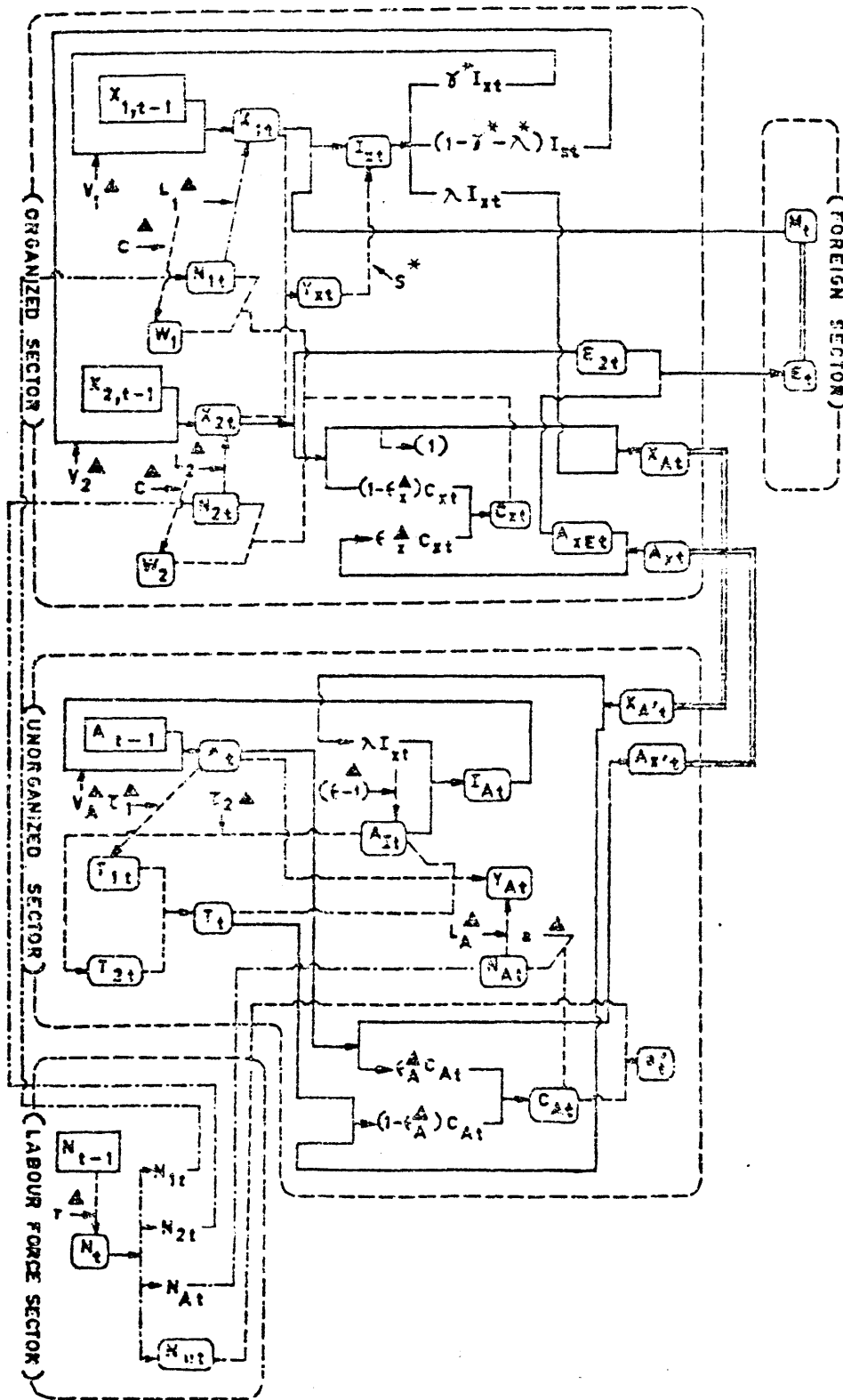


FIGURE 4.1 Adaptation of Ishikawa's Model to a Regional Context

TABLE 4.3

Notations of the ModelNotes:<sup>1</sup>

- I. This flow chart incorporates certain revisions of the original version of the projection model, notably the flow with notation (1) which was assumed in the original version as equal to  $\varepsilon_x C_{xt}$ .
- II. Symbols enclosed by  $\square$  indicate pre-determined variables; those encircled by  $\circ$ , endogenous variables; those attached with a \*, policy variables; and those attached with a  $\Delta$ , constants.
- III.  $\longrightarrow$  indicates the direction of the flow of commodities;  $\dashrightarrow$ , the direction of the flow of labor;  $\dashrightarrow$ , identical or causal relation; and  $\equiv$ , the assumed equality relation.
- IV. The symbols are classified as follows:
- (i) Policy variables:
- s net savings ratio of organized sector
- $\gamma$  coefficient of allocation of investment-goods to the investment-goods sector
- $\lambda$  coefficient of allocation of investment-goods to the consumer-goods sector
- (ii) Endogenous variables:
- $X_1$  net output of the investment-goods sub-sector
- $X_2$  net output of the consumer-goods sub-sector
- $Y_x$  net output of the organized sector
- $I_x$  net investment of the organized sector, inclusive of net investment transferred to the agricultural sector
- $C_x$  private and government consumption in the organized sector
- $N_1$  number of workes in the investment-goods sub-sector
- $N_2$  Number of workers in the consumer-goods sub-sector

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<sup>1</sup>From S. Ishikawa, (1966).

TABLE 4.3 (continued)

$W_1$	wage earnings of per-unit worker in the investment-goods subsector PLUS current expenditures of the government shared by per-unit worker
$W_2$	the same for the consumer-goods sub-sector
$E_2$	amount of the products in the consumer-goods sub-sector exported
$A_{xe}$	that part of agricultural products which is exported
$X_A$	supply of manufactured goods from the organized to the unorganized sector
$A_x$	demand of the organized sector for agricultural products
$A$	net output of the agricultural sub-sector
$T$	net output of the traditional sub-sector
$T_1$	net output of consumer goods in the traditional sector (not including A)
$T_2$	net output of investment goods in the traditional sector directed to the production of $T_1$
$Y_A$	net output of the unorganized sector
$I_A$	total capital formation in the traditional sector directed to the production of A
$A_I$	net output of investment goods in the traditional sector directed to the production of A
$C_A$	consumption of the traditional sector
$N_A$	number of labor force productively employed in the unorganized sector
$a'_t$	average income per-unit labor force in the unorganized sector
$X'_A$	demand of the unorganized sector for the manufactured goods of the organized sector

TABLE 4.3 (continued)

$A_x'$	supply of agricultural products to the organized sector
M	amount of total imports
E	amount of total exports
N	number of total labor force
$N_u$	number of labor force unemployed
(iii) Constants (parameters):	
$V_1$	marginal capital-output ratio in the investment-goods sub-sector
$V_2$	marginal capital-output ratio in the consumer-goods sub-sector
$\epsilon$	fraction of the consumption expenditure of the organized sector spent on agricultural products
$V_A$	marginal capital-output ratio in the agricultural sub-sector
$\tau_1$	the ratio of $T_1$ to A
$\tau_2$	the ratio of $T_2$ to $A_1$
$L_1$	per-unit labor productivity of the investment-goods sub-sector
$L_2$	per-unit productivity of the consumer-goods sub-sector
$L_A$	per-unit labor productivity of the unorganized sub-sector
$\epsilon_A$	fraction of the consumption expenditure in the organized sector to total net output of the sector
r	the rate of growth of population (labor force)
(iv) Constants (institutional variables):	
c	ratio of private and government consumption in the organized sector to total net output of the sector

TABLE 4.3 (continued)

- e coefficient of inducement for agricultural investment
- a average per-capita earnings of the employed labor force (such as the LABOR DAY remuneration in agricultural producers' cooperatives)

## CHAPTER FIVE: RETROSPECT AND PROSPECT

This last chapter summarizes the information presented in the preceding chapters. It concludes this stage of my research effort. An attempt is made here to describe the most important features of the Chinese regional economies. The future tasks of determining the specification of a model, the choice of variables and forms, is also discussed.

### 5.1 Features of the Chinese Regional Economies

#### 5.1.1 The Initial Conditions

The realization of a regional development problem in China by the Communist leadership came in basically the same way Friedman described Europe's post-war awakening to the spatial dimension of economic development. There were, however, numerous and important differences. Recall that in Europe and in many other parts of the world, the growing seriousness of the regional problem was brought about by a number of significant developments: (1) an urban revolution propelled by vast internal population transfers and progress in transport technology, i.e., the automobile; (2) impacts of industrialization and structural changes in the national economy redistributed the spatial dispersion of economic activities; (3) technological progress sometimes bypassed traditional centers of growth, creating new 'growth poles' leaving older areas to cope with with obsolete facilities, scarce factors of production, and a less dynamic

population; and (4) a rising expectation fueled by industrialization and new wealth was often unmet or unmatched for a large part of the rural and agricultural population.

Although wealth and economic development has traditionally been unevenly spread over a national territory, the initial 'random shock' of these developments imparted a disequilibrating effect on the spatial economy and tended to accelerate the polarization of population and economic activities in a few large metropolitan and industrial centers. These dramatic changes combined with a newly politically conscious population in the wake of the Second World War led to the assignment of regional development as major policy issue. These developments however had only a limited effect on the Chinese economy in the pre-Communist years (1949). Note the changes in Europe leading to the attention of regional development cited by Friedman had taken place during relatively peaceful years in the pre-war and post-war eras. China, in contrast, had been in constant political, social, and military turmoil since the middle of the last century. The initial conditions of the Chinese regional economies at the start of our study period (1949 to present) were therefore results of factors unique to the Chinese political economy.

The spatial economy at the time of the Communist liberation could be explained directly in terms of her political economic history. The economy was then marked by a spatial concentration of modern industry in a few industrial centers developed during the Japanese occupation of Northeast China.



The country as a whole had only a few lateral and longitudinal trunk lines; only the Northeast, the former Manchuria, had a fairly developed transport network commensurate with the development of heavy industry in the area.

Population were concentrated mainly along the coastal areas and in a few regions of greater soil fertility. The country was comprised of three sectors: (1) a large and self-sufficient agricultural sector; (2) a modern sector concentrated in the urban areas devoted to the management of goods and light industry, and (3). the heavy industrial sector located in the Northeast. The richer and relatively developed regions were located along the coast where trade and commerce with other countries was sufficiently large to sustain the agglomeration of population in a few large cities. These cities were often the loci of entrepreneurship and Western form of production and industrialization.

Another important feature of the Chinese political economy which has important implications for the regional distribution of economic activities was that China never really developed a market economy. Consequently, the older and larger cities performed more political administrative functions historically than economic. Further, there were only a few metropolitan industrial and commercial centers, and major markets with concentrated demand for producer and consumer goods were also few.

Thus, the spatial distribution of economic activities in the pre-Communist period was largely determined by the

traditional pattern of agricultural development. Population was relatively evenly distributed within China proper, with concentrations in a few areas of superior natural resources. Cities in China were centers of wealth not necessarily because they were the most efficient productive places, but because as sites of political administrative functions, they were control points of producer and consumer goods monopolized by the imperial governments. Most of the traditional centers performed central place functions for the surrounding countryside.

The impact of Western penetration into the traditional society of China, and attempts at industrialization and modernization, disturbed existing pattern of settlement and accelerated the concentration of population and vital economic activities in a few large cities in the coastal regions. The result was that a few centers, e.g., Shanghai and Tientsin, became disproportionately the most productive places. The modern sector was located almost entirely in a few cities opened to Western influence. Large parts of the inland regions remained traditional while the coastal regions became transitional societies. The initial shock of industrialization therefore increased urban-rural differences and led to the divergence of regional incomes and the spatial distribution of economic activities. It was an 'irrational' spatial pattern of development that the Communist leadership were faced with when they came to power in 1949.

### 5.1.2 Resolution of Contradictions

Chinese regional development policy was first and foremost an attempt to resolve various political, social, and economic 'contradictions' defined according to Maoist ideology and supposedly manifested in the irrational pattern of the spatial economy inherited by the Communist leadership. These contradictions may be identified as the following: (1) an urban-rural dichotomy; (2) an excessive concentration of heavy industry in the Northeast; (3) a concentration of the modern sector in a few large metropolises; (4) the disproportionate concentration of population and economic activities in the coastal regions; (5) underdevelopment of natural resources; and (6) a spatial economy shaped by and leading to class differentiation and functional specialization. The national development policy that evolved, of which regional development was a component part, was aimed at emphasizing the proper economic and political relationships in the Chinese economy. It was a policy concerned with the practical problems of economic development but deeply rooted in Maoist principles.

The most urgent tasks facing Chinese planners at the time of the Liberation in 1949 were the restoration of the basic capacity of the economy to pre-49 levels by 1952; the integration of the various sectors of the economy for the exchange and flow of goods and services, and preparing the way for a long-term program of socialization, massive industria-

lization, and agricultural modernization. Under these broad objectives, the following policies affecting regional development may be discerned:

(1) The development of new industrial centers in the inland regions. This was an attempt to develop Chinese natural resources in the frontier areas and to depart from an over-reliance on the existing industrial centers in the coastal regions. Industrial locations were determined by proximity to natural resources and markets, decentralization for defence purposes, and the transmission of growth to the underdeveloped regions. It is important to note that the industries established in these regions, such as steel and fuel industries, have assumed the role of primary growth sectors in the Chinese economy. The infrastructure and industrial base for further expansion of the regional economies have therefore been established.

(2) The creation of communes changed dramatically the units of political, social, and economic organization. This meant the standardization of population groupings in both urban and rural areas, in both developed and underdeveloped regions. It consolidated various sectoral activities under a given production unit and communes were called forth to establish both industrial and agricultural enterprises. It also created economies of scale in production (collectivization), internalized external economies, and enhanced self-sufficiency. More importantly, it carried the principle of balanced economic development to the most basic unit of production. The dynamics

of regional economic growth can consequently be analyzed in terms of a region's composition of communes engaged in specific sectoral activities. Once a sector's contribution to the gross domestic output can be ascertained, regional economic growth may possibly be estimated by determining the number of communes or production units engaged in that sector's activities.

(3) The multi-sectoral activities of production units within a commune began to eradicate urban-rural distinctions between traditional versus modern economic activities. One should therefore avoid Western distinctions between rural, largely non-industrial, sector on one hand and of an urban, largely industrial, sector on the other hand. Chinese planners have tried to avoid the domination of the country by a few giant industrial cities or of the economy by functionally specialized urban-oriented technocrats. In our modelling effort therefore, it would be difficult to arbitrarily fragment various sectoral contributions to regional economic growth in a society predominated by communes whose agricultural and industrial elements are closely interdependent.

(4) The changing priority between heavy industry, light industry, and agriculture in Chinese development policy affect the pattern of regional growth. Regions whose economic structure happen to be favorable with current development priorities would benefit in proportion to the region's share of the sectors marked for growth. A region whose share of industry is greater

than agriculture, for example, would obviously develop more rapidly under a policy of priority development of industry; alternately, agricultural regions would undergo more development under an 'agriculture first' policy. Our attempt to simulate Chinese regional development must therefore account for regional impacts of the changing and in fact ambivalent development priorities.

(5) Investments have been maintained at a very high level through various authoritarian government measures which shifts income from consumption and unproductive private investments to state investments. Although the rate of investment is impressive, it is not remarkable because Chinese prices generally overstate the value of investment and producer goods relative to consumer goods. Investments in the Chinese economy may be distinguished between the Traditional and the Modern sectors. Regional economic performance may be partly explained in terms of the relative share of investments in these sectors.

(6) Agriculture was often the primary source of savings financing the industrialization program, especially in the First Five Year Plan period. Savings were generated by the agricultural sector providing inputs at extremely low costs to the industrial sector which was then able to sell products at relatively high state-controlled prices. Enterprises' profits have thus formed a major source of savings.

(7) Savings has become the chain linking the various sectors of the economy. Since light industry was heavily dependent on the agricultural sector for its needed inputs, and since it is the major source of savings, expansion in the heavy industry sector was dependent in turn on the light industry sector, and ultimately on the agricultural sector. In China however, regional expansion of the industry sector need not necessarily be dependent on the performance or growth of the agricultural sector within the region because planning by material balances permit interregional movement of scarce factors. In a centrally planned economy such as China's, investment decisions could 'balance' the supply and demand of factors in all regions regardless of the region's own productivity. For example, agriculturally poor regions such as Kansu and Sinkiang are still able to develop a large industrial sector financed by savings from agriculture of other regions. In other words, regional industrialization need not be premised on agricultural development although the existence of the latter will obviously speed national development, i.e., more resources in the national macro-economy. This feature of the Chinese regional economies however does not deny the crucial importance of natural resource exploitation in regional development.

(8) Although planning by material balances equate the demand and supply of needed factors in a given region, overall Chinese regional policy has been to encourage regional self-

sufficiency. Regional economic cooperation meant that industries should rely more on materials derived from the particular administrative region rather than on materials that had to be imported from some distant source. If needed materials were not available, they were to be developed within their own particular region or substitutes had to be found. This policy of restricting interregional movement of both producer and consumer goods was a consequence of high transport costs due to an inadequate transport network. Each region can be considered an enclave protected by high tariff barriers, and developing complementary economic activities instead of regional specialization. A logical extension of this policy was that in addition to the requirements of enterprises purchasing materials and equipment within their own administrative units, products had to be marketed within their own particular area. The size of the market for a region's products was therefore limited. More importantly, exports were less able to play a growth-propelling role. As the Chinese economy develops and as the transport network expands, one can expect greater interregional movement of factors and commodities. At present however, the kinds of regional income convergence obtained through either factor or commodity price equalization from interregional movement of factors and commodities is unlikely. This point is not crucial because prices are controlled by the state and policy has been to achieve a uniform price level. To the extent that marginal analysis is useful (valid?) in a socialist economy, regional growth potential determined by



the relative rates of return to various factors is not as plausible a theory as in the free market economies.

(9) A noteworthy aspect of Chinese population policy has been the rural restification of urban youths. Although this policy probably derives basically from purposes of political education, there are possible economic impacts. The settlement of urban youths in the countryside could bring skills and organizational abilities. There could therefore be benefits of modernization. The predominant aspect of migration policy however has been to restrict urban in-migration from the rural areas. Population movement is rigidly controlled. The implications for regional growth is that migration as an equilibrating factor in regional income analysis is a powerful but relatively unused policy tool. Although there has been tremendous population movement from the East to the unsettled North, Northwest, and Southwest, the size and magnitude of this movement is small compared with China's population.

(10) In national economic growth, equilibrium is posited to be always relative and temporary while disequilibrium is always absolute and regular. It is therefore insufficient merely to plan for an equilibrium, one should instead realize the need for maintaining equilibrium regularly. The implication for regional growth is the dialectic process of development. Disparities in regional growth rates or income levels may not be defined as a problem when viewed in terms of the relative unity of opposites. Realization of the dialectic

process, e.g., bipolar development, suggests that planning should be geared towards a more dynamic process in which regional disparities should not necessarily be planned against but instead guided along a path which would result in some form of regional equality that is greater than the preceding convergence in a continual process of parity-disparity, income convergence-divergence.

## 5.2 Summary of the Chinese Spatial Economy

The most important conclusions of the Chinese spatial economy described in the preceding chapters may be summarized as follows:

(1) The expansion in the number of medium size cities indicates that development has been consistent with avowed official policy of promoting small and medium size cities; because of the limit of our sample size, it is difficult to determine absolute increase in the number of small cities. Relatively, their number has dropped, but it is reasonable to assume an absolute increase considering that the total increase in national urban population is greater than the total increase in population of our selected 117 cities. These residuals must lie with unaccounted smaller size cities.

(2) There has been increased urbanization but not at the high level anticipated based on the history of other developing and underdeveloped countries. This may be attributed to the official policy of discouraging migrating from the rural areas to the cities.

(3) The conspicuous increase in the number of large cities is significant and results in an overall impact which appears to contrast with what might have been expected from an announced policy of discouraging growth of the large cities. This may be attributed to the change in policy that occurred later when planners began to deplore over-zealousness in the

establishment of new economic areas at the expense of the general rate of economic expansion.

(4) Premature development of the inland industrial centers brought about a relatively slower increase in production output. This slow increase can be seen in the changing rates of growth of industrial production and of the GNP. The rate of increase of adjusted modern industrial output was 16 percent in 1953 to 1954, and 8 percent in 1954 to 1955. It later rose to 26 percent in 1955 to 1956 when priority was duly given to the large developed industrial centers.

(5) Regions with the highest growth rates are also regions that contain the largest number of cities; economic development seems to have been accompanied by a concomitant increase in urbanization.

(6) The rank relationship describing the distribution of cities in Communist China during intense periods of greatly increased economic activities indicates despite increased urbanization, the distribution remains basically unchanged.

(7) A closer examination of the rank size regression lines indicates that a levelling off suggest a less abrupt distribution of cities in 1958 than for 1953.

(8) The absolute drop in the predominance of China's largest city in spite of increased economic activities suggests a departure from primacy. China's primacy index for her urban system actually dropped from 1953 to 1958.

(9) The hypothesis that industrialization eventually implies a smooth rank size distribution and departure from primacy seems to bore out by this study of China's spatial economy. Our two analyses employing the rank size principle and primacy not only substantiate this hypothesis, but are congruent to each other's result.

### 5.3 Future Research

#### 5.3.1 Factors in Regional Development

The study of the Chinese regional economy presented in this thesis is insufficient to begin identifying the factors in regional development. Paucity of data is the major constraint on this aspect of the research. A further constraint is what I feel to be limited usefulness of the major theories of regional economic growth. As mentioned in Chapter Three, theory not only lags behind policy needs but it is more descriptive than explanatory. The most useful theory appears to be the location theoretic approach which emphasizes the role of natural resource exploitation and the sequence of developments inducing the localization of industrialization. The concept of linkage effects is also a useful explanation of why certain initial conditions lead to further development. Export base theory and regional income theory however seems to be of limited use in an economy where restrictions of factor and commodity trade is enforced.

Given the features of Chinese regional economies presented in this thesis, the identification of factors in Chinese regional development is now dependent on the availability of Chinese regional economic data. The real task of future research will lie in the construction of regional income accounts. Only then will the identification of the causes of regional growth have any theoretical and empirical validity. The review of theoretical and operational models in Chapter Three can then serve as an important guide in an

attempt to isolate the crucial factors in regional development. It will also be especially important to compare the factors identified in these Western and market-oriented models to the factors we might be able to determine in the Chinese case. The similarities and differences can have important policy implications.

### 5.3.2 Specification of a Model

It would be premature at this stage to list the specification of a model, the choice of variables and mathematical forms, but the recent appearance of two models of the Chinese economy constructed by Japanese economists offer interesting suggestions.

The projection model of Ishikawa presented in Chapter four is a valuable starting point. The following features can be adapted to the regional context: (1) differentiation of the economy into the organized (modern) and the unorganized (traditional) sectors; (2) the further breakdown of the organized sector into the producer and consumer goods sub-sector, a specification consistent with the two departments economy of Marx; (3) the limited role of export earnings as a source of growth; (4) the attention of surplus labor effects; (5) the role of an investment-inducement coefficient to account for the total utilization of materials and labor normally left unused; (6) government determination of savings ratio and investment distribution coefficients among sectors (and possibly an extension to regions) towards regional growth

rate maximization; (7) the assumption of the amount of producer goods as a prime mover of development; (8) the assumption of consumer goods and agricultural production surpluses; and (9) a condition for growth based on an unique relationship between increase in fixed capital and a concomitant increase in employment.

The other important model is an input-output table constructed for the 1956 Chinese economy recently developed by Niwa (1970). It is also a valuable prototype if we are interested in constructing Chinese regional accounts through the use of an input-output analysis. The following tasks will have to be followed in our next stage of research: (1) estimating the gross regional output value in each industry; (2) estimating the regional final demand; (3) estimating the amount of value added in each industry in a particular region; (4) estimating the amount of current transactions between endogenous sectors in a particular region; (5) estimating the amount of imports and exports; and (6) balancing.

In the construction of a simulation model replicating the pattern of regional income convergence-divergence or of regional income growth, it would be important to include the effects of urbanization which has been ignored in both the models discussed above.



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