Working Progress Report

INDUSTRIAL EMPLOYMENT AND INTERNAL MIGRATIONS

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I N D E X

I. FIELD OF RESEARCH

1.1. In general

The developing countries face many serious problems in their efforts for economic development. Some of these problems are over-population,[1] the continuous high rate of population growth, unemployment and population movements within the countries which are mainly movements of the economically active population from rural to urban -industrial- areas.[2]

On the other hand, one of the main aims of economic development is to take care of the employment needs of population, i.e. to maximize employment. Therefore the analysis of industrial employment[3] and its projections in the coming years will provide the quantitative aspects of these needs, the factors that affect them, etc. in the past and in the future. Furthermore, the quantitative measurement of industrial employment demand in conjunction with labour supply, population growth and expected economic development, will help policy makers to formulate the indicated policy for the employment

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1/ It is considered that over-population exists in a country and in a given level of economic development, if the less number of inhabitants of this country would provide a better standard of living for the remaining population, In other words, we speak about over-population when per capita income increases as population decreases. Furthermore, over-population creates employment problems in the developing countries. These employment problems are: the cyclical or Keynesian unemployment and technological unemployment. Kanelopoulos, A., Economic Development. Vol. I, Athens, Greece, 1966. pp. 302-304.

2/ Urbanizacion and the increase of earth's population are the two most important trends which are ascertained in the United Nations Demographic Yearbooks in the last decades. The urban population of most of the countries -developed and developing- was doubled in the period 1940-1970.

3/ The quantitative analysis of employment demand in manufacturing will also help economists to make models. These models will embody the basic factors of employment demand and will yield predictions as regards the expected development of employment demand in the future on a scientific basis.

problem as a whole and for national income. In this project we will investigate employment demand in the manufacturing sector of the economy, i.e. indirect employment demand or derived employment demand[4] based on the demand for commodities produced by industries which as it is known attempt to maximize their profits.[5]

As regards population movements from rural to urban areas -internal migration- which, as we said, are movements of agricultural labour force[6] towards manufacturing, are mainly caused by employment demand[7] in this sector of the economy, the level of wages, etc.[8] These changes in the allocation of labour force from rural to urban areas refer also to the occupation, i.e. to the kind of work performed by the individuals, etc. Thus, an analysis of employment demand in manufacturing, the size and the structure (by age, sex, kind of work, etc.) of the population movements which have taken place in a sample period will allow us to estimate the employment opportunities that have been covered by the population inflows from rural to industrial-urban-areas in this period of time.

4/ There is also the demand for personal services as this usually happens in the tertiary sector of the economy and this demand is really an aspect of the general theory of consumer's behaviour.

5/ For this reason, industries are guided in demand for factors of production as it is the factor of labour, whose successive units yield smaller additions to receipts from product sales.

6/ The terms "labour force" and "economically active population" are used with the same meaning in the present work and it is divided into agricultural, service and industrial labour force in accordance with the three sectors of the economy.

7/ For employment determination, demand for employment is considered to be the most important factor compared with the other factors combined. Lester, R., Shortcoming of Marginal Analysis for Wage-Employment Problems. Edited by Smith, O. and Mc Cormic, B., Baltimore, U.S.A., 1968. pp. 34-36.

8/ Athanassiou, S., Urbanization and Industrial Development in Latin American Countries. U.N. Latin American Demographic Centre (CELADE), Series A, N° 125, 1974, Santiago, Chile. In this study, simple models have been developed as regards the urbanization and the factors that affect it. The importance of the employment demand factor has also been ascertained empirically in the case of urbanization of Chilean population.

Finally, the estimations of employment opportunities covered by population movements that, of course, will consist of a part of these movements, will help us to predict the expected population movements which will be caused by the over-all industrial development.

1.2. Aims of the study

In the previous section, we gave a general view of the problem, industrial employment and internal migration, that will be investigated in this study. Here we will define the main aims of the study which can be summed up as follows:9/

a) As regards industrial employment

i) Analysis of development of employment demand in manufacturing industries as a whole and in each branch. This analysis will be based on time series and cross-section data.

ii) Formulation of industrial employment demand functions based on economic theory and the related empirical research as well as the specification of these functions. This specification will refer to a more satisfactory investigation of the functional relationships between employment demand and the factors that will be considered as determinative ones in each case of the empirical analysis.

iii) Estimation of the employment demand functions on the basis of the empirical data (censuses or samples). This estimation will be made by applying the traditional method of Ordinary Least Squares.

iv) Making forecasts as regards the development of industrial employment in the future years on the basis of the formulated models -equations- and the expected development of the determinative factors.

9/ This study will refer to some Latin American countries. The selection of the countries that will constitute the sample for the execution of this research, will be made on the basis of the available statistical data which are required by this research and the over-all research programme of the Centre.

b) As regards internal migrations

i) Determination of that part of industrial employment demand which has been covered by population inflows from rural to rural -industrial- areas in the sample period.

ii) The estimation of that part of employment demand which is expected to be covered by internal population movements in the post-sample period in conjunction with, of course, the population development of industrial -urban- areas.

Furthermore, the analysis and the estimation of industrial employment demand, apart from its size (number of employed persons) will refer to:

i) the structure by age and sex of employment
ii) the classification of employment from the point of view of production workers, overhead workers, etc.

Finally, this analysis and estimation of industrial employment demand will be extended to those geographic areas where a great number of industrial units is concentrated. A similar to the aforementioned classification will take place, of course, for that part of internal migration which has been or is to be covered by industrial employment.

1.3. Usefulness of the study. Its structure

It is known that the over-all economic development of the country is one of the main objectives of all the efforts made by all the countries regardless of their economic progress and their socio-economic standards of living. Speaking broadly, economic development means industrial development and consequently it is a problem of the greatest importance for the rapid economic development of the developing countries.[10/]

10/ This is because the per capita income is at low level and the industrialization is at the first stage. Furthermore, these countries desire to reach their economic development and the entry into the area of the developed countries the most rapidly possible.

In the general part of this Chapter, we said that the unemployment problem of developing countries is also one of the main problems for solution. On the other hand it is known that industrial development creates more opportunities of employment and thus it contributes to the solution of the aforementioned problem.[11] Furthermore, the industrial employment demand as it has been proved consists of one of the main determinants of population movements towards industrial areas.[12] Consequently, the usefulness of the investigation of industrial employment demand in conjunction with internal migrations that are absorbed by employment of the modern sector of the economy in the developing countries[13] becomes evident from this general point of view.[14] More specifically, the estimation of the employment demand functions empirically will give us a picture of the over-all development of industrial employment in a sample period as well as the factors that affect it. Furthermore, we will be able to predict the development of industrial employment in the coming years on the basis of statistical data obtained in the past as well as the expected development of the determinative factors. Thus, we will know the behaviour of employment in the industrial sector in the

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11/ The per capita income of industrial areas is also greater.

12/ Athanassiou, S., Urbanization and Industrial Development in Latin American Countries. United Nations Latin American Demographic Centre (CELADE), Series A, N° 125, Santiago, Chile. pp. 95-97.

13/ They are making great efforts for the purpose of their further industrial development and their internal migrations are a serious problem for solution. Moreover, in spite of the high average growth rates of some of the selected countries in a period of time, unemployment at the end of this period is higher than at the beginning and consequently the employment problems in the countries with high growth rates is also of the same great importance.

14/ The study of employment demand in manufacturing increases more due to the economic depression that is being experienced by nearly all the countries in recent years as a consequence of the rise in petroleum's price. If these circumstances will continue, then the development in the field of industrial labour, employment, unemployment, wages, etc. cannot be expected with a sense of satisfaction in the coming years.

sample and post-sample period in certain developing countries as the Latin American countries are, whose characteristics are high population growth rates, limited capacity of manufacturing, the bulk of labour force employed in the agricultural sector, population movements from this sector to industrial areas, and gh employment or underemployment rates.[15] The acknowledgement of industrial employment behaviour in the past and in the future and the various factors dete mining industrial employment emand of course, will be considered useful for planners[16] and policy makers as regards industrial development, employment, etc.

On the other hand, the determination of that part of the emigrants which entered to the manufacturing industries and the knowledge of the expected internal migrations which will take place for coverage by the industrial employment demand in the coming years, consists of data of a particular value to those who are engaged in the coordination of all the indicated economic measures for the achievement of the targets of economic plans and the exercising of economic policy.[17]

15/ The increase of employment and underemployment brings a more unequal income distribution, which is also a characteristic of the developing countries.

16/ All the Latin American countries have long-term economic plans in development whose objectives are the maximization of national income and of employment. Therefore such data regarding industrial employment -which is one of the main factors of these plans-, internal migrations, the expected absorbing capacity in labour of manufacturing, i.e. the needs in labour of manufacturing in the future, etc. are required and they are very useful for making economic plans.

17/ This will also help the population policy makers. They can use migration as a means for cancelling out national increase of over-population (Price, C., Migration as a Means of Achieving Population Targets. Seminar on Demographic Research in relation to Population Growth Targets. 3-9 April 1973, University of the West Indies, St. Augustine, Trinidad and Tobago, 1973. pp. 70-71. Furthermore, industrialization, with the accompanying increase in the urban population is one of the factors making for a decline in the birth rate (Ovsienko, V., Influence of Social and Economic Factors on Demographic Characteristics. United Nations World Population Conference, 1965, United Nations, New York, 1967. pp. 90-91).

The present study consists of ten chapters. In the first chapter we give a general picture of industrial employment demand and internal migrations. In this chapter we describe the aims of the study, its usefulness and the countries which will constitute the sample for the empirical analysis of the problem examined as well as the sources of statistical data. In the second chapter, we analyze the development of industrial employment and internal migration towards industrial areas and mainly of the part of internal migrations absorbed by industrial development for those countries which will constitute the sample of general applicability of industrial employment demand functions. In this chapter we will also give the structural changes of output, population and supply and demand for employment in the sampling period 1961-1971 as well as the development of some other economic magnitudes related to employment demand and internal migrations.

In the third chapter, we will refer to the theoretical consideration of employment demand. The problems of specification and estimation of employment demand functions in manufacturing are included in the fourth chapter. Furthermore, in the fifth chapter we realize the empirical analysis of the employment demand equations in manufacturing and the testing of statistical significance of the equations estimated.

1.4. Sample period, choice of some Latin American countries for empirical analysis of the subjects examined and sources of statistical material used

This study as defined by its purposes, will cover the period from 1960 to 1971 inclusive. Thereafter the end of this period (1971), important statistical data concerning industrial employment, value-added, price of labour, etc. for some of the countries involved are not available. Moreover, the effects of international or local events that took place in some of the selected countries in the period out of the sample, will not allow us to use the statistical data for empirical analysis and for comparative purposes from the point of view of their reliability. On the other hand, significant changes occurred

in the structure of output, in manufacturing and in the supply and demand for employment in the period 1960-71 while the internal migrations of these countries experienced an upwards trend in the above period. Finally, time series of twelve observations can be considered satisfactory for the statistical analysis of an economic phenomenon as it is industrial employment in the present study. Our intentions for the choice of the countries that will consist of the sample for study are to include those countries[18] which: i) have a degree of industrialization and urbanization at a high level; ii) have an average growth rate over than the average rate of all Latin American countries as a whole; iii) have a surplus of labour force; iv) have experienced structural changes in population and in output and whose industrial employment demand has followed an upwards trend in the sample period 1960-70. Based on these characteristics the countries selected for study are Chile, Venezuela,

The sources of statistical material about the demographic and economic magnitudes which are involved in this study are the official publications of the following organizations and institutions:

- United Nations (Yearbook of National Accounts Statistics, etc.)
- Economic Commission for Latin America, United Nations (Statistical Bulletin for Latin America, etc.)
- Latin American Demographic Centre, United Nations (Demographic Bulletins, etc.)

18/ The Latin American countries have also a high rate of population growth, unequal distribution of income and they are capital-importing countries.

19/ The average annual rate of growth of the gross domestic product was 5.3 percent in the period 1960-70 for all Latin American countries as a whole and this rate showed a slight increase (4-6 percent) if we compare with the previous decade 1950-60 (U. N. Economic Commission for Latin America, Economic Survey of Latin America, 1970. United Nations, New York, 1970. pp. 9-11).

- International Labour Organization (Statistical Yearbooks, Projections of labour force for Latin America, etc.)
- Institutions of National Statistics of the selected countries (Yearbooks, surveys, etc.)
- Centres of economic planning in the selected countries (Yearbooks, research, etc.)

In spite of the efforts made for the collection of detailed and completed statistical data as they are required for the present study, however, these have not been obtained satisfactorily for some countries. Therefore, the limitations to the present study imposed by the statistical data are heavy as they will appear in the empirical analysis of the subject examined.[20/]

20/ These limitations increase more due to the fact that some indices used or quantitative expressions of some demographic and economic variables vary considerably in the degree to which they are comparable between the same time series of different countries and in few times, between series of the same country.

2. OVERVIEW OF THE STRUCTURE OF THE ECONOMY, DEVELOPMENT OF POPULATION, INTERNAL MIGRATIONS AND CHANGES IN LABOUR FORCE FOR THE SELECTED COUNTRIES

2.1. Introduction

In this chapter the main characteristics of the economy will be given as well as the development of some economic and demographic magnitudes used in the present study of the selected countries. Thus, the sectoral structure of output and its development during the sampling period 1960-1971 will be referred to. The development of some economic variables which may consist of the determinants of industrial employment demand will also be referred to.[1/] Furthermore, the changes in population and internal migrations towards the urban-industrial-areas of the countries will be described. Finally the development of supply and demand for employment and mainly in the modern sector of the economy will be analyzed. Thus, on the one hand there will be a clear picture of the economic and population situation of the selected countries for study and on the other hand, the development will be known of some of the main economic and demographic features of these countries in the past period, whose investigation will play a vital role in the over-all study. To obtain the aforementioned picture and to analyze the development of these main variables, descriptive statistics will be used, that is, the indicated statistical tables which will be made on the basis of censuses or surveys data.

2.2. In the case of Chile

2.2.1. Sectoral performance of output

The economic growth of the Chilean economy was 4.44 percent in the period 1960-1972. This rate of growth is at the same level as it was in the previous decade, 1950-1960 (4.58

1/ It is probable that for some economic or demographic magnitudes their definitions or some elucidations may be required as regards their quantitative expresions, the indices used, etc.This, of course, will be done in this chapter during the description of these variables.

Table 2.2.1.1.

THE DEVELOPMENT OF GROSS DOMESTIC PRODUCT, ITS COMPOSITION AND RATE OF GROWTH IN MAJOR SECTORS IN THE PERIOD 1960-1972

(In million Escudos at 1965 prices)

n/n	Sector	Years							Average rate of growth %		
		1960	1962	1964	1966	1968	1970	1972	1960-1966	1966-1972	1960-1972
1.	Agriculture	1 625	1 645	1 827	1 929	2 114	2 069	2 049	2.90	1.01	1.95
	Index of change	100.00	101.23	112.43	118.71	130.09	127.32	126.09			
	1:4	11.56	10.50	10.68	10.04	10.44	9.54	8.65			
2.	Industrial[a]	5 499	6 611	7 315	8 155	8 464	9 068	10 103	6.79	3.63	5.21
	Index of change	100.00	120.22	133.02	148.30	153.92	165.23	183.72			
	2:4	39.11	42.18	42.78	42.43	41.82	41.89	42.65			
3.	Services	6 935	7 416	7 957	9 137	9 663	10 536	11 537	4.70	3.96	4.33
	Index of change	100.00	106.94	114.74	131.75	139.34	151.93	166.36			
	3:4	49.33	47.32	46.53	47.54	47.74	48.57	48.70			
4.	Gross domestic product	14 059	15 672	17 099	19 221	20 241	21 691	23 689	5.35	3.54	4.44
	Index of change	100.00	111.47	121.62	136.72	143.97	154.29	168.50			

Sources: i) Oficina de Planificación Nacional, Cuentas Nacionales de Chile 1960-1971. Santiago, 1972.
ii) Oficina de Planificación Nacional, Cuentas Nacionales de Chile 1965-1972. Santiago, 1974.

a/ Includes mining and quarrying; manufacturing; construction; electricity, gas, water and sanitary services.

percent) but it is less than the target set by international organizations.[2/] Furthermore, the rate of economic growth (4.44 percent) is more than twice above the population growth and consequently, per capita average annual rate of growth is above 2.1 percent in the period under consideration. Thus, per capita income,[3/] which is also used as a measure of the degree of economic growth of the country was US$ 590 in 1972 and from this point of view, Chile can be considered to be a developing country.[4/] The average rate of per capita growth was 2.1 percent in the aforementioned period (1960-1972). Referring to sectoral performance of Gross Domestic Product (GDP), in table 2.2.1.1. it is observed that at the end of the sampling period (1972) it had increased to 68.50 percent, the greatest income being experienced by secondary production (83.72 percent) and the lowest one by primary production (26.09 percent). Secondary production increased its

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2/ The international development strategy provides that the rate of growth should be at least 6 percent for the developing countries. But in this case it is worthwhile mentioning the conclusion of the United Nations Economic Commission for Latin America that the rate of growth of 6 percent cannot be considered high enough for Latin American countries as a whole to overcome the serious socio-economic problems. (United Nations, ECLA. Economic Survey of Latin America. 1970). United Nations, New York, 1972. p. 3.

3/ Per capita income is the most suitable indicator for measuring the degree of economic growth and it is used for international comparisons between countries as regards the level of their economies. (Kanelopoulos, A., Economic Development, Vol. I, Athens, Greece. pp. 105-106 and TEMPO, General Electric's Center for Advanced Studies, Population Growth and Economic Development, California. pp. 1-2.

4/ According to this main indicator of the degree of economic growth, developing countries are considered to be those ecomomies whose per capita income does not exceed 25 percent of the corresponding per capita income of the United States. (Kanelopoulos, S., Economic Development, op. cit. pp. 105-107.).

share in GDP from 39.11 percent to 42.65 percent while the agricultural one showed a slight drop from 11.56 percent. The tertiary sector had experienced an increase of 83.72 percent in the same period. The rate of growth of secondary production was 6.79 percent in the first sub-period (1960-66) while in the second sub-period (1966-72) it was 3.63 percent. Table 2.2.1.1. gives more details as regards the development of gross domestic product (GDP) and its structural changes during the period 1960-72. As a conclusion, from the examination of output, its development and its sectoral changes in the period 1960-72, we can say that the structural changes of output, in conjunction with the rate of growth of primary and secondary production can be considered in general as favourable points of Chilean economy.

2.2.2. Population development and internal migrations

The last two population censuses were conducted in 1960 and 1970. The total population of Chile in accordance with the 1970 census was 8 853 thousand inhabitants and it had increased in more than 1.4 million people in the decade 1960-70, i.e. 1.97 percent per annum on the average. Based on the population estimations made by CELADE,[5] the Chilean population[6] reached 9 715 thousand inhabitants in 1972 and consequently, the average annual rate of population growth was 2.09 percent in the period 1960-1972 which can be considered high. The population structure by age and sex has not changed between the two census years 1960 and 1970. Thus, for the sexes it can be said that they are evenly balanced with a surplus of women and for the distribution by age, the population can be considered normal in the sense that the proportions indicated exist among young age-groups, economically active population and old age groups. Internal migrations are mainly population movements from rural to urban areas. More specifically, they are movements of agricultural labour force to urban -industrial- areas. The distribution of the population in urban and rural population was 75.1 percent and 24.9 percent respectively in the last census (1970).

5/ United Nations Latin American Demographic Centre (CELADE), Boletín Demográfico, Año IX, N° 17. Santiago, Chile, 1976.

6/ The mean crude population density within the territory (742 thousand Km^2) was 13.1 persons/Km^2 in 1972 compared with 10 persons/Km^2 in 1960.

that is, the urban population formed in 1970 three quarters of the Chilean people. The urban population experienced a considerable increase (32.5 percent) in the period 1960-1970 and it was 6 660 thousand inhabitants in 1970.[7] Finally, the high rate of growth both of population and urban population increased the population of the cities which is to considered as being nearly pure urban centres. Thus, in 1970 the number of cities whose population was 65.6 percent of the total population of the country was 98 and it showed an increase of 93.5 percent during the period 1952-1970.[8]

Based on what was said previously, the conclusion can be reached that the population of Chile is characterized in the main by a high rate of growth and a considerable enlargement of urban population and an increase of the number of cities and of course of their population.

7/ The percentage distribution of urban and rural population of the country by province varies in each province. There are provinces whose population is urban (over 90 percent or over 80 percent). In sixteen of the 25 provinces of the country, the urban population is more than one half of the population of the provinces (Athanassiou, S., Urbanization and Industrial Development in Latin American Countries. United Nations Latin American Demographic Centre (CELADE), Series A, N° 125, 1974, Santiago, Chile. pp. 15-21.

8/ Due to the importance of internal migrations towards urban -industrial- areas in this study they will be referred to in the relevant chapter in more details.

2.2.3. Labour market in industrial areas

2.2.3.1. Economically active population. Classification, approach and sources

As it is known, total population is broken down into two categories: economically active and non economically active. The first category comprises all persons of a given age and over,[1/] of both sexes, who participate in the economic life of a country, i.e. they consist of the available manpower of the country for production of goods and services. These available persons to work in any given period -year- reflect the supply side of labour of the country. For the evaluation of economically active population the terminology adopted by population and statistical commissions in the official languages of the United Nations[2/] is applied. As regards the approach of evaluating economically active population, we apply the approach "labour foce" which, as it is known, is based on the activity of each of several persons during a determined period of time. The sources of statistical data which are used for labour force evaluations are censuses, industrial surveys, etc. and from this point of view the aforementioned approach for evaluation of labour force is indicated.[3/] Finally, the ratio of labour force by age-group and sex to the total population of the same age-group and sex gives the degree of participation, that can be written as follows:

$$e_i = \frac{L_i^a}{P_i} 100$$

where L_i^a : Labour force, in population age group and sex, i

P_i : Total population of this age-group and sex, i

e_i : Coefficient of participation rates of labour force, in population age-group and sex, i

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1/ The minimum age limit of a person to be counted as economically active varies in each country. This age limit is 12 years for most of Latin American countries.

2/ United Nations, Application of International Standards to Census Data on the Economically Active Population. Population Studies N° 9, United Nations, New York, 1951.

3/ Athanassiou, S., Manpower Planning in Greece. The English University Press Ltd., London, 1974. pp. 170-171.

Economically active population is further broken down into employed and unemployed persons. Employed persons in the census definition are those who had an occupation and received for this labour a remuneration in money or kind during the period determined by census schedule.[5] Unemployed persons are all persons who are looking for work and that had a job previously.

2.2.3.2. Changes in Chilean population by economic activity

First, a summary of the composition of population from the economic point of view in both census years 1960 and 1970 will be given.[4] (See Table 2.2.3.2.1.).

From Table 2.2.3.2.1. it comes that economically active population whose rate of growth was 0.95 percent during the period 1960-1970, amounted to 2 624 thousand persons and it was 29.54 percent of the total population in the last census (1970). This percentage of economically active population is less than the percentage (32.39 percent) in 1960 even though, active population had increased by 9.89 percent during the period 1960-1970. So we see that a serious reduction in the share of economically active population occurred between the two censuses, 1960 and 1970. The reasons for this phenomenon of relative decline of economically active population are the terms of a change concerning the definition of a part of population as active population, changes in structure, retirement age, etc. Percentage changes of the categories (pensioners, students, etc.) of non economically active population between the two censuses, 1960 and 1970 ascertain the aforementioned reasons of the decrease of economically active population proportionally.

Finally, changes in economically active population also occurred by rural and urban areas due to the structural changes of Chilean economy as we saw it in section 2.2.1. of the present Chapter. Some of these changes will be referred to in the next section in which industrial employment development will be analyzed.

4/ Economically active population estimates for 1972 have not yet been tabulated.

5/ This part of labour force reflects the demand side of labour of the country.

Table 2.2.3.1.1.

THE COMPOSITION OF ECONOMICALLY ACTIVE POPULATION IN THE CENSUS YEARS 1960 AND 1970

Population by economic activity	1960		1970	
	Absolute number	Percentage of EAP as regards the total population	Absolute number	Percentage of EAP as regards the total population
Economically active population a/	2 388 667	32.39	2 624 81	29.54
employed	2 229 062	30.23	2 474 878	27.86
unemployed	112 920	1.53	116 413	1.31
aspirant labour	46 685	0.63	33 526	0.38
Economically non active population a/	2 557 400	34.68	3 247 512	36.55
pensioners	122 405	1.66	227 854	2.56
home house-worker	1 622 009	22.00	1 853 709	20.86
students	668 393	9.06	1 074 953	12.10
others	144 593	1.96	90 996	1.02
Population of Chile	7 374 115		8 884 768	

Sources: i) Dirección de Estadística y Censos, XIII Censo de Población, 29 de noviembre de 1960. Serie A, Resumen del País, Santiago, Chile.

ii) Instituto Nacional de Estadísticas, XIV Censo de Población y III de Vivienda, 1970, Características Básicas de la Población. Santiago, Chile, 1975.

a/ Economically active population and economically non-active population refers to persons 12 years and over.

2.2.3.3. Employment and unemployment in the industrial areas

The employment in manufacturing industries according to ODEPLAN estimations[6] was 413 thousand persons in 1960 and it experienced an increase of 36.4 percent during the period 1960-1970. At the end of this period (1970) employment in manufacturing amounted to 563 thousand persons.[7]

Table 2.2.3.3.1.

LABOUR SUPPLY, EMPLOYMENT AND UNEMPLOYMENT LEVELS IN THE CENSUS YEARS 1960 AND 1970

Levels	1960			1970		
	Total	Industrial areas	Manufacturing	Total	Industrial areas	Manufacturing
Labour supply	2 494.3	1 726.3[a]	428.9[a]	3 185.3	2 392.0[b]	580.9[b]
Employment	2 317.0	1 605.9	412.6	2 994.2	2 256.2	562.9
Unemployment	177.3			191.1		

Source: Oficina de Planificación Nacional, División de Recursos Humanos.

a/ Census data.
b/ Estimations on the basis of available data (sample) tabulated by the National Statistical Institute (INE).

6/ Due to the lack of adequate statistical data regarding the Chilean population by economic activity (labour supply, employment, etc.) two sources are used: National Statistical Institute (INE) and ODEPLAN. Between the data tabulated by these two Institutes there is a difference: This difference of course does not reduce significally the general picture that we will try to give about the active population, employment, etc. in this Chapter.

7/ A realistic measure of actual employment is its expression in terms of man-hours. This measure will be used in the quantitative analysis of industrial employment. In this section, we want to give a general picture of employment and unemployment in Chile.

This increase of manufacturing employment can be considered satisfactory, comparing the increase of labour supply in the industrial areas of the country,[8] and it was a result of the over-all structural changes of Chilean economy, which occurred in the period under consideration (1960-1970), and mainly the increase of secondary production (83.7 percent) and wages in industries.[9] For a better understanding of the influence of these two factors on employment in manufacturing industries, diagram 2.2.3.3.1. gives, by means of appropriate indices, the development of production, employment, wage and labour productivity for the period 1960-71. But, in spite of the favourable development both of employment and production in manufacturing, however the unemployment problem in the industrial areas and in the country as a whole remains serious as it will be seen below. This problem, due to its importance in the over-all future economic growth of the country, perhaps will be an obstacle. Unemployment in the industrial areas was estimated at 91 thousand persons approximately in 1970 (April)[10] which consists of about 4 percent of labour supply of the areas. Unemployment in the industrial areas with seasonal unemployment in the agricultural sector of the economy is expected to range from 8 percent to 10 percent in the coming years.[11] Indeed, unemployment amounted to 9.2 percent of labour supply in 1974, in accordance to ODEPLAN data.[12]

8/ Labour supply in the industrial areas has increasdd by 38.6 percent in the period 1960-1970. Of course, the labour supply in these areas involves, apart from the manufacturing employment, the employment in the tertiary sector of the economy, etc.

9/ Wages in manufacturing industries had increased more than two times in the period 1960-1970.

10/ National Statistical Institute (INE), XIV Population Census (Sample) 1970, Santiago, Chile, 1971.

11/ The above figures of unemployment are considered to be with a zero net migration.

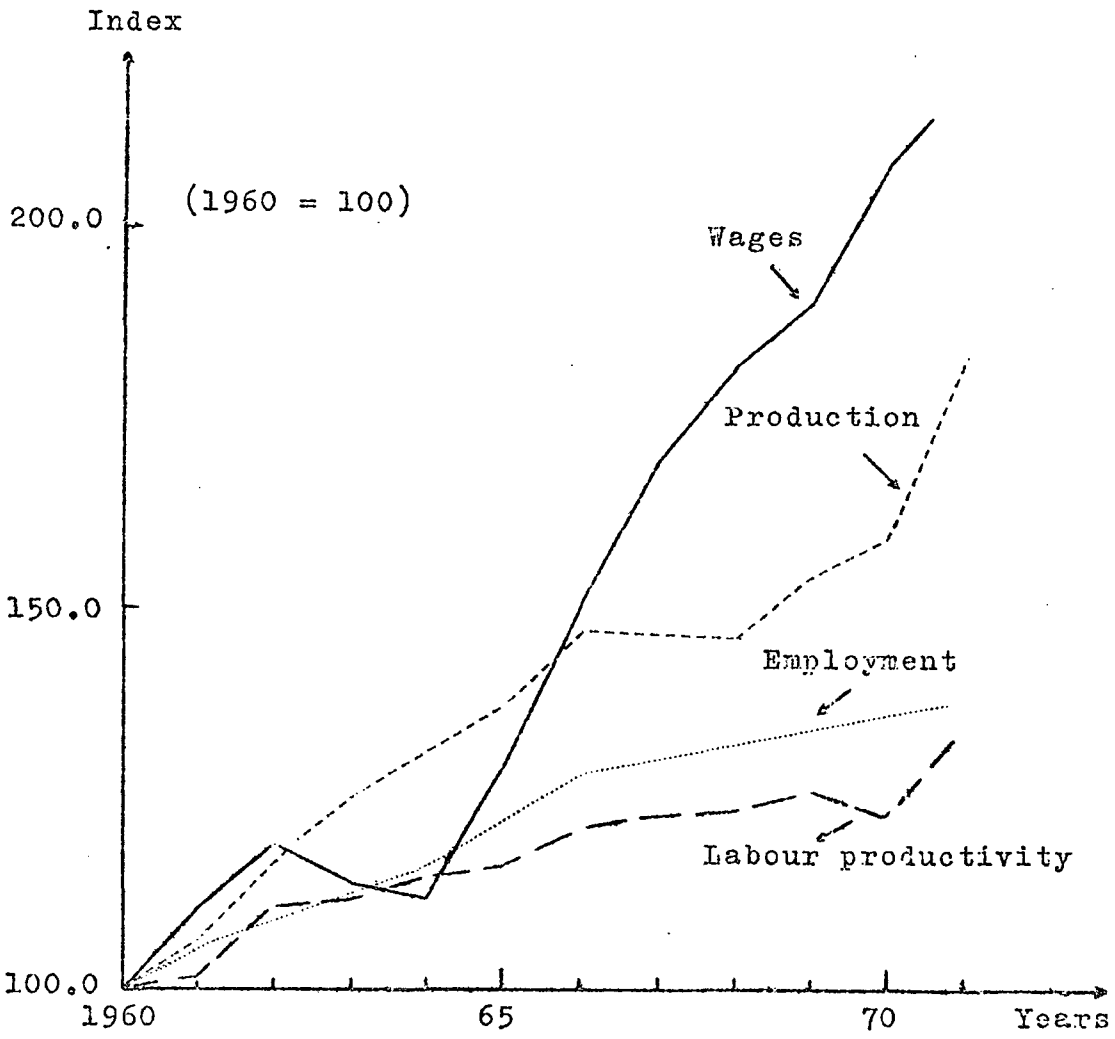
12/ Oficina de Planificación Nacional, Primer Plan Nacional Indicativo de Desarrollo 1975-1980 (Versión Preliminar), Santiago, noviembre de 1974.

Finally, considerable changes in the size and the structure of labour supply of rural and urban areas occurred during the aforementioned period 1960-70. These changes can be mainly attributed to the internal migrations which took place in this period[13/] and which will be dealt with in the relevant chapters.

13/ The Chilean population development is also characterized by a considerable enlargement of urban population as said elsewhere in this study.

Chart 2.2.3.3.1.

ANNUAL INDICES OF PRODUCTION, EMPLOYMENT, WAGES AND LABOUR PRODUCTIVITY IN MANUFACTURING FROM 1960 TO 1971



3. THEORETICAL CONSIDERATIONS OF EMPLOYMENT DEMAND IN MANUFACTURING

3.1. Industrial employment

Here we will give a general picture of the employment in the industrial sector of the economy in mathematical forms. First, we will express the industrial employment in matrix form: Thus, the employment in the industrial sector of the economy which consists of n types of labour in an industrial branch and of k industrial branches, in matrix form, can be written as follows:

$$L_{ij} = \begin{bmatrix} l_{11} & l_{12} & l_{13} & \cdots & l_{1n} \\ l_{21} & l_{22} & l_{23} & \cdots & l_{2n} \\ l_{31} & l_{32} & l_{33} & \cdots & l_{3n} \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ l_{k1} & l_{k2} & l_{k3} & \cdots & kn \end{bmatrix} \qquad (1)$$

where

l_i = type of labour, i $\qquad i = 1,2,3,\ldots n$

l_j = industrial branch, j $\qquad j = 1,2,3,\ldots k$

L_{ij} = total employment in the industrial sector of the economy

It is obvious that some types of labour of certain industrial branches may not be required in their productive process and consequently, the elements of the matrix of these types of labour will be equal to zero. The same can be made for some elements of matrix, i.e. they will be equal to zero, which refer to some industrial branches that do not exist in the industrial sector of the economy.

Secondly, we will express the industrial employment in summation form: Thus, the industrial employment of n types of labour in an industrial branch can be written as follows:

$$L_{ij} = \sum_{i=1}^{n} l_{ij} \qquad (2)$$

where

l_{ij} = type of labour, i and in an industrial branch, j

$i = 1,2,3,\ldots n$
$j = 1,2,3,\ldots k$

L_{ij} = sum of n types of labour in an industrial branch, j

and the industrial employment of a type of labour in k industrial branches can be written as follows:

$$L_{ij} = \sum_{j=1}^{k} l_{ij} \qquad (3)$$

where

l_{ij} = type of labour, i and in an industrial branch, j

$i = 1,2,3,\ldots n$
$j = 1,2,3,\ldots k$

L_{ij} = sum of a type of labour, i in k industrial branches

Hence, the industrial employment as a whole in this sector of the economy as it comes from (2) and (3) forms can be written as follows:

$$L_{ij} = \sum_{i=1}^{n} \sum_{j=1}^{k} l_{ij} \qquad (4)$$

where

l_{ij} = type of labour, i and in an industrial branch, j

$i = 1,2,3,\ldots n$
$j = 1,2,3,\ldots k$

L_{ij} = sum of n types of labour in k industrial branches, i.e. the total employment in the industrial sector of the economy

Of course, in the present research we will refer to employment of the most important industrial branches or types of labour, from the point of view of the number of employed persons and expected development in the coming years and consequently, many elements of matrix form will be equal to zero. For these reasons, the summation form for the estimation of the total employment of some types of labour and in certain industrial branches will be more useful.

Furthermore, we will try to refer to employment of the main industrial areas. This is because the majority of industrial units are concentrated in a few areas of a country and mainly in metropolitan areas as we will see during the empirical analysis of employment for the selected Latin American countries of this research. The mathematical forms, matrix and summation, can be also used for the expression of employment of these industrial areas as previously, with a wide application of summation form for the aforementioned reasons.

3.2. Technological progress

3.2.1. Meaning

It is known that as time goes, innovations (changes in technology) take place which are gradually introduced in the productive process. Technological changes which involve the substitution of a new resource which is abundant for a scarce resource will contribute to an increase of output.[1/] In the broadest sense, by the term "technological progress" we mean the employment of all means of production, economic, technical, organizational, etc. for a further increase of output.[2/] Thus, the achievement of any output level with smaller amounts of inputs used means an increase of technological progress.

1/ In the empirical analyses, it is obvious that the formulation of a general direct relationship between a change in technology and the employment of any resource is very difficult. However, it is possible to predict quantitatively the effects of technological progress on the industrial sector of the economy.

2/ Changes in technique can be distinguished from changes in technology due to the fact that they do not involve the employment of a new resource.

3.2.2. Technological progress and output-inputs

Many writers have proved the greatest importance of technological progress to total increase in output. They have also attemped to derive the relative proportions of output increase which are caused by technological progress.[3] Both Solow, T. in his research mentioned and other writers have tested for technological progress and have found it neutral on the average, that is, it simply results in a constant percentage addition annually tc output.[4] Others writers with various methods have studied the results of technological progress with the effects of inputs.[5] Thus, we must confront these effects, in a long-run term, in order to be led to true conclusions during the empirical analyses of production and labour functions.[6] As Professor

3/ Solow, R., "Technical Change and Aggregate Production Function". Review of Economic and Statistics. Vol. XXXIX. August 1957. Domar, E., "On the measurement of Technological Change". The Economic Journal. Vol. LXXI. December 1961. Brown, M., "On the Theory and Measurement of Technological Change". Cambridge, England. pp. 10-38.

4/ Economic theory distinguishe between neutral and biased (non-neutral) technological progress. The definition of neutrally is given in section 3.1 of this chapter, in which we deal with the productivity of inputs. About the classification of technological progress, the neutrality etc., see the studies made by Asimakopoulos, A. and Weldom, C., "The Classification of Technical Progress in Models of Economic Growth". Economica, Vol. XXX, 1963. Pesec, R., "Neutrality of Technical Progress", Review of Economics and Statistics, Vol. XLV, 1963.

5/ Massel, B., "Capital Formation and Technological Change in the United States Manufacturing". Review of Economics and Statistics. Vol. XLII, May 1960. Diamond, A., "Technical Change and the Measurement of Capital and Output". Review of Economic Studies, Vol. XXXII, 1961. Banerji, H., Technical Progress and the Process of Economic Development. Netherlands University, Foundation for International Cooperation, 1966. The Hague. In this research, the author attempts to assess the relationship between "technological progress" and the employment of labour. See alsc the study made by Tokman, V., Distribución de Ingreso, Tecnología y Empleo. ILPES, Naciones Unidas, N° 23. Santiago, Chile, 1975.

6/ Kuh, E., "Income Distribution and Employment over the Business Cycle". The Brookings Quarterly Econometric Model of the United States. North Holland Publishing Co., Amsterdam, 1965. pp. 241-243.

Th. Schultz says as regards the effects of employment of a resource in the aforementioned functions, we must measure the resource and its effects and not treat all or the part of the unexplained residual by simply calling it "and advance in technology".[7] We also said in the previous section 2.1. that the technical advance enter gradually on larger sectors of the economy and mainly in industrial sector.[8] Thus, the impacts of technical advances in industrial sector of economy depend on the speed that they transfer to it and consequently the decisions concerning the adoption of these advances must be made rapidly.[9]

3.3. Economic Theory

3.3.1. Productivity of inputs, capital and labour

The increase of technological progress causes an increase of productivity of the inputs, labour and capital. The productivity of these two factors, labour and capital, can be expressed as follows:

The productivity of labour[10]

$$Q_1 = \frac{Y}{L} \qquad (1)$$

7/ Schultz, Th., "Connections between Natural Resources and Economic Grwoth". In Natural Resources and Economic Growth, ed. Spengler, J., Washington, D.C., 1961.

8/ Of course, we will not enter in more details as regards the relationship between "technological progress" and "employment" neither will we try to explain the extent of the diffusion of technological progress throughout an industrial sector, because these explanations are out of the purpose of this research.

9/ The decisions for the adoption of major technical advances are those that include additions to available capacity and those that refer to the displacement of functioning facilities and to the replacement of capacity withdrawals (Cold, B., Pierce, W. and Rosegger, G., "Diffusion of Major Technological Innovations in U.S. Iron and Steel Manufacturing". The Journal of Industrial Economics, Vol. XVIII, July 1970.

10/ The term "productivity" refers mainly to the productivity of labour or the output per hour employed. The computation of productivity of labour in industry is a great problem due to the existence of many difficulties as regards the increase of prices, cost etc. (Review "Productivity". Greek Productive Centre. Athens, Greece, 1974. pp. 10-12).

where

Y : output level

L : employment

and

The productivity of capital

$$Q_2 = \frac{Y}{C} \qquad (2)$$

where

Y : output level

C : capital

Furthermore, the relationships (1) and (2) can be written as follows:

$$\frac{1}{Q_1} = \frac{L}{Y} \qquad (3)$$

and

$$\frac{1}{Q_2} = \frac{C}{Y} \qquad (4)$$

Thus, the relationships (3) and (4), an increase of productivity of labour, Q_1, and of capital, Q_2, respectively, that is, an increase of technological progress, mean either the same output level with smaller amounts of inputs used or the increase of output level with the same amounts of productive factors, capital and labour. This is illustrated diagrammatically in Fig. 1. Thus, diagrams 2a and 2b show the achievement of the same output level with smaller amounts of inputs used and the increase of output level with the same amounts of productive factors, respectively. The technological progress which influences only the output level by an increase of productivity of both inputs, while the proportional relationship of their amounts used remains constant, is called neutral change.[11/]

11/ Brown, M., On the Theory and Measurement of Technological Change. Cambridge, England. pp. 10-38.

Figure 1(a)

OUTPUT - INPUTS FUNCTIONS

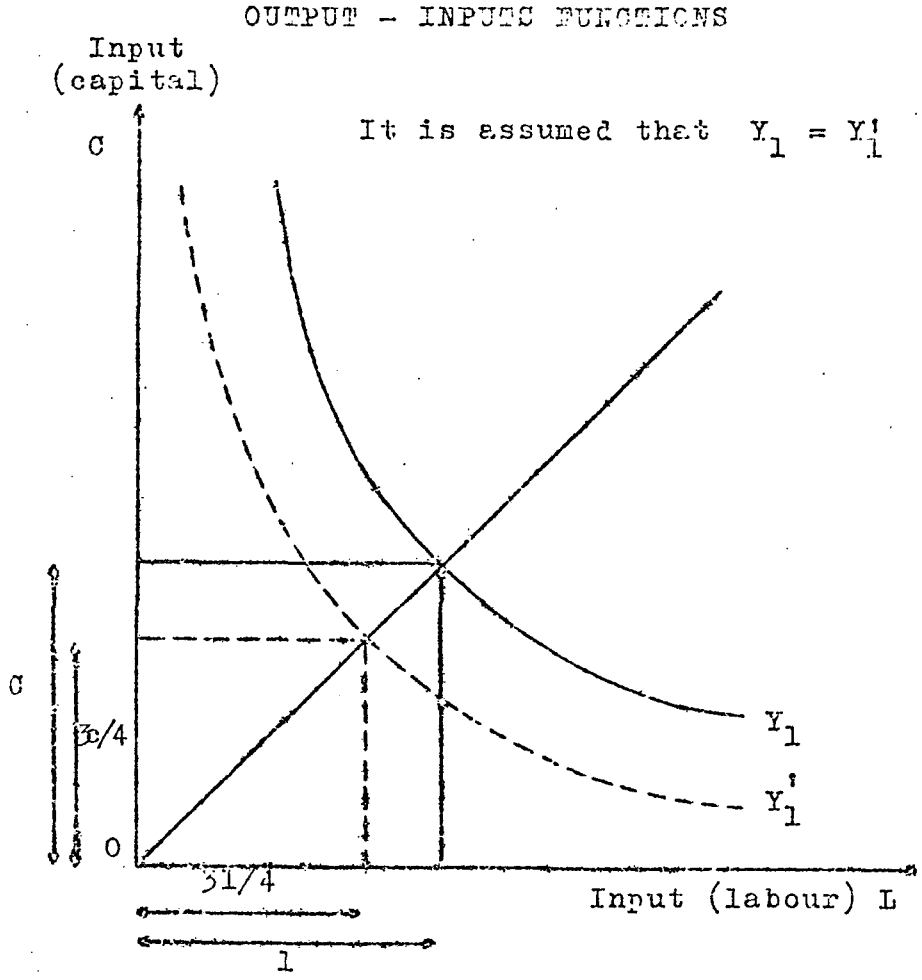
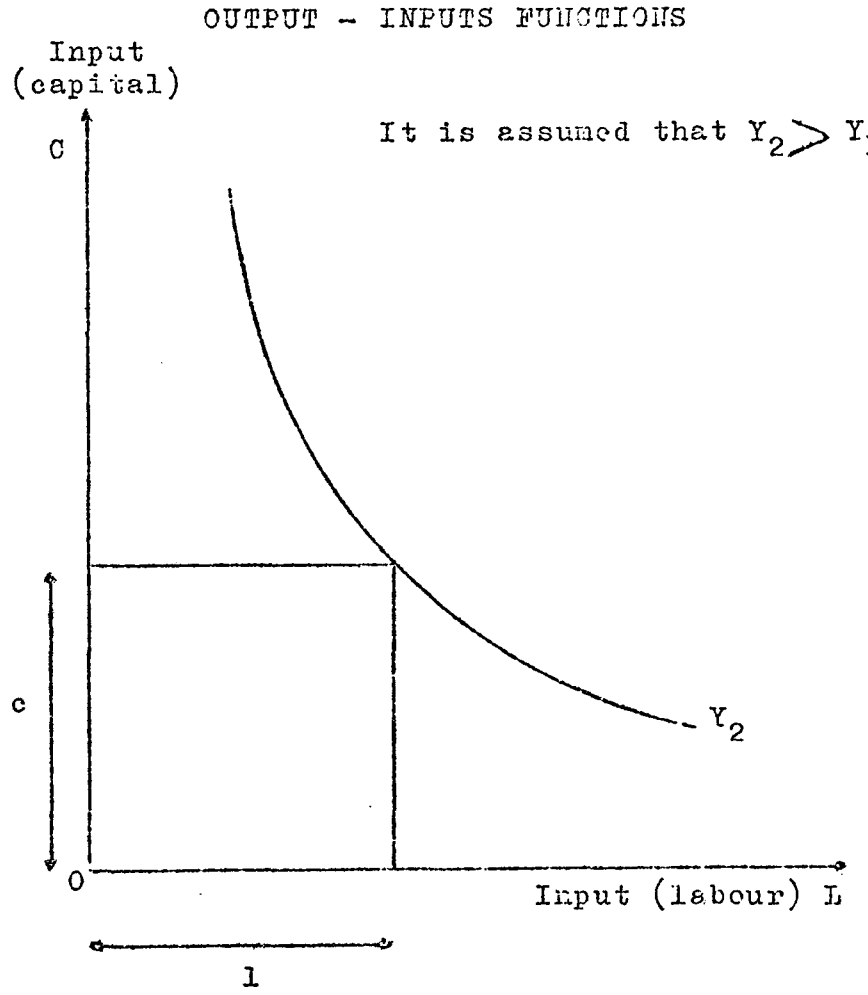


Figure 1(b)

OUTPUT - INPUTS FUNCTIONS



3.3.2. Theory of Production

On the basis of the theory of production, it comes that the changes of the output levels cause changes to the amounts of the productive factors used.[12] A diagrammatic illustration, Fig. 2, will help us to see these changes of amounts of factors caused by an increase or a decrease of the level of production. So we consider the two axis, horizontal and vertical, as representing the two inputs, capital, C and labour, L, respectively. Let us suppose that for the output level, Y_1, represented by its curve, the amount of the factors capital, C and labour, L, Oa_1 and Ob_1, are required. The ratio of these two amounts, Oa_1Ob_1, is given by the line, C_1L_1 and N_1 is the point of equilibrium.[13]

If we want to increase (or decrease) the output level as for instance, from Y_1 to Y_2 (or from Y_1 to Y_3), then the amounts used of inputs for this new level of production, will be Oa_2 and Ob_2 (or Oa_3 and O_{b3}) and the new point of equilibrium will be at N_2 (or N_3). Thus, we observe that an increase (or decrease) of output level will cause an increase (or decrease) of demand for the factors, capital, C and labour, L. In other words, the aforementioned ascertainment can be expressed as follows: the amount demanded of a productive factor is an increasing function of the output level.

Hence, in the case of labour we will have

$$L = f(Y) \qquad (1)$$

where

L : amount of labour

Y : output level

12/ Ferguson, G.E., Micro-Economic Theory. Texas, U.S.A., Richard D. Irwin Inc., 1969. pp. 159-164 and Sarantides, S. Publishing Co., Piraeus, 1971. pp. 231-235.

13/ The slope (negative) of the curve means that an increase of a factor causes a decrease of the other factor while its convexity shows the manner by which these changes take place.

and we specify that none of the variables may take negative values, i.e., L 0 and Y 0.

Furthermore, it is also known from the micro-economic theory that the amount demanded of a productive factor is a decreasing function of the price of this factor. To show this we assume a) the price of labour increases while the price of capital is fixed and b) the enterprise wants to keep the same level of production, i.e., Y_1. It is known that an increase of price of labour will cause on the one hand, a decrease of its amount used, i.e. from Ob_1 to Ob_4 and on the other hand, an increase of the amount of capital, i.e., from Oa_1 to Oa_4 due to the substitution of labour by capital, an effect which is called "substitution effect".[14] The ratio, Oa_4/Ob_4, is represented

14/ On the basis of the production function

$$Y_1 = f(C_1, L_1) \qquad (1)$$

the quantitative relationship between capital, C_1, and labour, L_1, given their changes C_1 and L_1, respectively and $Y_1=0$ in an iso-quant for instance, in Y_1, can be derived by differentiating the above function, i.e.

$$\frac{dY_1}{dC_1} \cdot C_1 + \frac{dY_1}{dL_1} L_1 = 0 \qquad (2)$$

From the equation (2) it comes

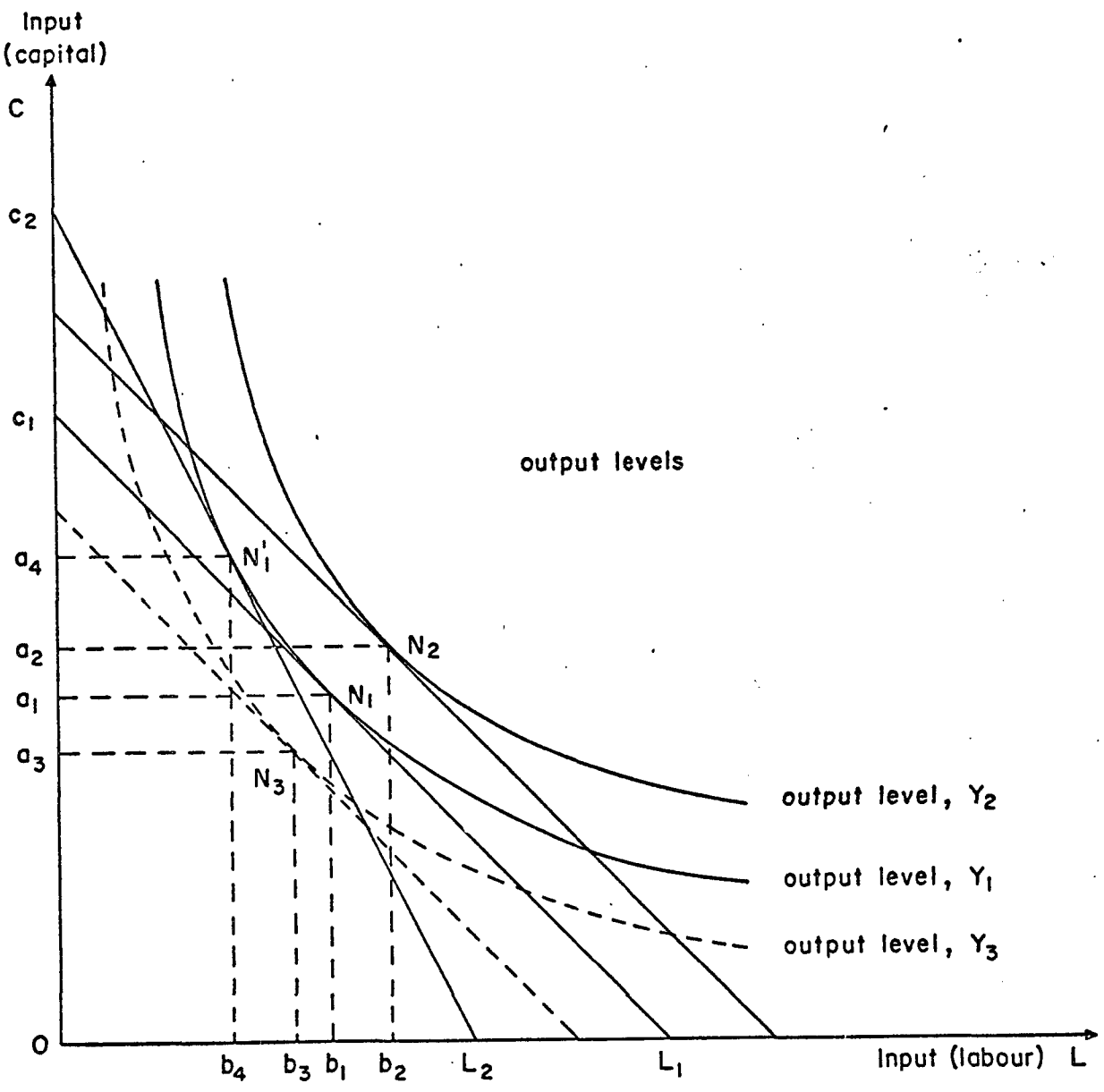
$$-\frac{L_1}{C_1} = -\frac{dY_1/dC_1}{dY_1/dL_1} \qquad (3a)$$

and

$$-\frac{C_1}{L_1} = -\frac{dY_1/dC_1}{dY_1/dC_1} \qquad (3b)$$

The ratio, C_1/L_1, is called marginal rate of substitution and it shows the rate of substitution of factor L_1 by the factor C_1 in the given point of curve, N_1. This ratio may be also constant or equal to zero.

Fig. 2. OUTPUT – INPUTS FUNCTIONS



by the line C_2L_2 and the new point of equilibrium will be at N_1'. So we can say that an increase in the price of labour caused a decrease of its amount used, the substitution of labour by capital and an increase of the amount used of capital. Thus, in the employment demand function, the determinative factor, price of labour, P, has an inverse correlation to the size of employment demand. Hence the employment demand function (1) can be written as follows:

$$L = f(Y,P) \qquad (2)$$

where

L,Y : as in relationship (1)

P : price of labour

and we specify on the basis of what we said previously, that the price of labour will take negative value, i.e., P 0.

3.4. Employment demand functions

3.4.1. Principal employment demand determinants

Here we will describe the main factors which seem to determine the size of employment demand in manufacturing industries. In section 3.2 we have already determined two main factors, output level, Y and price of labour, P, which affect the size of employment demand. This employment demand function is expressed in mathematical form as follows:

$$L = f\ (Y,P) \qquad (1)$$

where

L : Employment demand

Y : Output level

P : Price of labour

f : Symbol of function

Furthermore, in section 3.1 of the present Chapter it was said that by an increase of technological progress the same output level can be achieved with smaller amounts of productive factors used or to increase the output level without increasing

the amounts of inputs used. Therefore, the increase of technological progress, can be considered a determinative factor of employment demand.

A simple approach in order to present technological progress is to use a trend term.[15/] The use of this term is warranted by the fact that the technological progress is not achieved rapidly and its introduction in the industrial process takes place gradually. Thus, the function (1) can be written as follows:

$$L = f(Y, P, t) \qquad (2)$$

where

L,Y,P : as nn relationship (1)

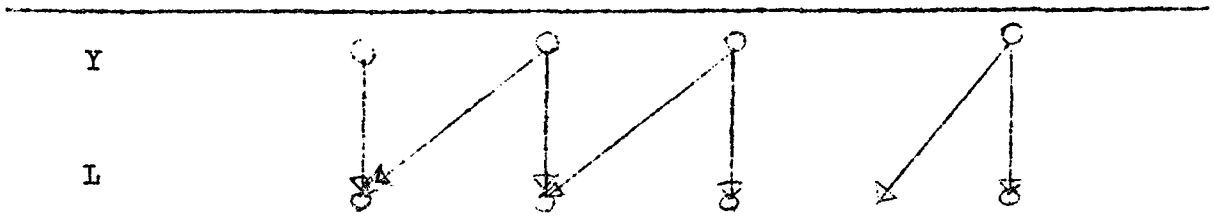
t : trend term $t=1,2,3,\ldots n$

The application of technological advances in industry, i.e. the increase of productivity of labour and capital will cause quantitative and structural (by age and sex) changes in manpower of industrial units. So we see that the technological progress will have a negative effect on the employment and consequently, we can say that the sign of coefficient of the term neutral technological progress, t, is expected to be negative.

The functions (1) and (2) express relationships between variables through time and they are based on the assumption that the value of explained variable in each period, for instance, a year, depends on the explanatory variables whose values have been formulated in the same period. But, it is known that the value of an explained variable may be affected by the values of explanatory variables in the previous periods, for instance, one, two years. On the basis of the related empirical research, the assumption that the employment depends also on the output level

15/ The trend elimination from explanatory variables is equivalent to introducing trend term into regression equation. (Tintner, G., Econometrics. John Wiley and Sons, Inc., New York, 1952. pp. 301-303.).

in the previous year seems to be obvious. This assumption in a schematic form is illustrated as follows:



Thus, the functional relationship (2), by the introduction of the variable, output level, in the previous year, can be written as follows:

$$L = f\ (Y, Y_{t-1}, P, t) \qquad (3)$$

where

Y, Y_t, t : as in relationship (2)

Y_{t-1} : output level lagged one year, t-1

The sign of coefficient of Y_{t-1} is expected to be the same with that of coefficient of ourput level in current period, Y.

Summarizing what we explained previously, we can say that the function (3) expresses that the employment demand in the modern sector of an economy depends on the factors (i) the output level in the current period (ii) the output level in the previous period (iii) the compensation of labour and (iv) the neutral technological progress. From all these factors affecting the employment demand, the increase of output level is expected to have the greatest positive effect, while the increase both of compensation of labour and technological progress will cause the two important negative effects without, of course, overlooking the importance of positive influence of the output level in the previous period and the variables which will be mentioned in the next sections, 4.2 and 4.3. This function is indicated both for an empirical analysis and for forecasts, because it includes the main determinants of employment and the variables, output level

lagged one year, Y_{t-1} and t, trend term, which make it a dynamic function. The above employment demand function (3), based on the explanatory variables which it involves, has been specified by Professors Klein, L.R. and Golberger, S.A. in their econometric model for the United States 1929-52 in the following form:16/

$$L = (\frac{W_o}{W}) (a_o + a_1 Y_1 + a Y_{t-1} + a_3 t) \qquad (4)$$

where

Y, Y_{t-1}, t : as in relationship (3)
W : labour compensation per person employed
W_o: price of output

Finally, it is considered advisable to mention here the function used by Ferber, H. and Verdorn, R. for the estimation of employment in the industrial sector of economy which is the following:17/

$$L = f (Y, Y_{t-1}) \qquad (5)$$

So we see that the function (5) includes as explanatory variables the output level in the current and previous period, i.e., only two variables, from four variables of the function (3). This function can be also used for the empirical analysis of the variable under study, employment, L, in a sample period and for its expected development in a post-sample period as it happens for the function (3).

16/ Klein, L.R. and Goldberger, S.A., An Econometric Model of the United States 1929-52. North-Holland Publishing Co., 1964. pp. 16-17.

17/ Ferber, R. and Verdorn, P., Research Methods in Economics and Business. MacMillan Publishing Co., New York, 1962. p. 374.

3.4.3. Other factors determining employment demand

Capital can also enter as merely determinant in an employment demand function. The importance of this factor increases more because as Solow, R. showed, capital used embodies technological progress which occurs over time.[1/] Of course, in these cases, a serious correlation problem arises and it refers to technological progress, which also enters in demand function as a trend term, and capital. This correlation, as it has been proved, is much stronger than the correlation of technological progress and output. In order to overcome the aforementioned difficulty for the statistical estimation of employment demand function, technological progress should be distinguished from quantity of capital. But, in a short period like sampling or forecasting period that will be used for the analysis of phenomenon under study, we believe that this confluence should not seriously affect its economic explanation and consequently we will not take away technological progress from capital. Certainly, capital coefficient will involve the influence of technological progress and its sign is expected to be positive.

Thus, the relationship (2) of section 2.1 of this Chapter can be written as follows:[2/]

$$L = f(Y,P,K,t) \qquad (1)$$

where

L,Y,P,t : as in the aforementioned relationship (2)

K : Capital

1/ Solow, R., "Investment and Technical Progress". Mathematical Methods in the Social Sciences. 1959, ed. Kenneth J. Arrow, Sanford, 1960. pp. 89-104.

2/ In many empirical research of employment demand function, capital stock, K^s, or capital stock lagged one year, K^s_{t-1}, instead of capital, K, is used. So, the functional relationship (1) can be written as follows:

$$L = f(Y, K^s, P, t) \qquad (1a)$$

or

$$L = f(Y, K^s_{t-1}, P, t) \qquad (1b)$$

where

L,Y,P,t : as in relationship (1)

K^s : Capital stock

K^s_{t-1} : Capital stock lagged one year, t-1

The changes which are caused in the quality of labour over time can be considered another factor of employment demand. It is knwon that training, experience, etc. of the workers employed in manufacturing production, in conjunction with the technological progress will surely improve the average quality of their work. Therefore, the size of employment demand can be regarded as a function of the average quality of labour.[1/]

$$L = f(I) \qquad (2)$$

where I : An index representing the changes in the average quality of labour.

Of course, the improvement of quality of labour on the average, will affect the employment demand negatively, i.e. the sign of the coefficient of this factor is expected to be negative.

Finally, the intensity of labour can be also considered a determinative factor of employment demand. The introduction of this factor in the estimated employment demand function presupposes the existence of statistical data on the variation in skill or intensity of labour, which are not available up to this moment as we said elsewhere in this study.

1/ In empirical research of employment demand function, an index representing the qualitative changes of labour over time enters as explanatory variable.

3.5. Classification of employment demand

It is known that in an industrial unit, production workers, salaried employees, owners, etc. are employed. Thus, the employment demand can be classified in two main categories: a) the employment of demand for production workers and b) the employment demand for overhead workers.[1] So we will have:

$$L_{it}^{w+s} = L_{it}^{w} + L_{it}^{s} \qquad (1)$$

where L_{it}^{w} and L_{it}^{s} stand for the employment demand for production and overhead workers respectively in industrial branch, i, and for given year, t, expressed in some labour units and the L_{it}^{w+s} is the sum of employment demand for production and overhead workers.[2] Furthermore, the employment demand of these two categories may refer to their structure by age and sex.[3]

Thus, the relationship (1) can be expressed as follows:

$$L_{it}^{w} = L_{it}^{wnl2} \qquad (2a)$$

$$L_{it}^{s} = L_{it}^{sml2} + L^{snl2} \qquad (2b)$$

and

$$L_{it}^{w+s} = L_{it}^{wml2} + L_{it}^{wnl2} + L_{it}^{sml2} + L_{it}^{snl2} \qquad (3)$$

where

L_{it}^{w+s}, L_{it}^{w}, L_{it}^{s} : as in relationship (2)

L_{it}^{wml2} : Employment demand for male production workers aged 12 and over

L_{it}^{wnl2} : Employment demand for female production workers aged 12 and over

---

1/ The designation, overhead workers or non-production workers, covers a wide range of activities: supervisor worker, office personnel, technicians, etc. which are paid by salary, the owners, non-compensated persons, etc. Oi, W., "In Labour as Quasi-Fixed Factor". Journal of Political Economy. December, 1962. pp. 538-555.

2/ Unfortunately, statistical data for working proprietors and non-compensated family members have not been tabulated in the censuses and industrial surveys for the countries to which the research will refer.

3/ The minimum age limit of a person to be counted as economically active is usually 12 years in Latin American countries.

L_{it}^{sml2} : Employment demand for male overhead workers aged 12 and over

L_{it}^{snl2} : Employment demand for female overhead workers aged 12 years and over

i : industrial branch i=1,2,3,...n

t : Time t=1,2,3,...k

We think that the analysis of employment demand by sex and age structure will give us a clear picture of over-all employment in the modern sector of an economy, because as it is known, the structure (age and sex) of industrial employment changes over time due to the industrial development and the increase of opportunity jobs both for males and for females. Furthermore, the distinction of employment between sexes will help us to study in more detail the employment for females whose participation in the productive process increases rapidly, but their compensation is lower compared with that of males due to legistative reasons and the quality of their work.

Finally, such an analysis of employment demand for male and female production workers and overhead workers and by age, will make it possible to estimate accurately the expected population movement towards industrial areas caused by employment demand increases, which is the second purpose of this study.

4. PROBLEMS OF SPECIFICATION AND ESTIMATION OF EMPLOYMENT DEMAND FUNCTIONS IN MANUFACTURING

4.1. Introduction

As it is known many problems, both from statistical and economic points of view, arise during the estimation of an economic function as it is the labour demand function. These problems refer mainly to

a) Specification of the model
b) Identification of the model, estimation of parameters, etc.
c) Use of available statistical data (time series or cross section data)
d) Quantitative measurement of the variables used.

The aforementioned problems affect the statistical results of the models used and consequently, it is possible that the conclusions of this work which of course will be based on such results, may not reflect reality as regards employment demand in manufacturing. Therefore, it is advisable to determine the consequences of these problems on the statistical results obtained before arriving to conclusions. In this chapter, these problems will be dealt with as they are related with the employment demand under study.

4.2. Specification of the model to be applied

It is known from the economic theory that the application of any relationship between variables in the empirical data, presupposes the expression of this relationship in mathematical form, that is to specify the model, with which the economic phenomenon under study will be investigated empirically.[1/] The specification of a model is based on the economic theory and on information relating to the phenomenon to be studied. The mathematical form may be a single one or a number of equations, linear or non-linear. The non-appropriate form of a model may lead to incorrect

1/ Koutsoyiannis, A., Theory of Econometrics. McMillan Publishing Co., London, 1973. p. 12.

statistical results and consequently, to unsafe conclusions from the economic point of view as regards the behaviour of particular phenomenon being studied. Furthermore, the specification problem of a relationship also involves: a) the number of explanatory variables which will be included in the model as well as their correlation. It is probable that many factors affect an economic phenomenon. The specification of some factors from the point of view of their quantitative measure is not possible. This is because some factors are qualitative factors, while for other factors, there are no statistical data available or their influence on the explained variable will be very small and consequently their statistical estimation is difficult and doubtful. Therefore, we usually try to introduce in the functional relationships to be tested the main factors which affect the variable under study, statistical data of which are available for measurement of these factors; b) the existence of a probable opposite direction correlation between explained and explanatory variables and c) the *a priori* theoretical expectations about the parameters estimates (sign and size) and the statistical criteria on the basis of which the model will be accepted from this point of view.

It is known that many of the basic ideas in economics are expressed in the form "given X we shall observe Y" as for instance in demand analysis. But it is often observed in economics that an interdependence between variables exists, and it happens in the employment demand function to be studied. In this function, there is also an influence running from output to employment as it is expressed by the production function. From these thoughts it comes the problem of choice technique of an equation or a system of equations for estimation of parameters of employment demand function. The estimation of the employment demand function by means of an equation presupposes that there is one functional relationship between variables of the function. In other words, the fluctuations of dependent variable depend on the changes of the explanatory variables, i.e. there is only one direction of the relationship. But, as we said previously, this does not exist in the employment demand function. Therefore, the estimation

of parameters of labour demand function must be made by a system of equations. In spite of this truth, the empirical research of employment demand as we saw in the review of the related research, chapter has been made by single equation least squares regression analysis. Furthermore, one of the purposes of this study is to predict the industrial employment demand in the coming years and many times the purpose of a study determines the choice technique for the estimation of the parameters of a function. Thus, the technique of least squares regression equation is the most indicated from this point of view. Finally, this technique has advantages as regards its computations and it gives best, linear and unbiased estimates of parameters of the employment demand function.[2] As regards the explanatory variables which affect employment demand, as we explained previously, all these variables cannot enter in the function to be estimated empirically. Therefore, an error term, e_i, is usually added to the functional relationship in order to catch any influence which has been omitted from this function as for instance, the influence of the variables omitted and the probable deviations between the shape of the assumed function and the true relationship.[3]

The assumptions both of the error term, e_i, and of a model of one equation, as it is the employment demand equation, which should be fulfilled for its estimation by the least squares technique, will be mentioned in section 4 of the present Chapter.

Finally, as for theoretical expectations about the size of parameters estimates, because their sign has been defined in the formulation of functional relationships, we will refer to during the analysis of the statistical results obtained of the equations applied.

2/ Koutsoyiannis-Kokkova, A., Production Function in Greek Industry. Center of Planning and Economic Research, Athens, Greeoe, 1964. pp. 103-105.

3/ Walters, A., An Introduction to Econometrics. McMillan Publishing Co., London, 1970. pp. 211-213.

4.3. Employment demand equations

Based on selection of the main explanatory variables, ..apter 3, and on what was explained in the previous section ..out the specification of the model for its empirical analysis, ..e employment demand equation to be used in the present research ..d in its linear form, will be the following:

$$L_t = b_o + b_1 Y_t + b_2 Y_{t-1} + b_3 P_t + b_4 L_{t-1} + b_5 K_t + b_6 t + e_t \qquad (1a)$$

Taking logarithms, the equation (1b) is written as follows:

$$\log L_t = \log b_o + b_1 \log Y_t + b_2 \log Y_{t-1} + b_3 \log P_t + b_4 \log L_{t-1} + b_5 \log K_t + b_6 \log t + e_t \qquad (1b)$$

Of course, the employment demand question 1(a-b) is in its general form from the point of view of the variables -factors which determine the employment demand but, as it is obvious, it cannot be tested statistically as a whole, due to the technical difficulties and the lack of adequate statistical data. Therefore, we will try to test this equation with some of the explanatory variables. Thus, it will come a number of simple employment demand equations tested. The statistical results obtained of these equations will make it possible to see what of these employment demand equations are suitable for their analysis of empirical data. Of course these simple equations for the study of the behaviour of employment in industry may lead to incorrect conclusions, concerning both the factors that determine the employment demand and the importance of their influence on it, but it is the only way for testing the aforementioned equation 1(a-b).

4.4. Assumptions of least squares technique

In this section the assumptions which refer to the error term, e_i, and the model of one equation will be described. The meaning and the consequences of these assumptions on the parameters estimates are also explained. Finally, mention will be made of the manner of testing the assumptions to be described. Thus,

a) The error term, e_i, is a random variable with normal distribution and the mean to be zero,[4] i.e. $E(e_i)=0$ for $i=1,2,3,...n$.

The fulfillment of this assumption requires to have unbiased parameters estimates of the equation.[5]

Furthermore, the relationship $E(e_i)=0$ also reflects the estimation of parameter constant, b_o, of a regression equation. Finally the assumption of normal distribution of the error term values, e_i, allows us the application of tests for the parameters estimates.[6]

b) The variance of this variable (e_i) to be fixed, i.e. $V(e_i)=S^2_{e_i}$ for $i=1,2,3,...n$. The fulfillment of this assumption requires to have best parameters estimates which means to have minimum variance of estimates in comparison with other estimates, i.e.

$$V(b_1) \leqslant V(b_1^*)$$

or

$$E(b_1-Eb_1)^2 \leqslant E(b_1^* - Eb_1^*)^2$$

4/ If $E(e_i)\neq 0$, then there will be a systematic error in the observations. In this case the estimation of true relationship in the population is not possible from this sample, without using more imformation about this error. (Drakatos, C., Econometrics, Vol. I. Kloukinas, S. Publishing Co., Athens, Greece, 1971. pp. 52-53).

5/ Unbiased estimates mean that the estimated value of parameter is equal to its real value, i.e. $E(b_1)=b_1$ for parameter b_1.

6/ Johnston, J., Econometric Methods. MacGraw Hill Company Inc., London, 1963. pp. 20-21.

where b_1^* is another estimate of b_1. If this assumption is not fulfilled, i.e. there is heteroscedasticity of distribution of random variable values, then the values of the tests which are applied for parameters estimates are under or over estimated.[7] To test this assumption, we compute the coefficient correlation, $R^2_{e.L}$ between the values of explained variable, L, and the values of random variable, e_i. The non-correlation between these two variables is an indication of fixed variance of error term, e_i.

c) The assumptions (a) and (b) can be written as follows:

$$e_i = N(0, S^2_{e_i})$$

The above expression can be read as the assumption that the values of the error term, e_i, are distributed normally with their mean to be zero and their variance to be fixed. The fulfillment of this assumption requires to have best unbiased parameters estimates of the equations as we explained previously.

d) The values of error term, e_i, are independent of one another, i.e. $E(e_i\ e_j)=0$ for all $i \neq j$. If this assumption is not valid, then the values of the error term, e_i, are autocorrelated.[8] When an autocorrelation between the values of error term, e_i, exists, then the variances of these values are large and the statistical tests cannot be applied efficiently on the parameters estimates of the equation.[9] On the other hand, safe conclusions cannot be arrived at as regards the explanation of the economic phenomena under study in the past on the basis of such inefficient parameters estimates and the making of forecasts as regards the expected development in the future based on these estimates will not be also accurate.[10] To test the autocorrelation of random

7/ Johnston, J., Econometric Methods. MacGraw Hill Company Inc., London, 1963. pp. 207-211.

8/ This assumption is often inappropriate to economic analysis when the observations consist of economic time series.

9/ Koutsoyiannis-Kokkova, A., Production Functions in Greek Industry. Center for Planning and Economic Research. Athens, Greece, 1964. pp. 109-110.

10/ Johnston, J., Econometric Methods, MacGraw Hill Company Inc., London, 1963. p. 179.

variable values, e_i, the Durbin-Watson and the Von Neumann's criteria are used. 11/ Here the Von Neumann's criterion is described -which is very similar to that of Durbin-Watson- and it will be used for the testing of auto-correlation. Thus, the Von Neumann's criterion is written as follows:

$$\frac{d^2}{s^2} = \frac{\sum(e_{it}-e_{it-1})^2}{\sum e_{it}^2} \cdot \frac{n}{n-1}$$

i.e. it is the ratio of the mean square successive difference to the variance corrected by the fraction $\frac{n}{n-1}$ for degrees of freedom. It is also assumed that $E(e_t, e_{t-1})=0$ for testing the statistical significance of this criterion.

e) The explanatory variables are assumed to be distributed independently of each other. If this assumption is not fulfilled, then we have the multicollinearity problem.12/ In this case it is not possible to isolate the contributions of the explanatory variables separately. Furthermore, multicollinearity affects increasingly the errors of parameters estimates and consequently, it creates doubts upon the significance of estimates.13/ The method used for examining the presence of multicollinearity in an equation consists of computing on the one hand, the intercorrelation coefficients, R^2, between the explanatory variables and on the other hand, the parcial correlation coefficients, r, between the explained and explanatory variables by using the Fisher and the t-student tests.14/

11/ "Testing for Serial Correlation in Least-Squares Regressions" Biometrica. Vols. I and II, 1950 and 1951.

12/ In the case of perfect multicollinearity the computation of parameters estimates cannot be made (Gamaletsos, Th., Econometrics. Papazissis Publishing Co., Athens, Greece, 1972. pp. 287-288).

13/ Drakatos, C., op. cit. pp. 67-68.

14/ Neisser, H. and Modigliani, F., National Income and International Trade. University of Illinois Press, Illinois, U.S.A., 1953. p. 220.

f) The values of explanatory variables are fixed numbers. The fulfillment of this assumption allows us to say that the random variable, e_i, is independently distributed with respect to explanatory variables.[15] The size of coefficient of multiple determination, R^2, will give us information about this assumption.

15/ If the random variable, e_i, is related to explanatory variables then the parameters estimates will be biased.

4.7. Quantitative measurement of the variables used

After the specification of the model to be applied, the statistical problems, etc. the last task is to define the quantitative expression of the various variables which will be used for the estimation of the employment demand functions. The main variables of employment demand function to be estimated as they have been defined in Chapter 3 are labour, output, price of labour, capital stock, and technological progress. Here, an effort has to be made to specify these variables from the point of view of their quantitative expression, taking into account, of course, the availability of statistical data which determine the best possible extension of measurement of these variables as well as the time period covered for the empirical analysis of employment demand functions in manufacturing.

4.7.1. Labour

For the measurement of labour, many difficulties are met because "standard labour units" with no variation in skill or intensity are not available. In the empirical analysis the number of persons employed and the total man hours worked, which is the most adequate approach for measurement of labour, because the "labour" appears in the sense of a flow concept, are indicated to be used.[1/] In the present research, we will use both the approaches, that is, the number of persons employed in the cases that statistical data of man hours worked are not available and man hors worked. Thus, on the basis of the statistical data derived by the censuses and sampling surveys on the modern sector of economy for the countries that this research will refer to, the labour will be expressed as the total annual number of persons employed or of man hours worked for production and overhead workers.[2/] Here it is advisable to mention that the

1/ Sarantides, S., An Introduction to Economic Analysis. Karaberopoulos Publishing Co., Piraeus, 1971. p. 264.

2/ In the case of overhead workers, the statistical data available refer to number of days worked, and for transforming these data to equivalent labour units, i.e. man hours worked, we used the base of eight hours per day for the period 1968-71. For the remaining years of the sampling period 1960-67 the number of man-hours worked was estimated on the basis of the available statistical data of number of overhead workers in conjunction with the man-hours worked by production workers.

variations in quality or intensity of labour which take place over time, are not taken into account by the aforementioned manner of its measurement due to non-availability of statistical data. This means that it is quite possible that many errors will be included in these labour measurements whose consequences on their accuracy may be serious.

.7.2. Output

- Our empirical research will refer to each industrial branch and it is known that a branch produces heterogeneous products. Therefore, the monetary measure of these products as a manner of their expression, can be considered the most indicated. Furthermore, the value added, instead of gross output in which the intermediate inputs are included, will be used as the output variable in the equations to be tested.[3] In the present work, output (value added) is measured in 1965 prices. Finally, the technological progress that takes place over-time, which probably results in an improvement of the average quality of output, has not been taken into consideration, due to the lack of statistical data and in a sampling period (1960-1972) as short period, such qualitative changes in the output cannot be considered as significant.

.7.3. The price of labour

The price of labour is average hourly earnings in the industrial production.[4] As average hourly earnings in the industry we compute the ratio of the sum of wages and salaries plus employer's contributions to security social institutions

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3/ In empirical research on production functions the use of the value added in indicated for many reasons. Kintis, A., The Demand for Labour in Greek Manufacturing. Center of Planning and Economic Research, Athens, Greece, 1973. pp. 78-79. The value added is defined as the difference between the gross output and the value of intermediate inputs.

4/ Resek, R., "Neutrality of Technical Progress". The Review of Economics and Statistics. Vol. XLV, February 1963. p. 59.

which is the total annual cost of labour, to the sum of annual number of hours worked by paid production workers and overhead workers.5/

So we have

$$P_{it}^{w+s} = \frac{\sum (W_{it} + S_{it} + C_{it}^{w+s})}{H_{it}^{w+s}} \qquad (1)$$

where

W : Annual wages — $t = 1,2,3...n$; $i = 1,2 \ldots k$

S : Annual salaries

C : Annual employer's contribution to security social institutions

H^w : Annual number of hours worked by paid production workers

H^s : Annual number of hours worked by paid overhead workers

t : time

i : industrial branch

5/ The average hourly earnings for production and overhead workers separately, the relationship (1) can be written as follows:

$$P_{it}^{w} = \frac{\sum (W_{it} + C_{it}^{w})}{H_{it}^{w}} \qquad (1)$$

and

$$P_{it}^{s} = \frac{\sum (S_{it} + C_{it}^{s})}{H_{it}^{s}} \qquad (2)$$

respectively.

Fortunately, statistical data on the components of relationships(1) are tabulated. The annual industrial surveys of National Statistical Institutes contain information as regards wages and salaries which include the worker's contribution to security social institutions. Furthermore, by adding the employer's contribution to security social institutions, so we have the total annual cost of labour.[6] Of course, the data of industrial surveys for wages and salaries are given at current prices and therefore, we deflated them by using the index of consumer, in order to obtain the wages and salaries series at constant prices. Statistical data of the components of relationship (1) for computation of the price of labour per hour worked for production and overhead workers as well as for the total annual cost of labour (production workers together with overhead workers) are included in Tables of Appendix 1.

.7.4. Stock of business capital

In the employment demand functions to be estimated we will use the capital stock instead of capital. This is for two reasons: i) time series data for capital as a whole of for its basic categories that it consists of and for the sampling period 1960-71 are not available; ii) in most of empirical research of employment demand functions, capital stock enters as an explanatory variable. Of course, for the quantitative measurement of all the variables of the model many difficulties are met, but most of the difficulties were met in an attempt to measure capital or capital stock both for manufacturing industries and for the economy as a whole. This is because, capital or capital stock relate to a point of time (at the end of a period) and it consists of a collection of heterogeneous capital equipment at various stages of its life cycles and at various degrees of

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6/ Statistical data for employer's contribution to security social institutions are available for the period 1968-71. For the rest of the years of the sampling period (1960-67) estimations about the employer's contribution have been made on the basis of data available.

obsolescence. Nor is it easy to give as Professor Robinson points out, a price measure because the relative prices of capital equipment are determined with the rate of future profit expectations.[7] Of course, without asserting that we overcome the aforementioned difficulties, we will try to have some measure of capital stock input on the basis of the information available. Industrial surveys give statistical data for capital stock, for its basic categories[8] at current prices, which were deflated by the indicated implicit deflator in order to obtain capital at constant prices and for the sampling period under study (1960-71). These data with their "innate weaknesses" are used in the present empirical analysis.

7/ Robinson, R., "The Production Function and the Theory of Capital". Review of Economic Studies. Vol. XXI, 1953-54. pp.

8/ They are i) materials; ii) work in process and iii) finished products.

4.8. Summary of variables used for the estimation of employment demand equation

The variables in the employment demand functions and in order of appearance are:

A. Variables in the employed labour force

1. L^W : Employment of production workers, thousands
2. L^W_{t-1} : Employment of production workers lagged one year, t-1, thousands
3. L^S : Employment of overhead workers, thousands
4. L^S_{t-1} : Employment of overhead workers, lagged one year, t-1, thousands
5. L^{W+S} : Employment of production and overhead workers, thousands
6. L^{W+S}_{t-1} : Employment of production and overhead workers lagged one year, t-1, thousands

B. Variables in the formulation of price of labour

1. W : Annual wages of production workers, at constant 1965 prices, in thousand escudos
2. S : Annual salaries of overhead workers, at constant 1965 prices, in thousand escudos
3. W+S : Sum of annual wages of production workers and annual salaries of overhead workers, at constant 1965 prices, in thousand escudos
4. C^W : Annual employer's contribution to security social institutions for production workers, at constant 1965 prices, in thousand escudos
5. C^S : Annual employer's contribution to security social institutions for overhead workers, at constant 1965 prices, in thousand escudos
6. C^{W+S} : Annual employer's contribution to security social institutions for production and overhead workers, at constant 1965 prices, in thousand escudos

7. $W+C^W$: Sum of annual wages of production workers and of employer's contribution to security social institutions for production workers, at constant 1965 prices, in thousand escudos

8. $S+C^S$: Sum of annual salaries of overhead workers and employer's contribution to security social institutions for overhead workers, at constant 1965 prices, in thousand escudos

9. $W+S+C^{W+S}$: Sum of annual wages of production workers, overhead workers, and employer's contribution to security social institutions for production and overhead workers, at constant 1965 prices, in thousand escudos

10. H^W : Annual number of hours worked by paid overhead workers

11. H^S : Annual number of hours worked by paid overhead workers

12. H^{W+S} : Annual number of hours workers by paid production and overhead workers

13. P^W : Price of labour per hour worked for production workers, at constant 1965 prices

14. P^S : Price of labour per hour worked for overhead workers, at constant 1965 prices

15. P^{W+S} : Price of labour per hour worked for production and overhead workers, at constant 1965 prices

C. Other variables used

1. Y : Output (value added), at constant 1965 prices, in million escudos

2. Y_{t-1} : Output (value added), at constant 1965 prices, in million escudos

3. K : Stock of business capital, at constant-1965 prices, in million escudos

4. K_{t-1} : Stock of business capital lagged one year t-1, at constant 1965 prices, in million escudos

5. I^C : Consumer price index

6. I^{C+d} : Implicit deflator of annual wages of production workers, overhead workers and employer's contribution to security social institutions for production and overhead workers, 100=1965

7. I^{o} : Whole sale price index for industrial products

8. I^{o+d} : Implicit deflator of stock of business, capital, 100=1965

Subscripts : They refer to the year t, or lagged one year, t-1.

5. EMPIRICAL ANALYSIS OF THE EMPLOYMENT DEMAND EQUATIONS IN MANUFACTURING

5.1. The estimation of the employment demand equations

In this section, the statistical estimates of the best fitting equations in linear and logarithmic form will be given. These equations explain the changes of the employment demand in manufacturing industries caused by the main determinants taken during the sample period 1960-71. All the equations were estimated by Ordinary Least Squares (OLS) and with time series data. The data are described in Appendix I. Together with the estimates of the equations, the criteria and the standard errors of structural coefficients on the basis of which the statistical significance of these equations will be tested are also given on the right-hand side of each equation and in parenthesis respectively.

5.1.1. The statistical estimates of the equations applied in Chilean manufacturing

Sixteen equations were estimated with time series data for the aggregate manufacturing sector and equations for twenty industrial branches.[1/] The statistical estimates of these equations both in linear and in logarithmic form are included in Table 1.1.1.

Some of the estimated equations refer to the aggregate employment demand (production and overhead workers) while the others deal with the demand for production workers and overhead workers separately. In these tables, the coefficient of determination. $\bar{R}^2$, the Von-Neumann's criterion, $d^s/_{S^2}$, and the standard errors of the parameters estimated in parenthesis are

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1/ The estimated equations for the aggregate manufacturing sector and for the industrial branches explain the employment demand in the industrial units employing 50 persons (and over) and 10 persons (and over) respectively during the sample period 1960-71. The industrial units employing 10 persons and over are referred by the term "large-scale manufacturing". The twenty industrial branches whose employment demand will be investigated for only some branches, are mentioned in Table of Appendix I.

also included. A detailed analysis of the obtained statistical results of the equations as they are included in Tables 1.1.1. and 1.1.2. for the testing of the statistical significance of the equations, that will make it possible to see the ability of the equations to explain the behaviour of employment demand in manufacturing in the past, and to select these equations for making forecasts as regards the expected development of the employment demand in the future will be made in the next section.

Table 5.1.1.1.

THE BEST FITTING EMPLOYMENT DEMAND EQUATIONS IN LINEAR FORM AND FOR THE AGGREGATE CHILEAN MANUFACTURING DURING THE PERIOD EXAMINED 1960-1971

Number of estimated equations	Employment demand L	Intercept	Explanatory Variables Y	K^S	K^S_{t-1}	L_{t-1}	Y_{t-1}	P	$\bar{R}^2$ (1)	$d^S/_S{}^2$ (2)
	Production and overhead workers									
1		6.006	0.042 (0.004)						0.916	1.699
2		49.717	0.016 (0.007)	0.052 (0.012)					0.968	2.041
3		30.514	0.027 (0.008)		0.031 (0.017)				0.933	2.505
4		2.807	0.019 (0.009)			0.564 (0.219)			0.947	2.866
5		9.854				0.451 (0.199)	0.024 (0.008)			
6		35.285	0.011 (0.007)			0.289 (0.169)		-8.910 (4.781)	0.976	2.694
	Production workers									
7		20.169	0.031 (0.003)						0.895	1.843
8		57.316	0.009 (0.005)	0.044 (0.010)					0.964	2.114
9		37.022	0.021 (0.007)		0.022 (0.015)				0.906	2.522

(continued)

Table 5.1.1.1. (Continued)

Number of estimated equations	Employment demand L	Intercept	Explanatory variables: Y	K	K_{t-1}	L_{t-1}	Y_{t-1}	P	$\bar{R}^2$ (1)	$d^S/_{S^2}$ (2)
	Production workers									
10		11.218	0.017 (0.008)			0.460 (0.250)			0.916	2.880
11		19.236				0.335 (0.234)	0.021 (0.007)		0.932	2.946
12		54.261	0.008 (0.005)	0.058 (0.014)		0.058 (0.188)		-9.416 (4.784)	0.970	2.566
13	Overhead workers	-14.801	0.011 (0.001)						0.922	1.511
14		- 7.417	0.007 (0.002)	0.009 (0.005)					0.938	1.960
15		- 6.322	0.006 (0.002)		0.011 (0.004)				0.958	1.999
16		- 3.079				0.665 (0.173)	0.004 (0.002)		0.973	1.881

Table 5.1.1.2.

THE BEST FITTING EMPLOYMENT DEMAND EQUATIONS IN THE LOGARITHMIC FORM AND FOR THE AGGREGATE CHILEAN MANUFACTURING DURING THE PERIOD EXAMINED, 1960-1971

Number of estimated equation	Employment demand L	Intercept	Explanatory Variables					$\bar{R}^2$ (1)	d^2/s^2 (2)
			Y	K^s	K^s_{t-1}	L_{t-1}	Y_{t-1}		
	Production and overhead workers								
1		-1.13729	0.93732 (0.08254)					0.921	1.560
2		-0.18039	0.33434 (0.17628)	0.39683 (0.11008)				0.964	1.961
3		-0.52221	0.56200 (0.22125)		0.24368 (0.13524)			0.935	2.242
4		-0.49612	0.39146 (0.17998)			0.59635 (0.18562)		0.959	2.886
5		-0.44478				0.52293 (0.17321)	0.42597 (0.15374)	0.966	3.111
	Production workers								
6		-0.87470	0.84160 (0.08312)					0.902	1.660
7		-0.31107	0.49768 (0.22961)		0.22329 (0.14035)			0.915	2.345
8		-0.44383	0.40986 (0.19101)		0.52503 (0.21697)			0.934	2.933
9		-0.37529			0.44442 (0.20822)	0.44326 (0.16780)		0.944	3.023

(continued)

Table 5.1.1.2. (Continued)

Number of estimated equation	Employment demand L	Intercept	Explanatory Variables: Y	K^s	K^s_{t-1}	L_{t-1}	Y_{t-1}	$\bar{R}^2$ (1)	d^2/s^2 (2)
10	Overhead workers	-3.52480	1.38743 (0.11211)					0.933	1.523
11		-2.64151	0.84846 (0.29403)		0.34993 (0.17973)			0.947	1.726
12		-2.37422				0.91195 (0.17315)	0.50970 (0.15369)	0.984	2.047

Table 5.1.1.1.3

THE BEST FITTING EMPLOYMENT DEMAND EQUATIONS IN LINEAR FORM AND FOR THE BRANCHES WOOD AND CORK IN CHILEAN MANUFACTURING DURING THE PERIOD EXAMINED, 1960-1967

Number of estimated equation	Employment demand L	Intercept	Explanatory variables							$\bar{R}^2$ (1)	d^2/s^2 (2)
			Y	K^s	K^s_{t-1}	L_{t-1}	Y_{t-1}	P	t		
	Production and over-head workers										
1		4.866	0.033 (0.008)							0.671	1.872
2		0.062	0.079 (0.031)						-0.720 (0.458)	0.737	2.562
3		-2.417	0.063 (0.035)				0.087 (0.055)	-3.298 (2.018)	-1.645 (1.019)	0.794	3.201
4		6.810	0.040 (0.008)					-2.366 (1.308)		0.762	2.069
5		5.507	0.021 (0.015)			0.688 (0.462)		-4.239 (1.720)		0.808	3.334
	Production workers										
6		4.614	0.027 (0.008)							0.632	1.886
7		0.505	0.067 (0.029)						-0.616 (0.425)	0.689	2.507
8		6.480	0.032 (0.007)					-2.360 (1.435)		0.713	2.072

(continued)

Table 5.1.1.3. (Continued)

Number of estimated equation	Employment demand L	Intercept	Explanatory variables							$\bar{R}^2$ (1)	d^2/s^2 (2)
			Y	K_s	K^s_{t-1}	L_{t-1}	Y_{t-1}	P	t		
	Overhead workers										
9		0.214	0.006 (0.001)							0.781	1.611
10		-0.553	0.013 (0.004)						-0.115 (0.054)	0.864	2.987
11		0.436	0.007 (0.001)					-0.152 (0.061)		0.883	2.340
12		-0.431	0.004 (0.001)	0.025 (0.014)						0.842	2.040
13		-1.098	0.011 (0.003)	0.023 (0.008)					-0.101 (0.036)	0.940	2.446
14		-1.643	0.010 (0.003)	0.024 (0.007)			0.010 (0.004)	-0.127 (0.073)	-0.229 (0.070)	0.968	3.444

Table 5.1.1.4

THE BEST EMPLOYMENT DEMAND EQUATIONS IN LINEAR FORM AND FOR SOME BRANCHES IN CHILEAN MANUFACTURING DURING THE PERIOD EXAMINED, 1960-1971

Employment Demand L Branches	Inter-cept	Explan-atory Variable Y	$\bar{R}^2$ (1)	d^2/S^2 (2)
Production and overhead workers				
Food manufacturing industries, except beverage industries	27.772	0.028 (0.006)	0.751	2.164
Manufacture of textiles	16.685	0.048 (0.005)	0.936	1.735
Manufacture of footwear, other wearing apparel and made-up textile goods	9.329	0.022 (0.007)	0.567	1.474
Manufacture of chemicals and chemical products	9.736	0.018 (0.006)	0.568	1.517
Manufacture of metal products except machinery and transport equipment	12.546	0.030 (0.008)	0.638	1.111
Manufacture of machinery, except of electrical machinery	4.622	0.044 (0.009)	0.752	1.741
Manufacture of transport equipment	5.348	0.033 (0.004)	0.917	2.538
Beverage industries	5.030	0.011 (0.003)	0.575	1.484
Production workers				
Food manufacturing	20.935	0.020 (0.004)	0.732	2.090
Manufacture of textiles	17.246	0.037 (0.005)	0.904	2.483
Overhead workers				
Food manufacturing	0.598	0.011 (0.001)	0.892	3.108
Manufacture of textiles	-0.505	0.010 (0.001)	0.931	2.052

5.2. Statistical significance of the equations

Here, the statistical significance of the equations estimated on the basis of the statistical results obtained and the indicated criteria will be tested. Thus, firstly, we will test the consistency of the statistical estimates of the structural coefficients with the a priori expectations -economic theory on the basis of which the equations were formulated and as it is known consistency refers both to the sign and the size of the parameters estimates. Furthermore, the linear influence of the explanatory variables on the explained variable will be tested, taking into consideration the proportion of the variance of this variable. As a measure of this proportion of the variance, the coefficient of multiple determination, R^2, will be used.[1] The "F" distribution will be taken into account for testing the statistical significance of the coefficient of determination, R^2, at a level of 5 percent or less. The reliability of the parameters estimates of each equation estimated will be tested on the basis of their standard errors which are cited in parenthesis below the corresponding estimates and by the use of the t-student criterion at a level of 5 percent or less. Finally, the autocorrelation and multicollinearity problems will be examined. Thus, i) for the testing of the serial correlation we will use the Von Neumann's ratio, $d^2/_S2$, and at the level of 5 percent;[2] ii) for the testing of the existence of multicollinearity we will compute, on the one hand, the intercorrelation coefficient, R^2, between the explanatory variables and on the other hand, the partial correlation coefficients, r, between the explained and explanatory variables.[3]

1/ Drakatos, C., Econometrics. Klukinas, S. Publishing Co., Athens, Greece, 1971. pp. 23-37.

2/ Significance levels for the ratio, $d^2/_S2$, have been calculated by B. Hart: "Significance levels for the ratio of the mean square successive difference to the variance". Mathematical Statistics, Vol. 13, 1972. p. 446.

3/ Neisser, H. and Modigliani, F., National Income and International Trade. University of Illinois Press, Illinois, U.S.A., 1953. p. 220.

A P P E N D I X

Table 1

DATA USED TO ESTIMATE THE VARIABLES OF THE EMPLOYMENT (PRODUCTION AND OVERHEAD WORKERS) DEMAND EQUATIONS IN THE CASE OF CHILE DURING THE SAMPLING PERIOD 1960-1971

		at current prices					at constant 1965 prices				(8):(9)
n/n	Year t	L^{w+s} (in thousands) (1)	L^{w+s}_{t-1} (in thousands) (2)	W+S (in thousand Escudos) (3)	C^{w+s} (in thousand Escudos) (4)	W+S+C^{w+s} (in thousand Escudos) (5)	W+S (in thousand Escudos) (6)	C^{w+s} (in thousand Escudos) (7)	W+S+C^{w+s} (in thousand Escudos) (8)	H^{w+s} (in thousands) (9)	P^{w+s} (in Escudos) (10)
1	1960	151	149	159 005	48 088	207 093	529 328	160 085	689 413	339 958	2.03
2	1961	153	151	192 115	58 140	250 255	593 827	179 711	773 538	340 770	2.27
3	1962	161	153	247 821	74 928	322 749	672 586	203 355	875 941	371 465	2.35
4	1963	169	161	355 779	107 432	463 211	668 865	201 972	870 837	401 592	2.17
5	1964	182	169	553 747	166 996	720 743	713 226	215 091	928 317	433 256	2.14
6	1965	192	182	868 117	261 041	1129 158	868 117	261 041	1129 158	452 916	2.49
7	1966	199	192	1 280 128	384 982	1665 110	1042 024	313 375	1355 400	479 121	2.83
8	1967	207	199	1 787 362	538 217	2325 579	1231 492	370 832	1602 324	496 785	3.23
9	1968	241	207	2 819 501	800 730	3620 231	1533 809	435 597	1969 406	536 943	3.67
10	1969	237	241	3 787 190	1146 735	4933 925	1575 471	477 042	2052 513	542 226	3.79
11	1970	244	237	5 662 902	1 707 571	7370 473	1778 151	536 177	2314 329	555 178	4.17
12	[illegible]	[illegible]	244	9.016 806	2 854 941	11871 747	2353 386	745 140	3098 526	562 773	5.51

Source:
1. Instituto Nacional de Estadísticas, Industrias Manufactureras, Años 1960-61-62-63-64, 1965, 1966, 1967, 1968, 1969, 1970 y 1971, Santiago, Chile (Establecimientos de 50 y más personas).
2. Corporación de Fomento de la Producción, Datos básicos sobre el sector industrial manufacturero, Período 1960-1970, Publicación N° 22-A/71, Santiago, Chile.
3. Oficina de Planificación Nacional, Antecedentes sobre el desarrollo chileno 1960-1970, Santiago, Chile, 1971.

Table 2

DATA USED TO ESTIMATE THE VARIABLES OF THE EMPLOYMENT (PRODUCTION WORKERS) DEMAND EQUATIONS IN THE CASE OF CHILE DURING THE SAMPLING PERIOD 1960-1971

		at current prices					at constant 1965 prices				(8):(9)
n/n	Year t	L^W (in thousands) (1)	L^W_{t-1} (in thousands) (2)	W (in thousand Escudos) (3)	C^{W} a/ (in thousand Escudos) (4)	$W+C^W$ (in thousand Escudos) (5)	W (in thousand Escudos) (6)	C^W (in thousand Escudos) (7)	$W+C^W$ (in thousand Escudos) (8)	H^W (in thousands) (9)	P^W in Escudos (10)
1	1960	127	125	102 847	32 476	135 323	342 378	108 113	450 490	285 662	1.58
2	1961	128	127	124 536	39 353	163 889	384 941	121 640	506 581	284 952	1.78
3	1962	135	128	158 781	50 175	208 956	430 932	136 175	567 107	311 519	1.82
4	1963	141	135	224 360	70 898	295 258	421 797	133 288	555 085	335 316	1.66
5	1964	149	141	344 334	108 779	453 113	443 502	140 107	583 609	355 912	1.63
6	1965	155	149	518 544	163 860	682 404	518 544	163 860	682 404	365 966	1.86
7	1966	161	155	765 966	242 045	1 008 011	623 496	197 025	820 521	387 103	2.12
8	1967	168	161	1 087 641	343 695	1 431 336	749 385	236 806	986 191	403 334	2.45
9	1968	198	168	1 704 352	509 759	2 214 111	927 167	277 309	1 204 476	441 026	2,73
10	1969	189	198	2 255 617	718 002	2 973 619	938 337	298 689	1 237 026	432 320	2.86
11	1970	194	189	3 320 852	1 077 248	4 398 100	1 042 748	338 256	1 381 003	442 101	3.12
12	1971	197	194	5 451 641	1 773 772	7 225 413	1 422 878	462 954	1 885 833	449 126	4.20

Source: 1. Instituto Nacional de Estadísticas, Industrias Manufatureras, Años 1960-61-62-63-64, 1965, 1966, 1967, 1968, 1969, 1970 y 1971. Santiago, Chile (Establecimientos de 50 y más personas).
2. Corporación de Fomento de la Producción, Datos básicos sector industrial manufacturero, Período 1960-1970, Publicación N° 22-A/71, Santiago, Chile.
3. Oficina de Planificación Nacional, Antecedentes sobre el desarrollo chileno 1960-1970, Santiago, Chile, 1971.

a/ 1960-1967: Estimations.

Table 3

DATA USED TO ESTIMATE THE VARIABLES OF THE EMPLOYMENT (OVERHEAD WORKERS) DEMAND EQUATIONS IN THE CASE OF CHILE DURING THE SAMPLING PERIOD 1960-1971

		at current prices					at constant 1965 prices				(8):(9)
n/n	Year t	L^s (in thousands)	L^s_{t-1} (in thousands)	S (in thousand Escudos)	C^{s} [a] (in thousand Escudos)	$S+C^s$ (in thousand Escudos)	S (in thousand Escudos)	C^s (in thousand Escudos)	$S+C^s$ (in thousand Escudos)	H^s (in thousands)	P^s (in Escudos)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	1960	24	22	56 158	15 612	71 770	186 950	51 972	238 922	53 936	4.43
2	1961	25	24	67 579	18 787	86 366	208 887	58 071	266 957	55 818	4.78
3	1962	26	25	89 040	24 753	113 793	241 655	67 180	308 834	59 946	5.15
4	1963	28	26	131 419	36 534	167 953	247 068	68 684	315 752	66 276	4.76
5	1964	32	28	209 414	58 217	267 631	269 725	74 983	344 709	77 344	4.46
6	1965	37	32	349 573	97 181	446 754	349 573	97 181	446 754	86 950	5.14
7	1966	38	37	514 163	142 937	657 100	418 529	116 351	534 879	92 018	5.81
8	1967	39	38	699 721	194 522	894 243	482 108	134 026	616 133	93 451	6.59
9	1968	43	39	1 115 149	290 970	1 406 119	606 641	158 288	764 929	95 917	7.97
10	1969	48	43	1 531 573	428 733	1 960 306	637 134	178 353	815 487	109 906	7.42
11	1970	50	48	2 342 050	630 323	2 972 373	735 404	197 921	933 325	113 077	8.25
12	1971	50	50	3 565 165	1 081 169	4 646 334	930 508	282 185	1 212 693	113 647	10.67

Sources:
1. Instituto Nacional de Estadísticas, Industrias Manufactureras, Años 1960-61-62-63-64, 1965, 1966, 1967, 1968, 1969, 1970 y 1971, Santiago, Chile (Establecimientos de 50 y más personas).
2. Corporación de Fomento de la Producción, Datos básicos, sector industrial manufacturero, Período 1961-1971, Publicación N° 22-A/71, Santiago, Chile.
3. Oficina de Planificación Nacional, Antecedentes sobre el desarrollo chileno 1960-1970, Santiago, Chile, 1971.

a/ 1960-1967: Estimations.

Table 4

DATA USED OF SOME EXPLANATORY VARIABLES OF THE EMPLOYMENT DEMAND EQUATIONS IN THE CASE OF CHILE DURING THE SAMPLING PERIOD 1960-1971

n/n	Year t	Y (in million Escudos) (1)	Y_{t-1} (in million Escudos) (2)	K (in million Escudos) (3)	K_{t-1} (in million Escudos) (4)	K (in million Escudos) (5)	K_{t-1} (in million Escudos) (6)	I^c (7)	I^{c+d} (8)	I^o (9)	I^{o+d} (10)
1	1960	3 207	2 952	263	231	873	788	11.6	332.9	2.9	331.3
2	1961	3 484	3 207	300	263	986	873	7.7	309.1	0.9	328.4
3	1962	3 885	3 484	387	300	1 163	986	13.9	271.4	9.3	300.4
4	1963	4 049	3 885	577	387	1 133	1 163	44.3	188.0	52.9	196.5
5	1964	4 293	4 049	893	577	1 143	1 133	46.0	128.8	53.5	128.0
6	1965	4 567	4 293	1 283	893	1 283	1 143	28.8	100.0	28.0	100.0
7	1966	4 959	4 567	1 780	1 283	1 387	1 283	22.9	81.4	28.3	77.9
8	1967	5 100	4 959	2 329	1 780	1 479	1 387	18.1	68.9	22.8	63.5
9	1968	5 225	5 100	4 112	2 329	1 994	1 479	26.6	54.4	30.9	48.5
10	1969	5 380	5 225	5 486	4 112	1 964	1 994	30.7	41.6	35.6	35.8
11	1970	5 366	5 380	7 441	5 486	1 942	1 964	32.5	31.4	37.2	26.1
12	1971	5 910	5 366	10 414	7 441	2 187	1 942	20.1	26.1	24.1	21.0

Source: 1. Instituto Nacional de Estadísticas, Industrias Manufactureras, Años 1960-61-62-63-64, 1965, 1966, 1967, 1968, 1969, 1970 y 1971, Santiago, Chile (Establecimientos de 50 y más personas).
2. Corporación de Fomento de la Producción, Datos básicos sobre el sector industrial manufacturero, Período 1960-70, Publicación N° 22-A/71, Santiago, Chile.
3. Oficina de Planificación Nacional, Antecedentes sobre el desarrollo chileno 1960-1970, Santiago, Chile, 1971.

Note: The variables stock of business capital, K, and stock of business capital, K_{t-1} in columns (3) and (4) respectively are expressed at current prices.

Table 5

DATA USED TO ESTIMATE THE VARIABLES OF EMPLOYMENT (PRODUCTION AND OVERHEAD WORKERS) DEMAND EQUATIONS AND FOR SOME BRANCHES IN CHILEAN MANUFACTURING DURING THE SAMPLE PERIOD 1960-1967

n/n	Branch		Years							
			1960	1961	1962	1963	1964	1965	1966	1967
1.	Food manufacturing industries, except beverage industries	L^{W+S}	35	34	33	36	37	39	39	40
		L^{W}	30	29	28	30	31	32	33	33
		L^{S}	5	5	5	5	6	6	7	7
		Y	399	416	446	449	469	532	594	611
2.	Manufacture of textiles	L^{W+S}	35	35	35	37	39	41	42	44
		L^{W}	32	31	32	33	35	36	37	39
		L^{S}	3.2	3.3	3.4	3.6	4.1	4.4	4.7	5.2
		Y	359	380	403	454	462	501	533	558
3.	Beverage industries	L^{W+S}	6.1	6.3	6.8	7.1	6.8	6.9	7.3	7.5
		Y	133	140	143	146	144	189	211	215
4.	Manufacture of footwear, other wearing apparel and made-up textile goods	L^{W+S}	19	21	21	20	20	21	22	22
		Y	445	498	530	535	528	526	563	560
5.	Manufacture of chemicals and chemical products	L^{W+S}	11.4	12.0	13.3	14.1	14.7	14.8	15.1	16.3
		Y	173	181	186	193	194	296	340	336
6.	Manufacture of metal products, except machinery and transport equipment	L^{W+S}	15.6	16.4	17.5	19.7	21.1	21.6	21.7	19.9
		Y	128	155	176	210	227	256	284	320

(continued)

Table 5 (Continued)

n/n	Branch		Years							
			1960	1961	1962	1963	1964	1965	1966	1967
7.	Manufacture of machinery, except of electrical machinery	L^{w+s}	8.5	8.2	8.0	9.0	10.5	11.4	11.3	11.0
		Y	75	84	104	111	114	142	151	152
8.	Manufacture of transport equipment	L^{w+s}	10.3	11.7	13.5	13.4	15.5	16.3	17.2	18.6
		Y	166	191	241	258	265	298	379	394

Sources: 1. Dirección de Estadística y Censos, Industrias Manufactureras, Años 1960-61-62-63-64, 1965, 1966 y 1967 (Establecimientos de 10 y más personas ocupadas). Santiago, Chile.
2. Corporación de Fomento de la Producción, Datos básicos sobre el sector industrial manufacturero, Período 1960-1970. Publicación N° 22 - A/71. Santiago, Chile.

Note: Employment in thousands of persons.
Value added in million Escudos at constant 1965 prices.

Table 6

THE MAIN BRANCHES IN CHILEAN MANUFACTURING, THEIR CODE NUMBERS AND THEIR EMPLOYED PERSONS IN THE YEAR 1967

n/n	Code number	Branches[a]	Number of employed persons (in thousands)
1	20	Food manufacturing industries, except beverage industries	39.6
2	21	Beverage industries	7.5
3	22	Tobacco manufactures	1.2
4	23	Manufacture of textiles	43.9
5	24	Manufacture of footwear, other wearing apparel and made-up textile goods	22.4
6	25	Manufacture of wood and cork, except manufacture of furniture	10.6
7	26	Manufacture of furniture and fixtures	4.5
8	27	Manufacture of paper and paper products	4.7
9	28	Printing, publishing and allied industries	9.2
10	29	Manufacture of leather and leather and fur products, except footwear and other wearing apparel	3.7
11	30	Manufacture of rubber products	3.6
12	31	Manufacture of chemicals and chemical products	16.3
13	32	Manufacture of products of petroleum and coal	1.3
14	33	Manufacture of non-metallic mineral products except products of petroleum and coal	13.1
15	34	Basic metal industries	13.3
16	35	Manufacture of metal products except machinery and transport equipment	20.0
17	36	Manufacture of machinery, except electrical machinery	11.0
18	37	Manufacture of electrical machinery, apparatus, appliances and supplies	7.9
19	38	Manufacture of transport equipment	18.6
20	39	Miscellaneous manufacturing industries	8.3
	2-3	MANUFACTURING	260.5

Source: Instituto Nacional de Estadísticas y Censos, Industrias Manufactureras, Año 1967, Santiago, Chile.

a/ Includes industrial Units employing 10 persons and over, i.e. the "large-scale" manufacturing.

Table 7

DATA USED TO ESTIMATE THE VARIABLES OF THE EMPLOYMENT (PRODUCTION AND OVERHEAD WORKERS) DEMAND EQUATIONS AND FOR THE BRANCHES WOOD AND CORK DURING THE SAMPLE PERIOD 1960-1967

				at current prices			at constant 1965 prices				(8):(9)
n/n	Year t	L^{w+s} (in thousands) (1)	L^{w+s}_{t-1} (in thousands) (2)	W+S (in thousand Escudos) (3)	C^{w+s} (in thousand Escudos) (4)	W+S+C^{w+s} (in thousand Escudos) (5)	W+S (in thousand Escudos) (6)	C^{w+s} (in thousand Escudos (7)	W+S+C^{w+s} (in thousand Escudos) (8)	H^{w+s} (in thousands) (9)	P^{w+s} (in Escudos) (10)
1	1960	9.3	9.0	5 818	1 785	7 603	19 368	5 942	25 310	20 754	1.22
2	1961	9.5	9.3	7 117	2 181	9 298	21 999	6 741	28 740	21 406	1.34
3	1962	8.6	9.5	7 544	2 307	9 851	20 474	6 261	26 726	20 144	1.33
4	1963	9.9	8.6	11 863	3 619	15 482	22 302	6 804	29 106	24 034	1.21
5	1964	11.5	9.9	18 094	5 520	23 614	23 305	7 110	30 415	26 909	1.13
6	1965	12.1	11.5	27 879	8 471	36 350	27 879	8 471	36 350	28 811	1.26
7	1966	12.5	12.1	41 311	12 581	53 892	33 327	10 241	43 868	29 004	1.51
8	1967	10.6	12.5	50 570	15 422	65 992	34 843	10 626	45 468	24 598	1.85

Sources:
1. Dirección de Estadística y Censos, Industrias Manufactureras, Años 1960-61-62-63-64, 1965, 1966 y 1967, Santiago, Chile (Establecimientos de 10 y más personas ocupadas).
2. Corporación de Fomento de la Producción, Datos básicos sobre el sector industrial manufacturero. Período 1960-1970. Publicación N° 22-A/71, Santiago, Chile.
3. Oficina de Planificación Nacional, Antecedentes sobre el desarrollo chileno, 1960-1970. Santiago, Chile, 1971.

Table 8

DATA USED TO ESTIMATE THE VARIABLES OF THE EMPLOYMENT (PRODUCTION WORKERS) DEMAND EQUATIONS AND FOR THE BRANCHES WOOD AND CORK DURING THE SAMPLE PERIOD 1960-1967

				at current prices			at constant 1965 prices				(8):(9)
n/n	Year t	L^W (in thousands) (1)	L^{W+S}_{t-1} (in thousands) (2)	W (in thousand Escudos) (3)	C^W a/ (in thousand Escudos) (4)	$W+C^W$ (in thousand Escudos) (5)	W (in thousand Escudos) (6)	C^W (in thousand Escudos) (7)	$W+C^W$ (in thousand Escudos) (8)	H^W (in thousands) (9)	P^W (in Escudos) (10)
1	1960	8.4	8.2	4 407	1 393	5 800	14 671	4 637	19 308	18 710	1.03
2	1961	8.5	8.4	5 320	1 681	7 001	16 444	5 196	21 640	19 100	1.13
3	1962	7.6	8.5	5 513	1 742	7 255	14 962	4 728	19 690	17 832	1.10
4	1963	8.8	7.6	8 433	2 665	11 098	15 854	5 010	20 864	21 270	0.98
5	1964	10.2	8.8	12 895	4 075	16 970	16 609	5 249	21 857	23 888	0.91
6	1965	10.7	10.2	18 950	5 988	24 938	18 950	5 988	24 938	25 333	0.98
7	1966	11.0	10.7	28 862	9 120	37 982	23 494	7 424	30 917	25 573	1.21
8	1967	9.4	11.0	35 880	11 338	47 218	24 721	7 812	32 533	21 853	1.49

Sources: 1. Dirección de Estadística y Censos, Industrias Manufactureras, Años 1960-61-62-63-64. 1965, 1966 y 1967. Santiago, Chile (Establecimientos de 10 y más personas ocupadas).
2. Corporación de Fomento de la Producción, Datos básicos sobre el sector industrial manufacturero, Período 1960-1970. Publicación N° 22-A/71, Santiago, Chile.
3. Oficina de Planificación Nacional, Antecedentes sobre el desarrollo chileno 1960-1970. Santiago, Chile, 1971.

a/ Estimations.

Table 9

DATA USED TO ESTIMATE THE VARIABLES OF THE EMPLOYMENT (OVERHEAD WORKERS) DEMAND EQUATIONS AND FOR THE BRANCHES WOOD AND CORK DURING THE SAMPLE PERIOD 1960-1967

				at current prices			at constant 1965 prices				(8):(9)
n/n	Year t	L^s (in thousands) (1)	L^s_{t-1} (in thousands) (2)	S (in thousand Escudos) (3)	C^s a/ (in thousand Escudos) (4)	$S+C^s$ (in thousand Escudos) (5)	S (in thousand Escudos) (6)	C^s (in thousand Escudos) (7)	$S+C^s$ (in thousand Escudos) (8)	H^s (in thousands) (9)	P^s (in Escudos) (10)
1	1960	0.9	0.8	1 411	392	1 803	4 697	1 305	6 002	2 044	2.94
2	1961	1.0	0.9	1 797	500	2 297	5 555	1 546	7 100	2 306	3.08
3	1962	1.0	1.0	2 031	565	2 596	5 512	1 533	7 046	2 312	3.05
4	1963	1.1	1.0	3 431	954	4 385	6 450	1 794	8 244	2 764	2.98
5	1964	1.3	1.1	5 198	1 445	6 643	6 695	1 861	8 556	3 021	2.83
6	1965	1.5	1.3	8 930	2 483	11 413	8 930	2 483	11 413	3 478	3.28
7	1966	1.5	1.5	12 449	3 461	15 910	10 133	2 817	12 951	3 431	3.77
8	1967	1.2	1.5	14 690	4 084	18 774	10 121	2 814	12 935	2 745	4.71

Sources: 1. Dirección de Estadística y Censos, Industria Manufacturera, Años 1960-61-62-63-64, 1965, 1966 y 1967. Santiago, Chile (Establecimientos de 10 y más personas ocupadas).
2. Corporación de Fomento de la Producción, Datos básicos sobre el sector industrial manufacturero, Período 1960-1970. Publicación N° 22-A/71, Santiago, Chile.
3. Oficina de Planificación Nacional, Antecedentes sobre el desarrollo chileno 1960-1970. Santiago, Chile, 1971.

a/ Estimations.

Table 10

DATA USED OF SOME EXPLANATORY VARIABLES OF THE EMPLOYMENT DEMAND EQUATIONS AND FOR THE BRANCHES WOOD AND CORK DURING THE SAMPLE PERIOD 1960-1967

n/n	Year t	Y (in million Escudos) (1)	Y_{t-1} (in million Escudos) (2)	K^s (in million Escudos) (3)	K^s_{t-1} (in million Escudos) (4)	K^s (in million Escudos) (5)	K^s_{t-1} (in million Escudos) (6)
1	1960	122	114	10	9	33	31
2	1961	130	122	12	10	39	33
3	1962	151	130	13	12	39	39
4	1963	161	151	20	13	39	39
5	1964	183	161	32	20	41	39
6	1965	199	183	47	32	47	41
7	1966	222	199	54	47	42	47
8	1967	206	222	64	54	41	42

Sources:
1. Dirección de Estadística y Censos, Industrias Manufactureras, Años 1960-61-62-63-64, 1965, 1966 y 1967. Santiago, Chile (Establecimientos de 10 y más personas ocupadas).
2. Corporación de Fomento de la Producción, Datos básicos sobre el sector industrial manufacturero, Período 1960-70. Publicación N° 22-A/71, Santiago, Chile.
3. Oficina de Planificación Nacional, Antecedentes sobre el desarrollo chileno 1960-1970. Santiago, Chile, 1971.

a/ The variables stock of business capital, K, and stock of business capital, K_{t-1}, in columns (3) and (4) respectively are expressed at current prices.

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