INFLUENTIAL FACTORS ON EMPLOYMENT GROWTH RATE
IN THE MANUFACTURING INDUSTRIES

Thitima Holumyong

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INFLUENTIAL FACTORS ON EMPLOYMENT GROWTH RATE
IN THE MANUFACTURING INDUSTRIES

Thitima Holumyong
School of Public Administration

Associate Professor ......................................... Major Advisor
(Montree Socatiyanurak, Ph.D.)

The Examining Committee Approved This Dissertation Submitted in Partial
Fulfillment of the Requirements for the Degree of Doctor of Public Administration.

Associate Professor ......................................... Committee Chairperson
(Gallayanee Parkatt, Ph.D.)

Associate Professor ......................................... Committee
(Montree Socatiyanurak, Ph.D.)

.............................................................. Committee
(Nuttakrit Powintara, Ph.D.)

Professor ...................................................... Dean
(Nisada Wedchayanon, Ph.D.)

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ABSTRACT

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Industrial sector is a fundamental unit in the economic system that promotes employment, raises national income, promotes international trade and increases productivity. Growth in the industrial sector would positively impact employment since labor was considered as the essential factor of production in Thai industry. On the other hand, problems and barriers that lead to limitation of growth in the industrial sector would inevitably shrink employment, negatively impact income distribution, and lower quality of life of workers in the industrial sector. While these workers have played a crucial role on national development, understanding factors that influence employment growth in the industrial sectors is a gateway of effective development. This study investigates factors influencing employment growth rate in the industrial sector. The determinants of the employment growth rate in the overall Thai industry as well as the determinants of the employment growth rate in each industrial category and in each business size in the industrial sector were examined.

Data were drawn from a database of the Department of Industrial Works, Ministry of Industry collected from 1969 to 2012. The study was based on 762 firms that were sampling from the overall 6,021 firms in the database. While employment in 2012 was the major target in the analysis, cross-sectional analysis was employed in this study.
The findings of the macro analysis showed that the size, age, and investment significantly determined the overall employment in the industrial sector. Comparing to all factors, size of firms was the most influential factor. Considering industrial category, factors that influenced the industry were varied by its production category. While industrial estate, size of firms, age of firms, and initial investment determined employment growth in the food product and beverage manufacturing, only initial investment played the positive role on influencing employment growth in the rubber and plastic product manufacturing. Considering the business size, large, medium, and small firms featured quite similar factors that influenced employment growth. Age of firms and initial investment were the crucial determinant of employment growth of all three-sized groups. Degree of influencing of each factor was, however, quite varied. Employment growth in small-sized firms was largely influenced by age while initial investment played the essential roles on determining employment growth in medium-sized and large-sized firms.

The findings from this study well enrich the knowledge on factors influencing employment growth rate in the industrial sector. Designing investment promotion policies and measures applied to the industrial sector should concern on the factors that influenced employment growth. Stipulation on the policy inciting demand of the industrial sector would be able to generate Thai industrial employment growth. Moreover, boosting up the promotion program offered to the small and medium enterprises in some industrial sectors such as food and beverages, vehicles and automotive parts, and electrical and electronics would cause higher potential firm o be able to compete in the global market.
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I am sincerely grateful to a number of outstanding individuals who provided me generous support, encouragement, and enthusiasm at crucial moments in my study. First of all, my special gratitude is to my supervisor, Associate Professor Dr. Montree Socatiyanurak, who provided me his priceless suggestions and comments. His wisdom and depth of knowledge have been invaluable supported throughout the process of this thesis.

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>iii</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>v</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>vi</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>viii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xi</td>
</tr>
</tbody>
</table>

## CHAPTER 1  INTRODUCTION

1.1 Statement and Significance of the Problem

1.2 Objectives

1.3 Scope of the Study

1.4 Proposed Outcomes

## CHAPTER 2  LITERATURE REVIEW

2.1 Concept and Theory of the Labor Market

2.2 Employment Growth

2.3 Linkage of Employment and Firm Growth

2.4 The Concept of Economic Growth

2.5 Structure of Thai Industry

2.6 Definition

## CHAPTER 3  CONCEPTUAL FRAMEWORK AND RESEARCH METHODOLOGY

3.1 Conceptual Framework

3.2 Equation for Employment Growth

3.3 Research Process

3.4 Assumptions and Research Questions

3.5 Unit of Analysis and Research Design

3.6 Target Population, Sampling, Background and Data Collection
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Tables</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Category of Industries and Samples</td>
<td>4</td>
</tr>
<tr>
<td>2.1 Thailand’s GDP Ranking and Proportion Compared to Global Organizations</td>
<td>37</td>
</tr>
<tr>
<td>2.2 Potentials and Future Goals for Thai Industry</td>
<td>43</td>
</tr>
<tr>
<td>3.1 Independent Variables</td>
<td>51</td>
</tr>
<tr>
<td>3.2 Operational Definition</td>
<td>70</td>
</tr>
<tr>
<td>4.1 The Number of Establishments Used in the Study</td>
<td>81</td>
</tr>
<tr>
<td>4.2 Data Transformation</td>
<td>84</td>
</tr>
<tr>
<td>4.3 Pearson Correlation Coefficient Matrix</td>
<td>87</td>
</tr>
<tr>
<td>5.1 Univariate Descriptive Statistics for Ratio-scale Variables</td>
<td>89</td>
</tr>
<tr>
<td>5.2 Percentage and Number of Small, Medium and Large Firm in Production Sector</td>
<td>90</td>
</tr>
<tr>
<td>5.3 Descriptive Statistics of Location</td>
<td>94</td>
</tr>
<tr>
<td>5.4 Descriptive Statistics of the Industrial Estate</td>
<td>95</td>
</tr>
<tr>
<td>5.5 Factors Influencing the Employment Growth</td>
<td>97</td>
</tr>
<tr>
<td>5.6 Results of Hypothesis Test</td>
<td>98</td>
</tr>
<tr>
<td>6.1 Univariate Descriptive Statistics for Ratio-scale Variables</td>
<td>103</td>
</tr>
<tr>
<td>6.2 Descriptive Statistics of Location</td>
<td>104</td>
</tr>
<tr>
<td>6.3 Descriptive Statistics of the Industrial Estate</td>
<td>104</td>
</tr>
<tr>
<td>6.4 Factors Influencing the Employment Growth in Food Products and Beverages Industry</td>
<td>105</td>
</tr>
<tr>
<td>6.5 Univariate Descriptive Statistics for Ratio-scale Variables</td>
<td>106</td>
</tr>
<tr>
<td>6.6 Descriptive Statistics of Location</td>
<td>107</td>
</tr>
<tr>
<td>6.7 Descriptive Statistics of the Industrial Estate</td>
<td>107</td>
</tr>
</tbody>
</table>
6.8 Factors Influencing the Employment Growth in Automobile and Automotive Parts Industry
6.9 Univariate Descriptive Statistics for Ratio-scale Variables
6.10 Descriptive Statistics of Location
6.11 Descriptive Statistics of the Industrial Estate
6.12 Factor Influencing the Employment Growth in Textile and Wearing Apparel Industry
6.13 Univariate Descriptive Statistics for Ratio-scale Variables
6.14 Descriptive Statistics of Location
6.15 Descriptive Statistics of the Industrial Estate
6.16 Factor Influencing the Employment Growth in Rubber and Plastic Product Industry
6.17 Univariate Descriptive Statistics for Ratio-scale Variables
6.18 Descriptive Statistics of Location
6.19 Descriptive Statistics of the Industrial Estate
6.20 Factors Influencing the Employment Growth in Jewelry and Related Articles Industry
6.21 Univariate Descriptive Statistics for Ratio-scale Variables
6.22 Descriptive Statistics of Location
6.23 Descriptive Statistics of Industrial Estate
6.24 Factors Influencing the Employment Growth in Electrical and Electronics Industry
6.25 Univariate Descriptive Statistics for Ratio Scale Variables
6.26 Descriptive Statistics of Location
6.27 Descriptive Statistics of the Industrial Estate
6.28 Factors Influencing the Employment Growth in Machine, Machinery and Equipment Industry
6.29 Results of Hypothesis Test in Each Industrial Category
7.1 Univariate Descriptive Statistics for Ratio-scale Variables
7.2 Descriptive Statistics of Location
7.3 Descriptive Statistics of the Industrial Estate
7.4 Factors Influencing the Employment Growth in Small-scaled Firms 136
7.5 Univariate Descriptive Statistics for Ratio-scale Variables 137
7.6 Descriptive Statistics of Location 137
7.7 Descriptive Statistics of the Industrial Estate 138
7.8 Factors Influencing the Employment Growth in Medium-scaled Firms 139
7.9 Univariate Descriptive Statistics for Ratio-scale Variables 140
7.10 Descriptive Statistics of Location 140
7.11 Descriptive Statistics of the Industrial Estate 141
7.12 Factors Influencing the Employment Growth in Large-scaled Firms 142
7.13 Results of Hypothesis Test in Each Firm’s Size 143
8.1 Relationship Direction and Importance of Independent Variables 153
8.2 Relationship Direction and Importance of Independent Variables in Each Industrial Category 154
8.3 Relationship Direction and Importance of Independent Variables in Each Firm’s Size 156
8.4 Proper Management of the Policy on Industrial Categories and Group-sized Firms 164
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figures</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Relationship of Utility</td>
<td>11</td>
</tr>
<tr>
<td>2.2 Labor Equilibrium is Changed Owing to the Increased Rate of Wage and Positive Supply Curve</td>
<td>12</td>
</tr>
<tr>
<td>2.3 Labor Equilibrium is Changed Owing to the Increased Rate of Wage and Negative Supply Curve</td>
<td>13</td>
</tr>
<tr>
<td>2.4 Income Effect Per Working Hour</td>
<td>13</td>
</tr>
<tr>
<td>2.5 Income Effect and Substitution Effect to Working Hour</td>
<td>14</td>
</tr>
<tr>
<td>2.6 Equilibrium in the Labor Market</td>
<td>18</td>
</tr>
<tr>
<td>2.7 Result of Change in the Demand of Labor</td>
<td>19</td>
</tr>
<tr>
<td>2.8 Result of Change in the Supply of Labor</td>
<td>20</td>
</tr>
<tr>
<td>2.9 The Aggregate Demand and Aggregate Supply Model and Level of Employment</td>
<td>21</td>
</tr>
<tr>
<td>2.10 Interaction of Factors on the Firm’s Growth</td>
<td>26</td>
</tr>
<tr>
<td>2.11 Dynamic Structure – Conduct –Performance Framework</td>
<td>29</td>
</tr>
<tr>
<td>2.12 Relationship between Consumer Spending and National Income</td>
<td>33</td>
</tr>
<tr>
<td>2.13 Proportion of the Product Value to GDP</td>
<td>37</td>
</tr>
<tr>
<td>3.1 Conceptual Framework</td>
<td>51</td>
</tr>
<tr>
<td>3.2 Conceptual Framework and Variables</td>
<td>52</td>
</tr>
<tr>
<td>3.3 Research Process Framework</td>
<td>60</td>
</tr>
<tr>
<td>3.4 Analysis Framework for Question 2</td>
<td>62</td>
</tr>
<tr>
<td>3.5 Analysis Framework for Research Question III</td>
<td>66</td>
</tr>
<tr>
<td>4.1 Distribution of Independent and Dependent Variables</td>
<td>83</td>
</tr>
<tr>
<td>4.2 Distribution of Independent and Dependent Variables After Transformation</td>
<td>85</td>
</tr>
</tbody>
</table>
5.1 Conceptual Framework for Hypothesis Test to Answer Research Question I 88
5.2 Models from Factor Analysis 99
6.1 Conceptual Framework for Hypothesis Test 101
6.2 Models from Analyses of Factors Influencing the Employment Growth in Each Industrial Category 130
7.1 Conceptual Framework for Hypothesis Test 132
7.2 Models from Analyses of Factors Influencing the Employment Growth in Each Firm’s Size 144
CHAPTER 1

INTRODUCTION

1.1 Statement and Significance of the Problem

Industrial sector, a fundamental unit in the economic system, is a manufacturing source of commodities in responding to the actual demand in the economic system. In the aspect of macro-economics, the industrial production facilitates employment growth, income distribution, increase of resources and creation of a better quality of life among the nation’s population. Moreover, by-products of industrial sections bring out both domestic and foreign revenues. It can be seen that the manufacturing processes and products of industrial sections have an influence in the nation’s economic cycle regarding the rich capacity on economic self-sufficiency for economic stability and support in the achievement of the optimal goal of economy.

According to Arthi Krusakayawong (2010: 100-106), the importance of the industrial sector which is beneficial to the economic system is as follows:

1) Industrial sector is a field that interrelates to other different fields in the economic system. It advances dependence on the nation’s economy.

2) Industrial sector promotes the ever-increasing employment, raises the nation’s income and increases productivity.

3) Industrial production helps to promote international trade of the country and on the other hand, reduces problems concerning the balance of trades and rate of trades.

4) Industrial activities maintain the economic stability and increase the economic growth.

All kinds of industrial activities result to currency circulation, the expenditure to purchase factors of production including labor, technology and resources, and national income originated from industrial production leading to the circulation of the
country’s economic system. Besides, the levels of industrial production are regarded as the best indicator of economic activity (Montree Socatiyanurak, 2005: 94). It is evident that the industrial sector is crucial for economic system; comparatively, it is a core that links between labor and resources, these two represent the unit of production factor, and consumers, unit of demand for goods and services.

Thai industrial sector in the past decade has gained higher potential to production. There has been proportional increase of gross domestic product from 38.1 percent to 41.3 percent from 1999 to 2009. Nevertheless, the rate of increase has been considerably low. Over a decade, the rate of increase on gross domestic product was only 8.4%. This is because of the influence of market concentration on four major groups which are petroleum, electronics, automotive and electrical appliances. All of them are facing the problem of moving their production bases to newly industrialized countries. In addition, most entrepreneurs are solely manufacturing sub-contractors yielding to low domestic added value and decreased competition ability of the country (National Competitiveness Committee, 2011: 14-21)

Nowadays, there has been higher technology development in Thai industrial sector which causes the problem of regression of employment rate. Additionally, it affects to the national macro-economics system as it affected to the countries with high technology in industrial developing, such as the United States of America, etc. However, at present, realizing of the problems, suitable methods and strategies have been developed. The results of the analysis found that the effects of technology growth toward the regression of employment can be reduced by the collaboration among the ones who take responsible according to the government policy and industrial sector in creating work and provide practices to labors to promote to higher skills. Moreover, educational institutions should educate and train students to work with high technology. In the near future, skill workers who can work with high technology are really very much wanted by the market. So if the regression of employment rate problem is neglected, the low technology workers problem will occur, and they can not be practiced to be skillful technicians (Kochan, 2013: 27-29).

Growth in the industrial sector would positively impact employment since labor was considered as the essential factor of production in Thai industrial sector. On the other hand, problems and barriers that lead to limitation of growth in the industrial
sector would inevitably shrink employment, negatively impact income distribution, and lower quality of life of workers in the industrial sector. While these workers have played a crucial role on national development, understanding factors that influence employment growth in the industrial sectors is a gateway of effective development collaboration of all stakeholders. Government, entrepreneurs, and the relevant organizations would benefit on homogeneously design and well planned on their policies to promote growth in the industrial sector and its employment.

This study, thus, aims to investigate factors influencing employment growth rate in the industrial sector which would benefit to policies to promote growth in the industrial sector and its employment. The study aims to examine both macro and micro pictures. The analysis, then, covers both the determinants of the employment growth rate in the industrial sector as a whole and the determinants of the employment growth rate in each industrial category and in each business size in the industrial sector.

1.2 Objectives

The main goals of this study are the following:

1) To study the factors influencing the employment growth rate in the industrial sector as a whole

2) To study the factors influencing the employment growth rate in each industrial category

3) To study the factors influencing the employment growth rate in each business size in the industrial sector

1.3 Scope of the Study

1.3.1 Population

This thesis studies industrial factories which enrolled to be the member of the Department of Industrial Factories. The populations were 7 pilot industries which were set in the National Industrial Development Master Plan B.E. 2555-2574 of the Ministry of Industry. The details of the population are shown in Table 1.1 below.
Table 1.1 Categories of Industries and Samples

<table>
<thead>
<tr>
<th>No.</th>
<th>Category</th>
<th>Number of establishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Food products and beverages</td>
<td>79</td>
</tr>
<tr>
<td>2</td>
<td>Automobiles and automotive parts</td>
<td>265</td>
</tr>
<tr>
<td>3</td>
<td>Textiles and apparels</td>
<td>203</td>
</tr>
<tr>
<td>4</td>
<td>Rubber and plastic products</td>
<td>28</td>
</tr>
<tr>
<td>5</td>
<td>Jewelry and related articles</td>
<td>48</td>
</tr>
<tr>
<td>6</td>
<td>Electrical and electronics</td>
<td>68</td>
</tr>
<tr>
<td>7</td>
<td>Machine, machinery and equipment</td>
<td>71</td>
</tr>
<tr>
<td>8</td>
<td>Renewable and alternative energy</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>762</strong></td>
</tr>
</tbody>
</table>

**Source:** Department of Industrial Works, 2012.

1.3.2 Data

Database, secondary data, provided by the Department of Industrial Works, Ministry of Industry, was utilized in this study.

Thai Industry comprised of various production sectors. Each sector possesses its own unique characteristics. Levels of development of each sector are varied. Moreover, there are many sizes of businesses in Thai industry. Policies supported from the government are also various by the sizes of businesses. This study, therefore, segregates the analysis into 3 parts to ensure the comprehensive knowledge gained from the models. Three parts of the analysis are as follows;

1) The study of factors influencing employment growth rate in overall Thai industry.

2) The study of factors influencing employment growth rate in each production sector of Thai industry.

3) The study of factors influencing employment growth rate in each size of business.
The main purpose of this study is to study the factors that influence the employment growth rate to reflect business growth in the industrial sector. Hence, the scope excludes the detail of employment in macro-economic level, labor production and productivity.

1.4 Proposed Outcomes

1) This study will benefit the policy maker to lay down policies for the promotion of industry and labor to gain the highest benefit. Such policies encompass with the domestic value added and at the same time control market concentration and monopolies by promoting the small and medium enterprises.

2) Findings and recommendations from this study will make a better understanding on the influential factors to the industry’s growth among the private sectors and trading organizations such as the industrial association. This is to stimulate the various influential factors in the industry’s growth.

3) This will be a fundamental knowledge for the development of the industrial sector’s potential, stabilization and development in accordance to the national development plan.

4) This will be a source of further research with regards to industrial growth.
CHAPTER 2

LITERATURE REVIEW

2.1 Concept and Theory of the Labor Market

2.1.1 Meaning of Labor

Labor is a significant resource in the economic system. It is one of the factors in the manufacturing system. Generally, labor is defined as the physical and intellectual power of human beings which are offered in the economic system by agencies buying and selling labor among the business units or entrepreneurs. This is in accordance with Kaufman and Hotchkiss giving the definition of labor as “a factor of production that is owned by individuals and, in effect, returned to business firms for a period of time (for instance, an hour or a year) to be combined with other factor inputs such as land and capital to produce a good or service (Kaufman and Hotchkiss, 1999: 2).

2.1.2 Significance of Labor

The economic system has problem with resource limitation for manufacturing at the same time, demand for consuming goods and services increases all the time. All these economic systems are unable to respond to the increasing-all-time need. There should be a necessity to select who could get the products. So that it would be the responsibility of the economic system to distribute limited resources efficiently in responding to unlimited needs.

Labor, then, is regarded as a limited manufacturing factor and is an important mechanism in manufacturing. Therefore, effective labor distribution would result in a better production that in turn, responds to the increasing demand.
2.1.3 Unique Features of the Labor Market

Labor market has unique features which is not the same as general goods market. In general goods market, when sellers did sell their goods, those goods would instantly and rightfully belong to the buyer. The buyer and the seller do not need to have continuous association after the trading of products. But in the labor market, the labor-owner is highly connected to the consumers in making a decision on labor trading. Labor is as a buy-and-sell matter. The labor-owner is a human and he/she has to take responsibility or remain associated to a sold labor. The labor-buyer who is the employer has to make a decision to purchase a labor from an owner who has a distinctive qualification and characteristic. When the employer did make a decision, it does not mean that he/she has the right to be a labor owner or as being a general goods owner.

A remarkable characteristic of labor market is a combination of human sentiment into the body of goods including having complexity in the process of decision making on trading. This is an important issue that economists have paid attention to. As the prospective of Alfred Marshall to this matter in general goods market, he stated that a seller does not need to be concerned about what goods a buyer purchases. In contrast, labor market is greatly significant to the labor-seller which is where labors are bought whether or not the labor-seller satisfies the place that he/she is going to work. H. Lorne Carmichael concludes that making a decision regarding selling labor does not only concern about wages but also other factors such as salary promotion, fringe benefit, working risk, retirement benefit, promotion, and allowance. At the same time, labor has to take time to practice working together with others or to add more skill, etc. (McConnell, Brue and Macpherson, 2009: 2)

Consequently, it can be said that labor market has unique features that are absolutely different from general goods market and services. There is a difference on both product characteristics and decision-making process. Besides this, labor market has no central clearing house and is not standardized. Concerning the negotiating power on trading, it was found out that negotiating power of labor is poorer than the employer (Sumalee Pitayanont, 1992: 83).
From the various uncommon characteristics of labor market, its differences from the general goods market and services are summarized as follow: (Kaufman and Hotchkiss, 1999: 4)

1) Labor Is Embodied in the Seller

Labor is a kind of goods that is different from the common market. It is a kind of goods which would be exchanged in the market by a labor-seller.

In general goods market, goods ownership is transferred from seller to buyer. Seller and buyer’s qualifications like sex, age, and personality are not important qualification in trading. The buyer and the seller are both interested particularly in goods being traded.

However, in labor market, labor is a service inseparable from the individual who is the labor-owner. So, in trading and exchanging labor, the existing factors are not only wages but also include other factors such as risk, condition, value, companion, and organizational management.

Consequently, owing to being human, an important factor toward labor and employer in making decision on buying and selling is not merely wage factor, it also has other factors that labor-seller should be concerned about. This is because labor-seller would deal with the advantages and disadvantages even after the labor trading agreement.

2) The Long-term Nature of the Employment Relationship

In general market, the purchaser can change goods and services immediately. But in labor market, the labor-buyer and the labor-seller cannot make a change on employment and labor-selling immediately as the general market.

Considering the part of the employer when it comes to employment of each employee, the employer has to invest on trainings and experience aggregation to the employees. Moreover, the employer wants continuous and permanent job for the employees. Supposing that employee quits a job or switches his/her job, it inevitably affects the employer’s business.

On the part of the employee, to make a decision to work at some place is of course concerned about a long-term benefit along with his/her working life such as the rate of salary increase, rate of increase in benefit. Other than those mentioned are nonfinancial-related factors such as a feeling of security, a sense of friendly workplace, etc.
As a result, increasing or decreasing wage is not the only factor in making a decision on labor-selling and employing.

3) Heterogeneity of Workers and Jobs

In common market places, the buyer and the seller make trading agreement by using goods price as a criterion for trading. But in labor market, workers and working details have heterogeneity. Workers offered in labor market would be approved by employees regarding heterogeneity of each worker due to workers’ differences on age, nationality, sex, education, experience and willingness to work. Aside from wage, workers also consider other reasons in responding to employment such as difficulty of job, travel convenience, welfare, and job condition.

With the various features of the labor market, it affects the two effects as the following:

1) Decision making on labor-selling does not depend on a pecuniary wage. Non-financial feelings are also a concern.

2) Getting information in making a decision on labor trading in labor market is complicated. The employer and the employee do not have complete information about advocating decision prior to making labor-trading.

4) Multiplicity of Markets

Knowing that demand and supply in labor market is a mechanism specifying the rate of wage, it can be seen that labor market is divided into small markets along with varying criteria such as geographical area and area of profession. So that considering wage specification would have to be deeply determined in terms of unique occupation like mechanic, academician, and banker. This is because labor demand for each occupation is different.

In the same way, workplace is also another factor yielding to the difference in labor market. For example, demand and supply of lawyer career in Chiang Mai province is of course different from those in Sa Kaew province. All these labor demands in each occupation in different areas are diverse.

Labor force is divided by other sub factors such as profession and geographical area. However, those markets also experience loopholes that unlock other occupations or labor from other regions to have an opportunity to move in a certain market. For example, a banking officer may change his/her job to be a flight
attendant as well as a builder in Nakhon Pathom province may move to work in Phrae province. That movement can happen if and only if there is demand in a certain market and the market is able to pay wage with novice labor satisfaction.

2.1.4 Measuring Supply of Labor

To measure labor supply, there are varying conceptual views. Each concept is applied with different objective analysis. Measuring labor force participation is a favorable approach. Measurement on labor movement is measuring the amount of working age group entering to labor force. The hypothesis is that whoever enters to labor force will have to be a ready person and seek for a job and able to call a labor supplier. This method will be measured by conducting survey or by estimating with econometric model. Such measurement is useful in making a developing plan in the macro level (Wuttithep Intapanya, 1996: 21).

2.1.4.1 Short-run Supply of Labor

In short-run means a duration which is unable to adjust manufacturing factor on the part of labor at the same time, labor is also not able to move to work to another job. This means that quality, competency, residence, occupation, and other factors relating to labor. Considering the short-run supply, it will use the principle of utilization which has a hypothesis that each labor wants a maximization of satisfaction with two factors as the following:

1) Wage

Wage is an income which the labor will gain from working. This is a return on working of labor. Wage might be a pecuniary return or a unit of goods and service.

2) Leisure Time

Leisure time is a time for taking a rest, it is not for working. Labor will not gain wage from such a time. The time will be measured in an hour per a certain time such as an hour per a day, an hour per week.

Relationship of utility function is the relationship between income, leisure time, and satisfaction.
Figure 2.1 Relationship of Utility


Figure 2.1 represents a satisfaction of labor in a different level from the proportion of wage and leisure time at different levels. Axis X represents leisure time. Axis Y represents the rate of wage. Line U1 represents satisfaction with the proportion of the rate of wage and leisure time which a worker gained. U2 represents more satisfaction than U1, and U3 represents more than U2.

2.1.4.2 Characteristic of Labor Supply

Demand line originates from the condition with a change in the level of wage rate. When there is a change in the level of wage rate, an amount of labor offering for sale would change. In changing the level of wage rate, a budget constraint line will change.

In this regard, labor supply has two features. It may be positive slope, when the rate of wage is higher or may be negative slope, when labor would offer for more sales. This means that when the rate of wage is higher, the labor is offering lesser sale.

1) Positive Slope Labor Supply Curve
Figure 2.2 Labor Equilibrium is Changed Owing to the Increased Rate of Wage and Positive Supply Curve.


Figure 2.2 represents positive labor curve. In case the rate of wage is higher, it offers a higher labor sale. This happens in the market having a great number work lovers or having a high target income. In other words, it would occur in the market having low income that is insufficient to a current cost of living.

It can be seen that in the five Baht an hour of wage rate, a worker would have equilibrium from working eight hours, and 16 hours of leisure time. When a wage increases to seven Baht an hour, so 10 hours would be increased and earning 70 Baht for income, the number of hour for leisure time would decrease into 14 hours.

For that purpose, when the rate of wage and the number of working hours offered for selling are investigated, the relationship is found the line of labor supply in the pattern of positive slope. This shows that a worker is working more when a wage rate is higher.

2) Negative Slope Labor Supply Curve
Figure 2.3 Labor Equilibrium is Changed Owing to the Increased Rate of Wage and Negative Supply Curve.

Source: Sumalee Pitayanont, 1992: 89.

Figure 2.3 shows that labor offering for sale is lesser when wage increases. This is because a satisfaction with leisure time exceeded subsequent income to earn. It means that marginal utility of leisure time to earn is more than the marginal utility of income lost because of not doing the job. Labor supply with negative slope would happen in labor market where wage is high and the workers are satisfied with their income level or probably experienced in the labor market where work haters exist or the worker are at a low income level.

2.1.4.3 Income Effect and Substitution Effect

1) Income Effect

Figure 2.4 Income Effect per Working Hour

Source: Sumalee Pitayanont, 1992: 90.
From figure 2.4, a rate of wage has no change, but a worker earns more income from other sources besides the wage. This result to worker selecting more hours for leisure time so, a satisfaction line will increase. It can be seen that income effect would yield to the level of satisfaction to increase more when a situation that non-wage income changed resulting to decrease in the working hour.

2) Substitution Effect

![Figure 2.5 Income Effect and Substitution Effect to Working Hour](image)

**Figure 2.5** Income Effect and Substitution Effect to Working Hour  
**Source:** Sumalee Pitayanont, 1992: 90.

Drawing from figure 2.5, an increase in the rate of wage would make budget constraint change into the line HMG3. A level of satisfaction increase is U2 and equilibrium point is Q. It can be seen that substitution effect yields to the change in working hour when the rate of wage changed.

To summarize, the behavior on labor offering for sale are the following:

1) If an income of a worker increases because of the increase in non-labor income, it would make labor offering for sale lesser in case the rate of wage is higher.

2) If a wage has short-term change, substitution effect would have more influence than income effect. It results in labor supply to have a positive slope. If there is a long and gradual increase trend in the rate of wage, income effect has more influence than substitution effect. Labor supply would be a negative slope.
2.1.5 Factors Influencing Labor Force Participation

1) Age

Labor who is young or old have low labor force participation. This is because the laborer who is young is still going to school and mostly has full-time studying. The reasons for the old age are health problems and having pension so they do not need to go to work.

2) Marital Status and Child Rearing

Women who are married and have very young children engage to fewer workforces than single women. The factor that determines workforce participation of this group is the husband’s income. This is because when the husband earns a higher income, the family would be able to manage resources in nurturing their children and other home activities.

Besides this, when a man’s wage in the labor market is higher than that of the woman, it is because the wife spends more time for domestic activities including additional time for child rearing. This makes the husband play a greater role in labor market.

3) Income Effect

As for male labor force demand, it was found out that when wage rate in the labor market is higher, demand would decline. This shows that income effect which is gained from high wage is more than substitution effect. On the part of labor demand of married women, it was found out that when wage in the labor market is higher, the supply would increase. That is, income effect is lesser than substitution effect.

4) Market Circumstance

Participating in the labor market sometimes depends on the volume and job category that exist in the market. In case of high unemployment and when the business owner does not want a new employment, some labor would be off to seek job and they would become jobless labor implicitly. A negative effect toward labor force participation from such high unemployment is called the discouraged worker effect. In some cases, if the unemployment higher, it is possible that this would cause labor participation to be higher. For instance, when the head of the household gets unemployed, it causes the other family members to seek for a job so as to relieve the burden of the family. This positive effect is called the added worker effect.
5) Structure of Economic System

In the economic system, sometimes if the income per capita is high, the rate of participation of the labor force is possibly low. This is because there is no need to work as compared to the poor country. However, there may be an opposite case if the economy of the developing country has a high wage rate. That is because the enhancement of workers entering the labor force increases.

2.1.6 Scope of Selection Capacity

To specify labor demand, it seems that labor would not be specified because all enterprises have accurate working hours. However, it was found out that labors are still able to adjust working hours as they desire. This is because the labor market has the following situations:

1) In the labor market, there are number of labors who work for their own or they are professional labors who have somewhat much independence in adjusting their working hours to comply with the income level.

2) A variety of industry has a shorter or longer operation than normal and seasonal industry such as business about tourist services. Consequently, those who desire to join this job can choose a job in which they would like to participate to satisfy their preference.

3) Many businesses employ particularly part-time workers while they are booming instead of recruiting novice workers. Although, part-time job in many industries would be compulsory, mostly, part-time job occurs voluntarily.

4) In several countries, part-time jobs are expanding particularly among the groups of housewives and teenagers. Those groups are pleased to earn lower wages than standard wages. This is because they can choose which time and hour they will work.

5) Much of labor who are working at more than one enterprise to gain extra income such as those who work as a teacher or tutor during his/her time-off or the governor working as a taxi driver after routine work.

6) In several businesses, workers can reduce their working hours by keeping off their vacation or private business without receiving a salary. So, a selection on whichever job may depend on the period of eligible vacation beyond wage rate (Sumalee Pitayanont, 1992: 81-93).
2.1.7 Concept and Theory of Wages

2.1.7.1 Definition of Wage

Wage means remuneration for labor paid by an employer to a worker. Wage rate means a remuneration received by a worker for working for a certain period such as a wage per hour or per day or per month.

In general, a wage is money paid. However, this money is unable to measure the standard of living of a worker. This is because the purchasing power is changeable. Therefore, some people always discuss about the money wage and the real wage.

Money wage means an amount of money that a worker receives for labor and this money has a relationship with the price level at that time. Real wage means an amount of goods and service that the money wage can purchase. The real wage is obtained by dividing the money wage by the retail price index. When comparing the money wage with the real wage, the latter tends to be lower than the former. This phenomenon is called “money illusion” as explained by Keynes.

2.1.7.2 Theory on Wage Setting

Some classical economists, like Ricardo and Malthus, explained that the wage which is remuneration for labor would tend to get equal to the level of subsistence. When the wage is higher than the subsistence wage, the number of population would rise. And when the increase happens, the supply of labor would increase while the wage would fall to the subsistence level. This is called “The iron law of wages”. The phenomenon commonly takes place in the least developed countries or during the stationary state of economic system.

In the next era, some neoclassical economists such as John B. Clark and Alfred Marshall also gave an explanation about the wage and remuneration from production factors. They made hypothesis statements that:

1) The economic system of a country is free economy. Prices of goods and prices of production factors are the results of the market demand and supply.

2) The number of production factor is limited. The process and technique of production is unchanged, and so is the taste of the consumers.
3) Some fixed factors such as machines could not be changed in number.

4) Only the production factor for labor could be changed.

As aforementioned, an explanation is made through the Marginal Productivity Theory that points out that the wage can be set by the demand and supply of labor (Chamnong Somprasong and Pradit Chasombat, 1976: 83-86)

2.1.7.3 Concept about Wage Equilibrium

The equilibrium will occur when the demand is equal to the supply in the labor market. From this point, the equilibrium will remain as long as there is no factor influencing a change in demand and supply as illustrated in Figure 2.6

![Equilibrium in the Labor Market](source)

**Figure 2.6** Equilibrium in the Labor Market

**Source:** Wutthitep Intapanya, 1996: 59.

In Figure 2.6, \( S_L \) represents the supply of labor and \( D_L \) stands for the demand of labor. \( W_1 \) is a high wage that will result in unemployment at a-b in a long term. When labors know that unemployment takes place, they will prepare themselves for the wage lower than \( W_1 \). Some labors will turn their back onto the market, not wanting to receive such low wage. Therefore, a reduction in supply of labor occurs, and so does an increase of demand. When the wage decreases, the labor market will turn to equilibrium. Conversely, if the wage is equal to \( W_3 \), there will be more demand than supply, forcing the employer to offer a higher wage. Also, the worker will want to increase their labor, changing the equilibrium back to \( W_2 \) and the level of employment stays at \( L_2 \).
The wage mobility in the market reveals that the market is in an adapting situation as in Figure 2.7

![Figure 2.7 Result of Change in the Demand of Labor](image_url)

**Source:** Wuthitep Intapanya, 1996: 61.

In Figure 2.7, the labor market previously gained an equilibrium at a, with the wage level at w and the employment level at L. If the economy is growing and people gain more income, goods and services will be more in need, causing manufacturers to produce more goods and services because they can get more profit. In this circumstance, manufacturers will need more production factors, which is labor. So, the DL moves to D’L. Thus, manufacturers cannot hire more labors up to C. This is because, the supply of labor remains only at a at the wage level W. Hence, manufacturers have to offer higher wage for higher supply of labor. In the meantime, when the wage gets higher, the employer will require less employment. This moves the wage to W’.

As long as the employer can push off the higher labor cost to the consumer by raising prices of goods, the employer will be willing to raise the wage. This situation will continue until the point that the employer can no longer raise the goods price. The employer, then, will stop raising wages because this will not be worth hiring more labor and extending the business.

In case of a decrease in labor supply such as the number of working age population reduces or there is an epidemic that causes lots of death in working-age people, this will produce impacts to the wage equilibrium as presented in Figure 2.8.
Figure 2.8 Result of Change in the Supply of Labor


Figure 2.8 demonstrates that when the supply of labor becomes lower, such as a lot of skilled labors in the industrial sector travel to work overseas, the supply of labor line moves from $S_L$ to $S'_L$. What happens is that, there is a labor shortage at e-d and the employer needs to increase the wage from $W$ to $W'$. This will result in more labors coming for jobs and create a new equilibrium wage, which is $W'$ at f (Wuthitep Intapanya, 1996: 58-61).

2.2 Employment Growth

2.2.1 Factors of Employment Growth

Economic theory considers that the level of employment is directly connected to the whole macro economy. Therefore, to comprehend the factors of employment growth, the aggregate demand and aggregate supply model should be a focal model to explain the adjustment of level of employment as presented in Figure 2.9.
Figure 2.9 The Aggregate Demand and Aggregate Supply Model and Level of Employment


Figure 2.9 (a) presented the aggregate demand and aggregate supply model commonly shown in the macroeconomics textbooks. The equilibrium yielded from the intersected points of aggregate demand and aggregate supply curves would generate equilibrium price and equilibrium quantity. This equilibrium quantity would derive demand for labor in the macro labor market and, therefore, influence the shift of labor demand curve in figure (b)

2.2.2 Factors Affecting Firm’s Growth

Storey (1994) divided the factors affecting firm’s growth into three main groups as follow:

1) Factors Related to Entrepreneur
2) Factors Related to the Firm
3) Factors Related to Strategy

Each group of factors comprises of sub-factors influencing the growth of employment. The details are the following (Storey, 1994; Fadahunsi, 2012)
1) Factors Related to Entrepreneur
   (1) Motivation
   (2) Education
   (3) Ownership/Management Experience
   (4) Number of Founders
   (5) Ethnicity/Race
   (6) Prior Self-Management
   (7) Family History
   (8) Social Marginality
   (9) Functional Skills
   (10) Training
   (11) Age
   (12) Prior Business Failure
   (13) Prior Sector Experience
   (14) Prior Firm’s Size Experience
   (15) Gender

2) Factor Related to the Firm
   (1) Age
   (2) Sector
   (3) Legal Form
   (4) Location
   (5) Size
   (6) Ownership

3) Factor related to strategy
   (1) Workforce Training
   (2) Management Training
   (3) External Equity
   (4) Technological Sophistication / Technical Resources
   (5) Market Positioning / Market Strategy
   (6) Market Adjustment
   (7) Planning
   (8) New Products
(9) Management Recruitment
(10) State Support/ External Advice and Support
(11) Customer Concentration
(12) Competition
(13) Information and Advice
(14) Exporting
(15) Internationalization
(16) Financial Resources

All of these are the findings of the study on the main factors commonly being used to prove the factors affecting the firm’s growth. They are the following:

1) Factors Related to the Entrepreneur

(1) Education

The results presented that the education level of owners were an indirect factor that influenced the firm’s growth with regard to the development of the management skills of firm owners (Story, 1994). Other studies have compared the level of educational attainment among firm owners and they found out that the owners with high level of education were able to manage their own business growth than those owners with low-level of education. (Johnson, 1994; Bhuamik, 2004; Okpara, 2007; Schmidt, 2007).

(2) Age

The study of Carter and Jones-Evans (2000) examining the factors affecting entrepreneur reflected that age was also a key of successful management. The owners who have older age have higher experiences and administrative tactics than younger ones. Age also includes credibility.

(3) Gender

There have been wide studies on gender as a factor influencing the firm’s growth. The findings from investigation showed that gender had both effect and no effect on it. As for the effect, researchers Downing and Daniels, (1992), Liedholm, McPherson and Chuta (1994), Liedholm and Mead (1999), Liedholm (2002) who studied this issue for long found that the firms of female entrepreneurs tend to have slower growth compared to the firms of male entrepreneurs. On the other hand, the studies regarding gender by the researchers such as Fielden (2003), Morris

2) Factor Related to the Firm

(1) Age

A significant contribution was made by Jovanovic (1982) and Evans (1987) in their study about relationship between firm’s growth and firm’s age. They have found that the firm’s growth decreases with age. This reflects that young firms are likely to develop more than the old ones. This is also in accordance with the study of Kangasharju (2000) that young firms would have internal forces to develop itself for capacity to overcome pressures from circumstances. Differently, the study made by Hed and Kirchhoff (2009) comparing the growth of employment of two entrepreneur group which were the newly established and current enterprises in the U.S. argued evidently as the two groups reveal no differences in the employment growth. They concluded that firm’s age was not related to the firm’s growth.

(2) Location

Studying on firm location, it is frequently the comparison of the varying settings in terms of economic supports; rural-urban areas, market-residence areas, center business–outer business settlements. Those comparisons of different areas reflect on supportive and obstructed factors for firm’s growth (Ram, 1997; Fielden, 2003; Robinson and Finlay, 2007). Likewise, Liedholm, McPherson and Chuta (1994) have exposed that the firms in the urban have more growth rate than in the firms in the rural area. Liedholm conducted further studies on the firms located in the market in 2002 and confirmed that near-the-market firms had survival rate more than the firms located on residential locations.

(3) Size

It has been found by Jovanovic (1982) that the firm’s size influences the efficiency of the firm’s growth within the selection procedure of economic system. To explain this, whenever effective firms are selected by the economic system, firms would grow gradually until reaching the minimum efficient size. Simultaneously, when low efficiency occurs, a firm would downsize until the maximum efficiency size is reached. Proved by the Evans’ study (1987), smaller firms have higher growth rate than larger firms. Firms would grow until reaching the minimum efficient size, no longer grow and remain with the same the size.
All these, the studies of Liedholm, McPherson and Chuta (1994) and Liedholm (2002) are the same as the works of Javanovic and Evans that the firm’s size is inversely related to their growth. Aw (2002), however has further presented a research in relation to productivity. The finding revealed that larger firms seem to have a slower growth compared to smaller firms in a constant productivity.

3) Factor Related to Strategy

(1) Workforce Training

Savery and Luks (2004) have exposed that the stability of the firm’s growth is resulting from continuous skill training in the workforce. Similarly, the studies of Liedholm (2002) and McPherson (2002) found that the firms that provide vocational and on the job training to their employees would go up than the ones without such provision.

(2) State Support/ External Advice and Support

The research findings by Storey on support from the state indicated that the firms supported by the state would experience a growth rate rather than the firms which are not supported by the state. Alternatively, Rasiah (2002) have also found that the private sector incorporated with the government sector for developing business have higher growth rate than the firms conducted alone.

In terms of government assistance, there are several forms. The form that the government supports is mostly industrial estates that have offered an investment. The firms that are present within the industrial estate have gained supports from the investment committee of Thailand. Furthermore, industrial estates have also established a human development center which is important for industry in the estate. It can be seen that industrial settlement enhances development and spinning-off on business and also helps in extensions (Wai Jamornmarn, Somboon Yommana and Kittiphum Wisetsak, 2007: 62).

Furthermore, the finding of Hyytinen and Toivanen (2005) and Lerner (1999) illustrated that whenever there is a government policy on promoting enterprises, there is an influence on the overall economic system. For instance, the settlements of industrial estate and business incubation or subsidy cause both positive and negative effects on the economic system. If the firms supported by the government gain higher potential, it would bring out positive effects which will contribute to the economic system. Conversely, the firms that are going down or
getting lower potential would bring an economic loss and loss in market concentration.

(3) Financial Resources

The study on investment and financial support influencing firm’s growth suggested that the firms which have problems in the cost of capital or firms facing problems on financial resources would have a slow growth compared to the firms which do not have any financial problem. (Paitoon Wiboonchutikula, 2001) found that medium-sized and small enterprises need the cost of capital sources lower than in market places.

But even so, each financial institution is concerned with the ability to recompense to those firms so several determined conditions do not facilitate small and medium-sized enterprises. It yields to those enterprises encountering difficult situations of available capital and very high cost of loan resulting in a slow firm’s growth compared to enterprises with full financial supports (Carpenter and Petersen, 2002). Accordingly, the findings of Kawai and Urata (2001) indicated that all small and medium – sized enterprises in Japan encounter the barrier of starting a business due to the problem in the cost of capital and lack of financial resources.

From the elements mentioned above, these are all supportive factors for the firm’s growth (Storey, 1994; Fadahunsi, 2012). Nevertheless, Storey (1994) found that three factors - entrepreneur, firm, and strategy- are the co-factors supporting a rapid growth of firms (see figure 2.10).

![Figure 2.10 Interaction of Factors on the Firm’s Growth](source: Storey, 1994: 124.)
Figure 2.10 exhibits that a firm in gray shading which is the overlapping area of the three main factors which are factors related to the entrepreneur, factors related to the firm and factors related to strategy would be the fast-growing firm. It means that the rapid growth of the firm is gained from completely-supportive factors.

2.3 Linkage of Employment and Firm Growth

Firm’s growth reflects on the capacity of the firms in survival and stability on overall economy. This is because the expansion of the firm’s size of each sector indicates that the increased demand will originate various activities in its cycle and conceive economic growth. Aside from that, the firm’s growth also indicates the economic system in terms of the ability of labor absorption (Carrizosa, 2006).

In more recent times, there has been broad attention gained in the study on firm’s growth in which factors influencing employment growth are often proved. This matter was brought about in the further studies of Robert Gibrat, the founder of Gibrat’s Law or the Evolution of Gibrat’s Law aimed to test and prove the influential factors to the firm growth.

2.3.1 Measurement for Firm’s Growth

There are several methods to measure a firm growth depending on specific objectives (Correa, 1999). Favorable methods used in measuring the size of the firms are the following:

1) Measuring on the financial or stock market value
2) Measuring on the number of employees
3) Measuring on the sales and revenue
4) Measuring on the productive capacity
5) Measuring on the value of production
6) Measuring on the added value of production

The findings of Ampol Navavongsathian (2008) revealed that in order to measure enterprise outcome by evaluating the ability on profit margin, the method of ROCE (return on capital employed) will be applied. In the case of measuring on
ROSE (return on shareholder’s equity), sale growth, asset growth and employment growth, they will be quantified. To measure on business effectiveness, the productivity of employees will be assessed.

However, when considering a limitation of data used for measuring on firm’s size, it was found that some kind of measuring form is interchangeable. Due to having been proved, each indicator is not significantly different. For instance, the study of Kirchhoff & Norton (1992) suggested that measuring on employment, asset, and sale do not differ statistically. Thus, it is exchangeable.

From the study on the details of the firm’s size, each indicator is deficient in reflecting some factors. These should be considered as follow:

1) Measuring on firm’s value does not reflect the characteristic of management and operation of firms.

2) Measuring on sales volume is a well-liked technique as it is the easiest available data. Measuring on sale, however, may cause the findings awry because of the sale volume growing up resulting from other factors, such as company’s policy, company’s strategy which does not come from a real ability of the firm.

3) Measuring on asset is another conventional method but its result is most likely the result measured on firm’s value. It does not demonstrate different activities that present management system within organization.

4) Measuring on employment is another popular technique to illustrate ability on firm management. Besides, employment is also a reliable indicator because there is no sensitivity to the effect of inflation change or foreign currency exchange (Kimberly, 1976).

From the above-mentioned and literature review, it was found that employment is the best indicator. This is because it can reveal organizational complexity of firms in the economic system and also reflect a capacity on managerial implications of growth (Penrose, 1959).

**2.3.2 Firm’s Growth Theory**

The theories mentioned about the firm’s growth are various perspectives and are studies from the past up to the present. The details of these theories of school of thoughts are the following:
2.3.2.1 Classical Economists

Firm’s growth theory explained by classical economist has not mentioned directly to the firm’s growth but it is a study about the future growth trend by forecasting the past conducts. However, the group of classical economists can explain the factors determining the firm’s growth. Structure- Conduct- Performance Framework (SCP) based on microeconomic theory refers to the relationship between structure and structure that their dynamic processes occur over time. Further explanation is that large-structured firms are able to bring more manufacturing products and be back and forth mutual relation all the time. Once firms have better performance, they would probably extend their enterprises. Figure 2.11 shows the dynamic SCP model.

![Dynamic Approach](image)

**Figure 2.11** Dynamic Structure – Conduct – Performance Framework

**Source:** Carrizosa, 2006: 45.

2.3.2.2 Gibrat’s Law

Robert Gibrat (1904–1980) has studied the connectivity of factors between firm’s size and firm’s growth which are well-known as Gibrat's rule of Proportionate Growth or Gibrat’s Law. The main consequences of Gibrat’s Law are as follow:

1) Firm’s growth is not definitely connected with each other, including factor of attribute and factor of time.

2) Firm’s growth is independent of firm size.

3) Firm’s growth is a normal distribution.

Gibrat’s finding suggested that the firms of every size present no difference in growth’s characteristics. That is to say, such growth is naturally
developing, not reflected by other factors, even the factors of the firm’s size. Consequently, Gibrat has also given policy recommendations that government should not intervene in the firm’s growth as the growth of firms is already a natural process and is normally distributed, whether the government plays an intervening role by stimulating growth rate or extending firm size, it will disturb a normal distribution. A firm with a size larger than the equilibrium will cause a distribution of growth is right-skewed. In the situation of the firm size larger than equilibrium, it is a product and effect of market concentration.

2.3.2.3 The Evolution of Gibrat’s Law

Having tested simultaneously and developed, Gibrat’s Law (The Evolution of Gibrat’s Law) postulated that size affects firm’s growth. It was demonstrated that size has an inverse relationship with the growth of the firm. This means that the firm growth will have a gradual development with reduced rate and will slow down growing when the firms reach equilibrium and constant at that point (Evans, 1987; Hall, 1987; Dunne et al., 1989; Variyam and Kraybill, 1992; Mata, 1994; Mata and Portugal, 2004; Dunne and Hughes, 1994; Harhoff et al., 1998; Hart and Oulton, 1999; Farias and Moreno, 2000 and Lotti, 2001).

2.3.2.4 The Model of Learning and Selection

To study firm’s growth, the scope of the study tends to connect the factors enhancing survival with stability and sustainability. All these, there has been studied by several school of thoughts regarding the linkage of all the factors influencing the firm’s growth and the factors enhancing firm’s survival. The conclusions are below:

Geroski (1995) have found that the growth and survival of firm can cause a capacity to learn. Along with the studies of Jovanovic (1982), Ericson & Pakes (1995) and Pakes and Ericson (1998), it presents the concept of learning and selection that show factors enhancing the survival and growth of firms.

The learning and selection model has been explained that the firm itself is unable to know how much potential it has until entering in to the market place or starting enterprises in the economic system. Such learning procedure is called Bayesian or the passive learning process. Alternatively, market place or business system will make a selection of the most efficient firm in which the most growth is possible when reaching the minimum efficient size.
2.3.3 The Role of Employment on Firm Growth

The study of Lockett et. al. (2009) have excellently presented the tight relationship between employment growth and firm growth. Lockett et. al. referred their work on Penrose (1959), the founder of firm growth theory which has been well-known in the management field. Penrose’s firm growth theory considered the growth of production resources of firm as the essential factor in the theory such as manager and human resources.

Lockett et al. used employment growth to represent firm growth in order to study the adjustment costs of growth and the productive opportunity set facing the firm. This study is the direct revisit of Penrose’s analysis in the new era as the adjustment costs of growth and the productive opportunity set facing the firm were focal point of Penrose’s analysis. Lockett et. al. considered employment growth as the great representative of firm growth since the expansion of human resource were mainly concerns in Penrose’s firm growth theory.

2.4 The Concepts of Economic Growth

The development of a country leads to an increase gross national product in the long run (Meir, 1995). The optimal goal of economic development is to increase the standard of living of the nation’s population as a whole. Owing to the problem of poverty, unemployment, and income distribution, economic development by structural change in production, reduction in agriculture production for manufacturing extension in the industrial sector will advance a rapid growth of economy and its effect will continue to people in terms of increasing employment (Siriporn Sajjanant, 2002: 16-20).

A success in economic development by advancing in the industrial sector can be examined by the growth activities of firms existing in potential industrial sector which is originated by demand-driven growth. That means the growing of firms come from force and response to market opportunity which reflects successful economic development (Liedholm, McPherson and Chuta, 1994; Mead, 1994).
2.4.1 Theories and Concepts Related to Economic Growth

2.4.1.1 Economic Growth Theory in Competitive Capitalism

Adam Smith explained in his book “An Inquiry into the Nature and Courses of the Wealth of Nations” that economic growth of a country occurs owing to free market competition. Capital accumulation in the economic system is significant determinant resulting in the growth of the economic system. When the system of the economy has extended, it will generate to division of labor, more skill and will lead to labor productivity. Fundamental elements of economic growth are composed of three characteristics as follow:

1) A rational man
2) Laissez-faire
3) Invisible hand

However, economic growth will come after when the economic system enhances a division of labor which its effect will create specialization that leads to increase in labor productivity. Increased productivity will generate additional outcomes that expose in terms of economic growth. Division of labor will generate due to capital accumulation. That means producer led physical capital – tools and machinery for labor to be a part of production.

He has demonstrated the factors endorsing the growth of economy as follow:

1) Savings
2) Market size
3) External economies

It can be said that Adam Smith’s concept emphasized on capital accumulation can bring to division of labor, specialization, increased productivity, and economic extension (Dararat Arnandhanasuwong, 2002, pp.46-48).

2.4.1.2 Economic Growth Theory on Aggregate Demand by John M. Keynes

John M. Keynes accentuates an effective demand or aggregate demand. His study explained the factors influencing changes of income and employment in the economic system at a certain point of time. Such concept has been written in the book “The General Theory of Employment Interest and Money (1936) which is an initialization of modern macro-economics.
Keynes says that in the short run, aggregate demand would be a manufacturing determinant, but in the long run it would not be along aggregate demand but it would run by natural mechanism.

To gain an aggregate demand, Keynes represents the new concepts as follow:

1) Multiplier is a push factor generating a sub-demand and multiplied inclusion to achieve an aggregate demand. An aggregate demand would affect the manufacturing quantity in the economic system.

2) Liquidity preference is a demand which occurs continually or the process by which monetary policy affected the interest rate. The interest rate will have a continuous effect originating from gross demand.

3) Expectation is a likelihood of potential changes in the factors or government policies in the way that these changes would affect the volume of consumption and investment that would further influence the gross demand.

4) Animal spirit is the concept explaining the behavior of human beings that influence the production requirements.

The relationship between different factors affecting the gross demand is presented in the figure below:

![Graph](image)

**Figure 2.12** Relationship between Consumer Spending and National Income

**Source:** Montree Socatiyanurak, 2005: 24.
From Figure 2.12, the national income used the total of country’s resources which is $Y_F$ (Full employment). According to Keynesian theory, in the event of inadequate aggregate expenditure, economic system would be in equilibrium at $Y_0$ which is lesser than full employment. In case the government increases expenditure ($G_1$), it will cause the level of national income equal to $Y_F$. This is the level of full employment (Montree Socatiyanurak, 2005: 22-24).

Keynesian theory concludes that in the short run, wages would be sticky. Consequently, if the demand of economic system is in the low level, government has to take account on adjusting real demand to be extending by amplifying expenditure as for generating employment. This is the best way to create gross demand in the economic system that can facilitate in solving the problem of economic cycle, needless to apply the mechanism of invisible hand (Teerana Bhongmakapat, 2008: 44).

2.4.2.3 Theory of Technology’s Role in Economic Growth

Robert Solow, creator of Solow Growth Model in 1956 indicates technological improvement as a factor affecting the growth of the economy. Solow’s five hypotheses are presented below:

1) The two manufacturing factors in the economic system are capital and labor.

2) Production function is identified as Cobb-Douglas and has constant returns to scale.

3) Economic system is a complete market where national income is distributed to overall manufacturing factor in the economic system. Those factors are capital and labor in terms of interest returns and wage rates.

4) The model is hereunder a closed economy and without international transaction.

5) Technology variable is exterior factor.

Solow model is composed of two significant functions which are production function and capital accumulation function. The equation for the Solow model is:
\[ Y = B K^\alpha L^{1-\alpha} \]

*where:*

- \( Y \) = National income
- \( K \) = Capital
- \( L \) = Labor
- \( B \) = Hicks-Neutral Productivity or Total Factor Productivity
- \( \alpha \) = Capital share parameter

The model of Solow reflects that the rate of economic growth comprises of two main elements. These are the growth of manufacturing factor and the growth of technological progress. From the result tested by Solow, the model pointed out that when the factors of savings increase, affecting capital increase, it would generate a permanent change of the national income (Level effect) which is not influential to economy in the long run (Growth effect). Only technological progress factor affects the growth of economy. Equally important, in the long run, conventional output is likely to expand itself with limitation, such as the limitation of growing working population. For this reason, the policy on economic growth moving forward should be the way of technological improvement that derives from conducting research and development in charge of either government or private sector (Jirawat Charoensathapornkul, 2010: 187-204).

2.4.1.4 Harrod and Domar’s Theory: Savings and Investment

Harrod and Domar, (quoted in Dararat Arnochana, 2002: 61) have explained that capital accumulation would bring about an increase of real national income and results in a smooth economic growth. They demonstrated the two significances of capital accumulation as follows:

1) Investment will generate income which is in accordance with the concept of demand of Keynes asserting that investment is one factor producing employment and economic growth.

2) Investment causes productivity according to the concept of demand created by neo-classical economists.
Harrod and Domar explained that capital accumulation on demand leads to capital increase. When other factors are constant, there would be more increase in employment and individuals will have more earnings. When income increases, it would create more savings. Regarding supply, investment results to adding more machinery. Proportion capital to labor is high which affects manufacturing productivity increase. With regard to increase in investment, if it can boost income on demand, and the level of saving is higher than the increase of manufacture of productivity on supply, it would be out of balance in economic system and the level of employment could not be maintained. Therefore, to uphold full employment level, the net investment must be higher to handle increased savings. Higher savings could occur if and only if there is an increase in real income (Dararat Arndhananasuwong, 2002: 61).

2.5 Structure of Thai Industry

Thai economic structure comprises of three major economic activities which are (1) agricultural sector (2) industrial sector (3) service sector. The agricultural sector had been the major economic activity once in the past. However, because of the First National Economic and Social Development Plan that sped up the country’s development, the economic structure then experienced a great change. From 1990, the GDP rose continuously from about 27 percent to 30 percent or 3,297,910 THB million in 2011 (Office of Industrial Economics and Thammasart University Research and Consultancy Institute, 2009: 37).
The overall image of gross domestic products in Thailand seems to have a continuing expansion but it is considered just domestic activities. Considering about global competitiveness, it was found that it decreased. See the table below:

**Table 2.1** Thailand’s GDP Ranking and Proportion Compared to Global Organizations

<table>
<thead>
<tr>
<th>Change in Global Ranking</th>
<th>Change in Share of Global GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Capita GDP 2000-2008</td>
<td></td>
</tr>
<tr>
<td><strong>Year</strong></td>
<td><strong>2000</strong></td>
</tr>
<tr>
<td>Rank</td>
<td>84th</td>
</tr>
<tr>
<td>US$</td>
<td>4,925.28</td>
</tr>
</tbody>
</table>

**Source:** Adapted from the full report of the project studying the direction of Thai industry development forward for global competitiveness conducted by the Office of Industrial Economics, Ministry of Industry and National Institute of Development Administration.
From Table 2.1, it can be seen that Thailand has adjusted the global GDP rank from 84th in 2000 to the 78th in 2008. Considering the global GDP share, in return, it showed that during eight years, Thailand has adjusted up the GDP share slightly, or rather constantly, which was as from 0.73% in 2002 (23rd of global rank) to 0.78% in 2008 (22th of global rank). All these, when analyzing the result of ranking in general compared to global organizations such as the World Economic Forum (WEF) it has been estimated that the competitiveness indicators of Thailand in 2010 stays in the 36th rank from 35th in 2002. Including conducted by International Institute for Management Development (IMD) Thailand ranks 26th on competitiveness in 2010 from being rank 34th in 2002 which was the consequence that Thailand has potentiality in global market competitiveness with somewhat constant figure. The result of ranking is still not consensus which can indicate that Thailand has a competency in the global level. As a result, Thailand must rush its development competency to catch up with other countries. Otherwise, there will be an effect on the overall Thai economy (Office of Industrial Economics and National Institute of Development Administration, 2010: 36-37).

All these, considering the development of the Thai industrial sector, it is found that Thailand has paid attention to industrial sector by conducting the policies that support and develop the industrial sector since the First National Economic and Social Development Plan was applied in Thailand in 1961. Simultaneously, there was a continuing support to the later plans. The details are the following:

2.5.1 The National Economic and Social Development Plan and Industrial Advancement

2.5.1.1 The First National Economic and Social Development Plan B.E. 2504-2509 (A.D. 1961-1966)

The Investment Promotion Act B.E. 2520 became effective in 1960 to mainly promote the production and reduce material imports. It highly promoted the use of raw materials locally and protected domestic industries by regulating tax barriers for import. The First National Economic and Development Plan created a guideline for industrial development by allowing the private sectors to lead industrial production without the state’s interaction by competing with it.
2.5.1.2 The Second National Economic and Social Development Plan B.E. 2510-2514 (A.D. 1967-1971)

The Second Plan was a continuation of the First with an addition that the government further promoted the state-run industry which the private sector lacked the capacity to run. Still, the import-substituting industry was a major concern along with its supporting measures such as tax barriers, financial and academic assistances, science development and location supports.

2.5.1.3 The Third National Economic and Social Development Plan B.E. 2515-2519 (A.D. 1972-1976)

This Plan replaced the development focuses written in the first two initiatives with the export-oriented industry especially the intensive labor industry. This was the reason that the former import-substituting industry created no economy of scale due to limitations of domestic market and caused low standard products and increased imports of capital goods, raw materials and intermediate goods. Furthermore, the government had neither technological measures nor capital goods production to support this industry.

2.5.1.4 The Fourth National Economic and Social Development Plan B.E. 2520-2524 (A.D. 1977-1981)

After all previous development plans have been carried on, this Fourth Plan emphasized on both import-substituting industry and export-oriented industry. It expanded the promotion of industries that influenced the country’s economy such as the automotive and electronics industries. Additionally, the expansion of industries in the provinces was highlighted.

2.5.1.5 The Fifth National Economic and Social Development Plan B.E. 2525-2529 (A.D. 1982-1986)

The export-oriented industry still played the leading role in the Fifth Plan with an inclusion of financial measures for import promotion and the continued focus on industrial expansion into the regions particularly in the eastern seaboard. In this period, foreign investments from Japan, South Korea and Taiwan became crucial for Thailand’s industrial sector. This was because of the 1985 Plaza Accord in September in New York in which powerful economic powers such as the United States, France, Germany and Japan reached an agreement to create an economic balance.
2.5.1.6 The Sixth National Economic and Social Development Plan B.E. 2530-2534 (A.D. 1987-1991)

The export-oriented industry and regional industrial expansion were remained as key points in this plan. However, the medium and small-scale industry was introduced and so was the value-added tax aimed to reduce double taxation as a replacement of commercial tax.

2.5.1.7 The Seventh National Economic and Social Development Plan B.E. 2535-2539 (A.D. 1992-1996)

This plan gave special attention to the promotion of efficient production through structural adjustment, technological improvement and industrial standard system. Human resource was mentioned so that they could achieve skill enhancement. The government also implemented flexibilities in regulations, adjusted tax structure, provided energy sources sufficient for industrial production and promoted technological utilization as a substitute for labor.

In the Plan, six target industries were identified as follows:

1) Textile and apparel industry
2) Machinery industry
3) Agricultural industry
4) Electronics industry
5) Petro-chemical industry
6) Steel industry

2.5.1.8 The Eighth National Economic and Social Development Plan B.E. 2540-2544 (A.D. 1997-2001)

This plan continued policies from previous plans with greater attention to medium and small-scale industries and the development of knowledge, production and management. It promoted foreign investment and sustainable development as well as industrial pollution reduction.

2.5.1.9 The Ninth National Economic and Social Development Plan B.E. 2545-2549 (A.D. 2002-2006)

It stated on the capacity in global competition by structural adjustment to strengthen industrial production. It put importance on developments in human resources production management and goods quality, technological advancement, industrial research and medium and small industry strengthening.
2.5.1.10 The Tenth National Economic and Social Development Plan B.E. 2550-2554 (A.D. 2007-2011)

During this period, an environment that facilitated the industrial growth was the key point. The government, therefore, eased up some financial restrictions and legalities that hindered an expansion of the capital market. It tried to manage the country’s budget more efficiently and adjusted tax and production structures. It even took concern about the supply chain and cluster development to better favor the productivity. As to the value chain, the government did promote and provided opportunities for medium and small enterprises to have value added in their goods and services based on knowledge and Thai identities.

The government also maximized foreign investments through a creation of value added by stressing the investment in which technologies could be transferred. It did upgrade the country’s agricultural production aimed for food security and safety. Furthermore, logistic system, energy and related alternatives were enhanced to sufficiently serve the country’s industrial sector in the future (Arthi Krusakayawong, 2010: 115-118).

2.5.1.11 The Eleventh National Economic and Social Development Plan B.E. 2555-2559 (A.D. 2012-2016)

Developments in the past revealed that the production sector significantly influenced the country’s economic system. Thus, it was a fact that the overall productivity was not well developed. The total productivity remained low as it increased by 1.1 percent in the first three years of the Tenth Plan.

In this period, the industrial development plan gave a priority to industrial structural change by way of utilizing sciences, technologies and creativities that would lead to green industry, environmental friendliness and sustainable and balanced development as follow:

1) Developing ecological industrial cities and restoring the environment in major industrial areas continuously
2) Developing and promoting agro-processing industry and new industry by using knowledge, creativities, local wisdoms and innovations for value added and higher standard goods
3) Increasing productivity and efficiency of the industrial sector by developing infrastructures that would enhance the production standard;
promoting an application of sciences, technologies and innovations to add value to industrial products and; coordinating development initiatives of public and private sectors, education institutions and institutes in skill trainings.

4) Promoting and providing supports for linkages between large industries and local industries and expanding industrial developments to regional areas (Office of the National Economic and Social Development Board, 2012: 66-76)

2.5.2 The National Industrial Development Master Plan

To response to nation’s development policy as specified in the National Economic and Social Development Plan and to strengthen the global competitiveness of the industrial sector, Ministry of Industry has set a development plan for each sector besides overall plan.

All these, the National Industrial Development master Plan B.E. 2555-2574 specifies the guidelines for different fields of industry. The plan specified the pilot manufacturing sectors as the following: (Ministry Industry, 2012: Kor 8)

Gain maximum benefit industry
- Foods and beverages
- Textile*
- Rubber and rubber products

Handicraft industry
- Motor vehicle
- Jewelry and related articles

Social support industry
- Clothing *

Advance technological industry
- Electrical and electronics

Infrastructure industry
- Machinery and equipment

Green environment industry
- Renewable energy

Note: *Garment and Clothing Industry as a Pilot Industry
All eight pilot industrial sectors were specified by the Ministry of Industry on their roles for future goals in global competitiveness. This will be the guidelines for developing all sectors to achieve definite goals. The details as the following:

**Table 2.2** Potentials and Future Goals for Thai Industry

<table>
<thead>
<tr>
<th>Sector</th>
<th>Current role</th>
<th>Future role</th>
<th>Position in global / goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food and beverages</td>
<td>Manufacturer and exporter</td>
<td>Global brand owner</td>
<td>Brand owner of convenience foods</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Management source for raw materials in Asian region</td>
</tr>
<tr>
<td>Automobiles and automotive</td>
<td>Support manufacturing entrepreneurs</td>
<td>Support manufacturing</td>
<td>Research and Development source on automobiles of the region</td>
</tr>
<tr>
<td>parts</td>
<td></td>
<td>entrepreneurs</td>
<td></td>
</tr>
<tr>
<td>Garment and clothing</td>
<td>Outsourcing for global brand SMEs as a brand owner</td>
<td>Global manufacturer</td>
<td>Quality manufacturing source for garment and clothing goods and connection to global brand owners</td>
</tr>
<tr>
<td>Rubber and plastic products</td>
<td>Raw material manufacturer and exporter</td>
<td>Global brand owner for rubber products</td>
<td>Potential brand owner and has the capacity to determine rubber-cost direction together with the country manufacturer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Global source manufacturer</td>
<td></td>
</tr>
</tbody>
</table>

Region
Table 2.2  (Continued)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Current role</th>
<th>Future role</th>
<th>Position in global / goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jewelry and related</td>
<td>Importer</td>
<td>Global</td>
<td>Process source for adding value to goods</td>
</tr>
<tr>
<td>articles</td>
<td>Manufacturer</td>
<td>manufacturer</td>
<td>Global buyer &amp;seller of jewelry market</td>
</tr>
<tr>
<td></td>
<td>Exporter</td>
<td>Exporter</td>
<td>Global buyer &amp;seller of jewelry market for consumers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Manufacturer of raw materials for jewelry market in the region</td>
<td></td>
</tr>
<tr>
<td>Electrical and</td>
<td>Outsourcer (Electronics)</td>
<td>Electrical products producer in the region</td>
<td>Electrical brand owner Outsurcer</td>
</tr>
<tr>
<td>electronics</td>
<td>Electrical component manufacturer</td>
<td>Promoter of electrical goods for global company</td>
<td>Source of Research and electronics technology</td>
</tr>
<tr>
<td>Machinery and</td>
<td>Outsourcer Technology buyer</td>
<td>Manufacturing supporter</td>
<td>Machinery mold manufacturing basement</td>
</tr>
<tr>
<td>equipment</td>
<td></td>
<td></td>
<td>Machine manufacturer</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Industrial manufacturing supporter</td>
</tr>
<tr>
<td>Renewable energy</td>
<td>Technology buyer</td>
<td>Potential Manufacturer of circulated energy</td>
<td>Manufacturing basement of machinery and appliance about producing alternative energy in the global level</td>
</tr>
</tbody>
</table>

**Source:** Adapted from the Table about competency of Thai industry at present and future goal from the Thai Industry Master Plan B.E. 2555-2574, Ministry of Industry.
The goals in the master plan include the guidelines for industrial categories to enable to reach global-industry position as planned. The details are as follow:

Food and beverage industry
- Building and publicizing Thai goods to be acknowledged universally
- Creating the standard in the manufacturing of products
- Establishing research and development basement on food industry

Automobile and automotive parts industry
- Producing a number of labor that corresponds to demand
- Developing skills and proficiency among laborers
- Developing supporting structure and infrastructure advantageous to investment
- Imposing the use of raw domestic materials and decrease the import of raw products

Garment and clothing industry
- Upgrading competitiveness of entrepreneurs
- Passing over labor cost competition and stepping forward creativity economy
- Building regional cooperation and networking

Rubber and plastic product industry
- Increasing the amount of entrepreneurs particularly rubber transforming industry
- Enhancing research and development on rubber transforming industry

Jewelry and related article industry
- Adjusting structure to enhance continuing development
- Increasing the number of skilled laborers

Electronics and electrical appliance industry
- Adjusting the structure on labor and obligation favorable to business operation
- Developing a technology center for product design
- Regional market development
- Developing universal standard of product
Machinery and machinery mold appliance industry
- Creating specialists in Thailand in the field that lack labor force.
The lack of specialist in the labor force is a big obstacle in developing the whole industries of the country. This is due to machinery industry regarded as fundamental industry in Thai industry.
- Building the growth of market producing machinery mold for the expansion of this industry
- Market development by being regional outsourcer of machinery mold

Circulated and alternative energy industry
- Increasing the number of entrepreneurs
- Specifying attractive benefits to entrepreneurs
- Arranging agencies to take responsibility for the development of this sector
- Changing the role from a technology buyer to a manufacturer of machinery and technology for this sector

2.6 Definition

Employment means the number of employees at present that are hired and granted a wage (Krugman and Wells, 2006: G-2)

Economic Development means the process that facilitates an increase in real gross national product per capita in a long term in which the number of population living below the absolute poverty line remains unchanged while the income distribution does not lessen (Meir, 1995: 7, Siriporn Sajjanant, 2002: 16)

Investment means spending for investment for equipment, inventories and fundamental factors of business (Mankiw, 2004: 534)

Investment Promotion is a promotion of investment by encouraging the Board of Investment of Thailand, an organization in charge of granting a permission to an enterprise to receive an investment promotion. The enterprise should be important and beneficial in terms of economic, social and security. The enterprise can be an
exporter, a business that highly needs labor and services, or uses agricultural products or natural resources as raw materials. The promoted enterprise may be those that have never existed in Thailand or already existed but low in number. The permission also extends to those whose production methods are obsolete (National Statistical Office).

The benefits of this investment promotion are presented below:

**Tax incentives (Board of Investment of Thailand)**
- Exemption/reduction of import duties on machinery (Section 28/29)
- Reduction of import duties for raw or essential materials (Section 30)
- Exemption of juristic person’s income tax and dividends (Section 31 and 34)
- A 50 percent reduction of the juristic person’s income tax (Section 35(1))
- Double deductions from the costs of transportation, electricity and water supply (Section 35(2))
- Additional 25 percent deduction of the cost of installation or construction of facilities (Section 35(3))
- Exemption of import duty on raw or essential materials for use in the production for export (Section 36)

**Non-tax incentives**
- Permit for foreign nationals to enter the Kingdom for the purpose of studying investment opportunities (Section 24)
- Permit to bring into the Kingdom skilled workers and experts to work in investment promoted activities (Section 25 and 26)
- Permit to own land (Section 27)
- Permit to take out or remit money abroad in foreign currency (Section 37)

**Guarantees**
- The State will not nationalize the activity of the promoted person (Section 43).
- The State will not undertake a new activity in competition with the promoted person (Section 44).
- The State will not monopolize the sale of products similar to the promoted person (Section 45).
- The State will not impose price controls on the products of the promoted person (Section 46).
- The State will grant permission to export at all times (Section 47).
- The State will not allow any government agency, government organization or state enterprise to import any kind of product being produced by the promoted person into the Kingdom by granting import duty exemption (Section 48).

Protection

- To charge extra import fees into the Kingdom on products similar to those produced by the promoted person at a rate not exceeding 50 percent of the price of overseas insurance and freight charges effective for a period of not more than one year (Section 49).
- In the case where the Board’s opinion that Section 49 is inadequate for protecting the activity of the promoted person, it will increase the measure by banning the import of products similar to the local productions (Section 50).
- In the case where the promoted person encounters any problem or obstacles in the course of carrying out the promoted activity, the Chairman will have the power to render any appropriate assistance (Section 51).
- In the case where the tax rate structure or system for tax collection or service charge or fee collection is an obstacle to the promoted person, the Chairman will have the power to rectify (Section 52).

Labor Force means the number of persons with ability to work. The number includes those having jobs and those having no job (Mankiw, 2007: 564).

Medium Enterprises means the enterprises that produce goods that have more than 50 but not over 200 employees or have a value of fixed assets of 50 million baht but not over 200 million baht (The Ministerial Regulation on the Number of Employees and Value of Fixed Assets of Medium and Small Enterprises, B.E. 2545).

Small Enterprises means the enterprises that produce goods that have less than 50 employees or have a value of fixed assets of not over 50 million baht (The Ministerial Regulation on the Number of Employees and Value of Fixed Assets of Medium and Small Enterprises, B.E. 2545)
Large Enterprises means the enterprises that produce goods that have more than 200 employees or have a value of fixed assets of over 200 million baht.

Machine means a component of several pieces in generating energy, changing or altering energy or transmitting energy by the force of water, steam, wind, gas, electricity, or any other energy or energies combined and also includes fly-wheel equipment, pulleys, belts, axles, gears, or other things which work reciprocally (Factory Act, B.E. 2535).

Total Factor Productivity (TFP) means an increase of product that does not derive from production factors (capital, labor and land) but technologies (Office of the National Economic and Social Development Board).

Value Added means the value of a business’ product combined with the value of enhancement added to that product.

Factory means a building, place, or vehicle which uses a machine from five horsing powers or an equivalent thereof or more or which employs seven workers or more with or without any machine for manufacturing, producing, assembling, filling, repairing, maintaining, testing, improving, altering, transporting, keeping, or destroying anything in accordance with the type or kind of factory as provided for in a ministerial rule (Factory Act, B.E. 2535).

Industry means the production or transformation of materials into finishing goods for trading. It has factories for production and requires money investment and labor for the production, such as agricultural products, industrial products or services such as forestry, fishery, plantation, banking, insurance and tourism (Orthip Ratniyom, 2004: 3; Arthi Kroosakayawong, 2010: 12)
CHAPTER 3

CONCEPTUAL FRAMEWORK AND RESEARCH METHODOLOGY

3.1 Conceptual Framework


1) The Evolutions of Gibrat’s Law (The Law of Proportionate Effect)
2) Structure-Conduct-Performance Framework
3) Learning and Selection Model

By integrating these three concepts and the literature reviews on the growth determinants (as stated in Chapter 2), this study identifies five independent variables as shown in Table 3.1 that presents the variables and factors that influence the employment growth according to Storey (1994) and Fadahunsi (2012). These factors were effectively used by the government to develop the industrial sector.
Table 3.1 Independent Variables

<table>
<thead>
<tr>
<th>No.</th>
<th>Independent variables</th>
<th>Level of measurement</th>
<th>Factors influencing the employment growth rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Location</td>
<td>Nominal</td>
<td>Related to the firm</td>
</tr>
<tr>
<td>2</td>
<td>Industrial Estate</td>
<td>Nominal</td>
<td>Related to Strategy</td>
</tr>
<tr>
<td>3</td>
<td>Size</td>
<td>Ratio</td>
<td>Related to the firm</td>
</tr>
<tr>
<td>4</td>
<td>Age</td>
<td>Ratio</td>
<td>Related to the firm</td>
</tr>
<tr>
<td>5</td>
<td>Investment</td>
<td>Ratio</td>
<td>Related to Strategy</td>
</tr>
</tbody>
</table>

Figure 3.1 Conceptual Framework

Table 3.1 and Figure 3.1 show independent variables as follow:

1) Location is based on the administration district where the firm is located.
   0 represents the firms that are located in the inner city.
   1 represents the firms that are located in the inter city and outer city.
2) Industrial Estate means the operation in the industrial estate.
   0 represents the firms that are operating in the industrial estate.
   1 represents the firms that are not operating in the industrial estate.

3) Size implies the number of employees at the start of the firm.

4) Age implies the total operational years from the start of the firm until 2012.

5) Investment value is the total investment at the start of the firm registration with the Department of Industrial Works. The investment includes machines, properties and circulating capital.

The variables are concluded in the conceptual framework shown in Figure 3.2.

Figure 3.2 Conceptual Framework and Variables
This study was divided into 3 main studying dimensions as follow:

1) The study on factors influencing the overall employment growth in the industrial sector

2) The study on factors influencing the employment growth in each industrial category

3) The study on factors influencing the employment growth by firm’s size

3.2 Equation for Employment Growth

As mentioned, there are three dimensions in the study. And so, the equation is divided into three groups. Each group shows the relationship between independent variables and dependent variables as follow:

**Firm Growth Determinants Model**

**Group 1: A Dimension for Studying the Overall Employment Growth in the Industry**

**Model 1: \( xgemp = F (loc, est, xsize, age, xinv) \)**

- \( xgemp \) is the overall employment growth in the industry
- \( loc \) is the dummy variable that represents the firm’s location
  - Firms that are located in the inner city = 0
  - Firms that are located in the inter city and outer city = 1
- \( est \) is the operation in the industrial estate
  - Firms that are operating in the industrial estate = 0
  - Firms that are not operating in the industrial estate = 1
- \( xsize \) is the number of persons engaged at the start of the firm
- \( age \) is the total operational years from the start of the firm until 2012
- \( xinv \) is the investment value at the start of the firm
Group 2: A Dimension for Studying Each Industrial Category

Manufacture of Food Products and Beverages

Model 2: \( x_{\text{gempFB}} = F(\text{locFB}, \text{estFB}, x_{\text{sizeFB}}, \text{ageFB}, x_{\text{invFB}}) \)

- \( x_{\text{gempFB}} \) is the employment growth rate
- \( \text{locFB} \) is the dummy variable representing the firm’s location
  - Firms that are located in the inner city = 0
  - Firms that are not located in the inter city and outer city = 1
- \( \text{estFB} \) is the operation in the industrial estate
  - Firms that are operating in the industrial estate = 0
  - Firms that are not operating in the industrial estate = 1
- \( x_{\text{sizeFB}} \) is the number of persons engaged from the start of the firm
- \( \text{ageFB} \) is the total number of years at the start of the firm until 2012
- \( x_{\text{invFB}} \) is the investment value at the start of the firm

Manufacture of Automobiles and Automotive Parts

Model 3: \( x_{\text{gempAP}} = F(\text{locAP}, \text{estAP}, x_{\text{sizeAP}}, \text{ageAP}, x_{\text{invAP}}) \)

- \( x_{\text{gempAP}} \) is the employment growth rate
- \( \text{locAP} \) is the dummy variable representing the firm’s location
  - Firms that are located in the inner city = 0
  - Firms that are not located in the inter city and outer city = 1
- \( \text{estAP} \) is the operation in the industrial estate
  - Firms that are operating in the industrial estate = 0
  - Firms that are not operating in the industrial estate = 1
- \( x_{\text{sizeAP}} \) is the number of persons engaged at the start of the firm
- \( \text{ageAP} \) is the total operational years from the start of the firm until 2012
- \( x_{\text{invAP}} \) is the investment value at the start of the firm
Manufacture of Textiles and Apparels

Model 4: \( x_{gempGT} = F (locGT, estGT, xsizeGT, ageGT, xinvGT) \)

- \( x_{gempGT} \) is the employment growth rate
- \( locGT \) is the dummy variable representing the firm’s location
  - Firms that are located in the inner city = 0
  - Firms that are located in the inter city and outer city = 1
- \( estGT \) is the operation in the industrial estate
  - Firms that are operating in the industrial estate = 0
  - Firms that are not operating in the industrial estate = 1
- \( xsizeGT \) is the number of persons engaged at the start of the firm
- \( ageGT \) is the total operational years from the start of the firm until 2012
- \( xinvGT \) is the investment value at the start of the firm

Manufacture of Rubber and Plastic Product

Model 5: \( x_{gempTP} = F (locTP, estTP, xsizeTP, ageTP, xinvTP) \)

- \( x_{gempTP} \) is the employment growth rate
- \( locTP \) is the dummy variable representing the firm’s location
  - Firms that are located in the inner city = 0
  - Firms that are located in the inter city and outer city = 1
- \( estTP \) is the operation in the industrial estate
  - Firms that are operating in the industrial estate = 0
  - Firms are not operating in the industrial estate = 1
- \( xsizeTP \) is the number of persons engaged at the start of the firm
- \( ageTP \) is the total operational years from the start of the firm until 2012
- \( xinvTP \) is the investment value at the start of the firm
Manufacture of Jewelry and Related Articles

Model 6: \( x_{\text{gempGE}} = F (\text{locGE}, \text{estGE}, \text{xsizeGE}, \text{ageGE}, \text{xinvGE}) \)

- \( x_{\text{gempGE}} \) is the employment growth
- \( \text{locGE} \) is the dummy variable representing the firm’s location
  - Firms that are located in the inner city = 0
  - Firms that are located in the inter city and outer city = 1
- \( \text{estGE} \) is the operation in the industrial estate
  - Firms that are operating in the industrial estate = 0
  - Firms that are not operating in the industrial estate = 1
- \( \text{xsizeGE} \) is the number of persons engaged at the start of the firm
- \( \text{ageGE} \) is the total operational years from the start of the firm until 2012
- \( \text{xinvGE} \) is the investment value at the start of the firm

Manufacture of Electrical and Electronics

Model 7: \( x_{\text{gempEL}} = F (\text{locEL}, \text{estEL}, \text{xsizeEL}, \text{ageEL}, \text{xinvEL}) \)

- \( x_{\text{gempEL}} \) is the employment growth rate
- \( \text{locEL} \) is the dummy variable representing the firm’s location
  - Firms that are located in the inner city = 0
  - Firms that are located in the inter city and outer city = 1
- \( \text{estEL} \) is the operation in the industrial estate
  - Firms that are operating in the industrial estate = 0
  - Firms that are not operating in the industrial estate = 1
- \( \text{xsizeEL} \) is the number of persons engaged at the start of the firm
- \( \text{ageEL} \) is the total operational years from the start of the firm until 2012
- \( \text{xinvEL} \) is the investment value at the start of the firm
Manufacture of Machine, Machinery and Equipment

Model 8: \( x_{\text{gempMP}} = F(\text{locMP}, \text{estMP}, x_{\text{sizeMP}}, \text{ageMP}, x_{\text{invMP}}) \)

- \( x_{\text{gempMP}} \) is the employment growth rate
- \( \text{locMP} \) is the dummy variable representing the firm’s location
  - Firms that are located in the inner city = 0
  - Firms that are located in the inter city and outer = 1
- \( \text{estMP} \) is the operation in the industrial estate
  - Firms that are operating in the industrial estate = 0
  - Firms that are not operating in the industrial estate = 1
- \( x_{\text{sizeMP}} \) is the number of persons engaged at the start of the firm
- \( \text{ageMP} \) is the total operation years from the start of the firm until 2012
- \( x_{\text{invMP}} \) is the investment value at the start of the firm

Group 3: A dimension for Studying Firm’s Size

Small Scale Industry (1-50 employees)

Model 9: \( x_{\text{gempS}} = F(\text{locS}, \text{estS}, \text{ageS}, x_{\text{invS}}) \)

- \( x_{\text{gempS}} \) is the employment growth rate
- \( \text{locS} \) is the dummy variable representing the firm’s location
  - Firms that are located in the inner city = 0
  - Firms that are located in the inter city and outer city = 1
- \( \text{estS} \) is the operation in the industrial estate
  - Firms that are operating in the industrial estate = 0
  - Firms that are not operating in the industrial estate = 1
- \( \text{ageS} \) is the total operational years from the start of the firm until 2012
- \( x_{\text{invS}} \) is the investment at the start of the firm
Medium Scale Industry (51-200 employees)

Model 10: \( xgempM = F (locM, estM, ageM, xinvM) \)
- \( xgempM \) is the employment growth rate
- \( locM \) is the dummy variable representing the firm’s location
  - Firms that are located in the inner city = 0
  - Firms that are located in the inter city and outer city = 1
- \( estM \) is the operation in the industrial estate
  - Firms that are operating in the industrial estate = 0
  - Firms that are not operating in the industrial estate = 1
- \( ageM \) is the total operational years from the start of the firm until 2012
- \( xinvM \) is the investment value at the start of the firm

Large Scale Industry (201 employees and over)

Model 11: \( xgempL = F (locL, estL, ageL, xinvL) \)
- \( xgempL \) is the employment growth
- \( locL \) is the dummy variable representing the firm’s location
  - Firms that are located in the inner city = 0
  - Firms that are located in the inner city and outer city = 1
- \( estL \) is the operation in the industrial estate
  - Firms that are operating in the industrial estate = 0
  - Firms that are not operating in the industrial estate = 1
- \( ageL \) is the total operation years from the start of the firm until 2012
- \( xinvL \) is the investment value at the start of the firm

3.2.1 Employment Growth Rate

This study applied the calculation of annual growth rate to determine the difference of valuation between the number of employees at the start of firm and the
number of employees at present. The difference is then used to find out the mean value to compare with the age of the firm. The calculation formula is as follows:

The formula to calculate the employment growth rate:

\[
\text{Employment growth} = \frac{\text{Number of employment at present} - \text{Number of employment at the start of firm}}{\text{Firm's operational year}}
\]

The above calculation formula was cited from the study on firm growth (Liedholm, McPherson and Chuta, 1994, p. 1179)

3.3 Research Process

The multiple regression analysis was employed to explore independent variables that influenced dependent ones. Both STATA version 10.0 and SPSS version 17.0 were used to analyze data. This research was composed of three processes for analysis and hypothesis test in order to meet the research objectives.

3.3.1 Process I

This first process started with an exploration of the overall employment growth in the industrial sector. In the process, all 762 samples were brought into analysis to search for influences of each independent variable on the overall growth of the industrial sector. After that, the result was taken into hypothesis test and analysis to explain independent variables’ influence on the dependent variable.

3.3.2 Process II

Those 762 samples were grouped based on seven industrial categories. These seven categories are pilot industries scheduled in the National Industrial Development Master Plan, B.E. 2555-2574. After the categorization, a separate test of each industrial category was administered to explore influential factors in the employment growth in the industrial category. Such factors then facilitated the hypothesis testing and analysis for the explanation about the importance of independent variables to the employment growth in each industrial category.
3.3.3 Process III

The third process pertains to the size of the firm. Therefore, this study broke down the same 762 samples into three groups according to the firm’s size. The small scale firm has 1-50 employees, the medium scale firm has 51-200 employees and the large scale firm has at least 201 employees. After categorizing them into groups, the test was conducted in each group to explore independent variables’ influence on the dependent variables. Following this was the hypothesis test for answers to the research questions, for analysis and for result discussion.

<table>
<thead>
<tr>
<th>Process I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explore the overall employment growth in industrial sector by testing independent variables to find the influence on the employment growth of all 762 sampled firms.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explore independent variables influencing seven industrial categories by testing each category separately.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explore independent variables influencing each firm’s size by dividing into three size groups which are small, medium and large, and then examine the results of each group separately.</td>
</tr>
</tbody>
</table>

Figure 3.3  Research Process Framework
3.4 Assumptions and Research Questions

This study developed research questions and hypotheses as guides to statistical tests for answers and hypothesis proof. So, by relying on research questions, hypotheses were grouped as follow:

3.4.1 Research Question I
What are the factors that influence the overall employment growth in the industrial sector?

Group 1 Hypotheses
H 1.1 Firm’s location influences the difference in the overall employment growth.
H 1.2 Firm’s operation in the industrial estate influences the difference in the overall employment growth in the industrial sector.
H 1.3 Firm’s size positively influences the overall employment growth in the industrial sector.
H 1.4 Age of the firm negatively influences the overall employment growth in the industrial sector.
H 1.5 Investment value at the start of the firm positively influences the overall employment growth in the industrial sector.

3.4.2 Research Question II
What are the factors existed in each industrial category that influenced the employment growth? In order to answer Question 2, this study created Figure 3.4 to help in answering.
Figure 3.4 Analysis Framework for Question 2
Group 2 Hypotheses

**Hypothesis 2.1: Manufacture of Food Products and Beverages**

H 2.1 Firm’s location influences the difference in the employment growth in the manufacture of food products and beverages.

H 2.2 Firm’s operation in the industrial estate influences the difference in the employment growth in the manufacture of food products and beverages.

H 2.3 Firm’s size positively influences the employment growth in manufacture of food products and beverages.

H 2.4 Age of the firm negatively influences the employment growth in manufacture of food products and beverages.

H 2.5 Investment at the firm’s start positively influences the employment growth in manufacture of food products and beverages.

**Hypothesis 2.2: Manufacture of Automobile and Automotive Parts**

H 2.6 Firm’s location influences the difference in the employment growth in the manufacture of automobile and automotive parts.

H 2.7 Firm’s operation in the industrial estate influences the difference in the employment growth in the manufacture of automobile and automotive parts.

H 2.8 Firm’s size positively influences the employment growth in the manufacture of automobile and automotive parts.

H 2.9 Age of the firm negatively influences the employment growth in the manufacture of automobile and automotive parts.

H 2.10 Investment at the start of the firm positively influences the employment growth in the manufacture of automobile and automotive parts.

**Hypothesis 2.3: Manufacture of Textiles and Apparels**

H 2.11 Firm’s location influences the difference in the employment growth in the manufacture of textiles and apparels.

H 2.12 Firm’s operation in the industrial estate influences the difference in the employment growth in the manufacture of textiles and apparels.
H 2.13 Firm’s size positively influences the employment growth in manufacture of textiles and apparels.
H 2.14 Age of the firm negatively influences the employment growth in manufacture of textiles and apparels.
H 2.15 Investment at the start of the firm positively influences the employment growth in manufacture of textiles and apparels.

**Hypothesis 2.4: Manufacture of Rubber and Plastic Product**
H 2.16 Firm’s location influences the difference in the employment growth in manufacture of rubber and plastic product.
H 2.17 Firm’s operation in the industrial estate influences the difference in the employment growth in manufacture of rubber and plastic product.
H 2.18 Firm’s size positively influences the employment growth in manufacture of rubber and plastic product.
H 2.19 Age of the firm negatively influences the employment growth in manufacture of rubber and plastic product.
H 2.20 Investment at the start of the firm positively influences the employment growth in manufacture of rubber and plastic product.

**Hypothesis 2.5: Manufacture of Jewelry and Related Articles**
H 2.21 Firm’s location influences the difference in the employment growth in manufacture of jewelry and related articles.
H 2.22 Firm’s operation in the industrial estate influences the difference in the employment growth in manufacture of jewelry and related articles.
H 2.23 Firm’s size positively influences the employment growth in manufacture of jewelry and related articles.
H 2.24 Age of the firm negatively influences the employment growth in manufacture of jewelry and related articles.
H 2.25 Investment at the start of the firm positively influences the employment growth in manufacture of jewelry and related articles.
Hypothesis 2.6: Manufacture of Electrical and Electronics

H 2.26 Firm’s location influences the difference in the employment growth in manufacture of electrical and electronics.

H 2.27 Firm’s operation in the industrial estate influences the difference in the employment growth in manufacture of electrical and electronics.

H 2.28 Firm’s size positively influences the employment growth in the manufacture of electrical and electronics.

H 2.29 Age of the firm negatively influences the employment growth in the manufacture of electrical and electronics.

H 2.30 Investment at the start of the firm positively influences the employment growth in the manufacture of electrical and electronics.

Hypothesis 2.7: Manufacture of Machine, Machinery and Equipment

H 2.31 Firm’s location influences the difference in the employment growth in manufacture of machine, machinery and equipment.

H 2.32 Firm’s operation in the industrial estate influences the difference in the employment growth in manufacture of machine, machinery and equipment.

H 2.33 Firm’s size positively influences the employment growth in manufacture of machine, machinery and equipment.

H 2.34 Age of the firm negatively influences the employment growth in manufacture of machine, machinery and equipment.

H 2.35 Investment at the start of the firm positively influences the employment growth in manufacture of machine, machinery and equipment.

3.4.3 Research Question III

What are the factors in each firm’s size that influence the employment growth?

Figure 3.5 presents the analysis framework to answer this question.
Figure 3.5 Analysis Framework for Research Question III
Group 3 Hypotheses

Hypothesis 3.1: Small-Scale Firm Group

H 3.1 Firm’s location influences the difference in the employment growth in small-scale firm group.

H 3.2 Firm’s operation in the industrial estate influences the difference in the employment growth in small-scale firm group.

H 3.3 Age of the firm negatively influences the employment growth in small-scale firm group.

H 3.4 Investment at the start of the firm positively influences the employment growth in small-scale firm group.

Hypothesis 3.2: Medium-Scale Firm Group

H 3.5 Firm’s location influences the difference in the employment growth in medium-scale firm group.

H 3.6 Firm’s operation in the industrial estate influences the difference in the employment growth in medium-scale firm group.

H 3.7 Age of the firm negatively influences the employment growth in medium-scale firm group.

H 3.8 Investment at the start of the firm positively influences the employment growth in medium-scale firm group.

Hypothesis 3.3: Large-Scale Firm Group

H 3.9 Firm’s location influences the difference in the employment growth in large-scale firm group.

H 3.10 Firm’s operation in the industrial estate influences the difference in the employment growth in large-scale firm group.

H 3.11 Age of the firm negatively influences the employment growth in large-scale firm group.

H 3.12 Investment at the start of the firm positively influences the employment growth in large-scale firm group.
3.5 Unit of Analysis and Research Design

The units of analysis are the firms in the industry sector in Bangkok. This research utilized both descriptive and quantitative techniques. In the descriptive approach, the data are collected and analyzed by reviewing literature, articles, research reports and related documents. Information from government organizations such as the Ministry of Industry, Ministry of Labor, Bank of Thailand, Ministry of Finance, Ministry of Commerce and National Statistical Office were also gathered for analysis. For the quantitative approach, the cross-sectional study through three dimensions with the utilization of the same dataset was used. In order to achieve data, this research adopted the simple random sampling and used the secondary data of the 2012 year-end database collected by the Department of Industrial Works, Ministry of Industry. The multiple regression analysis facilitated the analysis to determine influential factors, test hypotheses and answer research questions.

3.6 Target Population, Sampling, Background and Data Collection

The population in this study is the firms in the seven pilot industries drawn upon the National Industrial Development Master Plan, B.E. 2555-2574. These firms are operating in Bangkok and there are 6,021 firms in total. Population data came from the secondary database of 2012 of the Department of Industrial Work, Ministry of Industry. This database consists of the firm’s and factory’s name, type of firm, location, operation in the industrial estate, number of employees, age of the firm, investment and production capacity. These are the independent variables in this study.

By using the secondary data of the Department of Industrial Works, this study did the simple random sampling along with Taro Yamane’s calculating formula to get 762 samples (Yamane, 1967: 886)

\[
    n = \frac{N}{1 + N(e)^2}
\]
\[ n = \text{Sample size} \]
\[ N = \text{Population size} \]
\[ e = \text{Level of decision} \]

The mentioned formula helped in calculating the sample as follows:

\[
375 = \frac{6,021}{1 + 6,021(0.05)^2}
\]

In the finite population, or 6,021 firms and the desired confidence level of 95 percent \((e=0.5)\), the appropriate number of sample should be 375. However, after comparing the 762 samples for this study with 375 samples from calculation, this study found that the former outnumbered the latter and so 762 samples were used.

### 3.7 Data Analysis and Statistics

This study adopted the descriptive statistic and multiple regression analysis. The descriptive statistic was useful in the exploration on characteristics of data used in this study. Mean, minimum, maximum, and standard deviation were part of the method.

The multiple regression analysis was aimed to identify independent variables that influenced the dependent variables so that hypothesis testing and research answering could follow.

### 3.8 Operational Definitions

Based on literature reviews, this study identified five variables that have a possibility to influence the employment growth. But to have these variables measured, the study created operational definitions of such variables as detailed in Table 3.2. This was for distinctness and usefulness for hypothesis test and answers to research questions.
Table 3.2 Operational Definition

<table>
<thead>
<tr>
<th>Variable</th>
<th>Independent/ Dependent</th>
<th>Measurement level</th>
<th>Description</th>
<th>Unit of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>xgemp</td>
<td>Dependent</td>
<td>Ratio</td>
<td>(Number of persons engaged at present – number of employee at start) /Age of the firm</td>
<td>Rate of employment</td>
</tr>
<tr>
<td>loc</td>
<td>Independent</td>
<td>Nominal (0,1)</td>
<td>Location of the firm 0= In inner city 1= In inter city and outer city</td>
<td>-</td>
</tr>
<tr>
<td>est</td>
<td>Independent</td>
<td>Nominal (0,1)</td>
<td>Operation of the firm in the industrial estate 0= In the industrial estate 1= Not in the industrial estate</td>
<td>-</td>
</tr>
<tr>
<td>xsize</td>
<td>Independent</td>
<td>Ratio</td>
<td>Number of persons engaged at the start of the firm</td>
<td>Number of employees</td>
</tr>
<tr>
<td>age</td>
<td>Independent</td>
<td>Ratio</td>
<td>Age of the firm</td>
<td>Number of years</td>
</tr>
<tr>
<td>xinv</td>
<td>Independent</td>
<td>Ratio</td>
<td>Investment value</td>
<td>Amount in baht</td>
</tr>
<tr>
<td>xgempFB</td>
<td>Dependent</td>
<td>Ratio</td>
<td>Measuring food products and beverages industry (Number of persons engaged at present – number of employee at start) /Age of the firm</td>
<td>Rate of employment</td>
</tr>
<tr>
<td>locFB</td>
<td>Independent</td>
<td>Nominal (0,1)</td>
<td>Location of the firm in food products and beverages industry 0= In inner city 1= In inter city and outer city</td>
<td>-</td>
</tr>
<tr>
<td>estFB</td>
<td>Independent</td>
<td>Nominal (0,1)</td>
<td>Operation in industrial estate of the firm in food products and beverage industry 0= In industrial estate 1= Not in industrial estate</td>
<td>-</td>
</tr>
<tr>
<td>Variable</td>
<td>Independent/ Dependent</td>
<td>Measurement level</td>
<td>Description</td>
<td>Unit of measurement</td>
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<tr>
<td>-----------</td>
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<td>---------------------</td>
</tr>
<tr>
<td>xsizeFB</td>
<td>Independent</td>
<td>Ratio</td>
<td>Number of employee at start of the firm in food products and beverages industry</td>
<td>Number of employees</td>
</tr>
<tr>
<td>ageFB</td>
<td>Independent</td>
<td>Ratio</td>
<td>Age of the firm in food products and beverages industry</td>
<td>Number of years</td>
</tr>
<tr>
<td>xinvFB</td>
<td>Independent</td>
<td>Ratio</td>
<td>Investment value in food products and beverages industry</td>
<td>Amount in baht</td>
</tr>
<tr>
<td>xgempAP</td>
<td>Dependent</td>
<td>Ratio</td>
<td>Measuring automobile and automotive parts industry (Number of persons engaged at present – number of persons engaged at start) / Age of firm</td>
<td>Rate of employment</td>
</tr>
<tr>
<td>locAP</td>
<td>Independent</td>
<td>Nominal (0,1)</td>
<td>Location of the firm in automobile and automotive parts industry</td>
<td>-</td>
</tr>
<tr>
<td>estAP</td>
<td>Independent</td>
<td>Nominal (0,1)</td>
<td>Operation in industrial estate of the firm in automobile and automotive parts industry</td>
<td>-</td>
</tr>
<tr>
<td>xsizeAP</td>
<td>Independent</td>
<td>Ratio</td>
<td>Number of persons engaged at the start of the firm in automobile and automotive parts industry</td>
<td>Number of employees</td>
</tr>
<tr>
<td>ageAP</td>
<td>Independent</td>
<td>Ratio</td>
<td>Age of the firm in automobile and automotive parts industry</td>
<td>Number of years</td>
</tr>
<tr>
<td>Variable</td>
<td>Independent/Dependent</td>
<td>Measurement level</td>
<td>Description</td>
<td>Unit of measurement</td>
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<tr>
<td>----------</td>
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</tr>
<tr>
<td>xinvAP</td>
<td>independent</td>
<td>Ratio</td>
<td>Investment value of the firm in automobile and automotive parts industry</td>
<td>Amount in baht</td>
</tr>
<tr>
<td>xgempGT</td>
<td>Dependent</td>
<td>Ratio</td>
<td>Measuring textiles and apparels industry (Number of persons engaged at present – number of persons engaged at start) / Age of the firm</td>
<td>Rate of employment</td>
</tr>
<tr>
<td>locGT</td>
<td>independent</td>
<td>Nominal (0,1)</td>
<td>Location of the firm in textiles and apparel industry 0= In inner city 1= In inter city and outer city</td>
<td>-</td>
</tr>
<tr>
<td>estGT</td>
<td>independent</td>
<td>Nominal (0,1)</td>
<td>Operation in industrial estate of firm in textiles and apparel industry 0= In the industrial estate 1= Not in the industrial estate</td>
<td>-</td>
</tr>
<tr>
<td>xsizeGT</td>
<td>independent</td>
<td>Ratio</td>
<td>Number of persons engaged at start of the firm in textiles and apparel industry</td>
<td>Number of employees</td>
</tr>
<tr>
<td>ageGT</td>
<td>independent</td>
<td>Ratio</td>
<td>Age of the firm in textiles and apparel industry</td>
<td>Number of years</td>
</tr>
<tr>
<td>xinvGT</td>
<td>independent</td>
<td>Ratio</td>
<td>Investment value of firm in textiles and apparel industry</td>
<td>Amount in baht</td>
</tr>
<tr>
<td>xgempTP</td>
<td>Dependent</td>
<td>Ratio</td>
<td>Measuring rubber and plastic productindustry (Number of persons engaged at present – number of persons engaged at start) / Age of the firm</td>
<td>Rate of employment</td>
</tr>
<tr>
<td>Variable</td>
<td>Independent/Dependent</td>
<td>Measurement Level</td>
<td>Description</td>
<td>Unit of Measurement</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------</td>
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<td>---------------------</td>
</tr>
<tr>
<td>locTP</td>
<td>independent</td>
<td>Nominal (0,1)</td>
<td>Location of the firm in rubber and plastic product industry 0= In inner city 1= In inter city and outer city</td>
<td>-</td>
</tr>
<tr>
<td>estTP</td>
<td>independent</td>
<td>Nominal (0,1)</td>
<td>Operation in industrial estate of the firm in rubber and plastic product industry 0= In the industrial estate 1= Not in the industrial estate</td>
<td>-</td>
</tr>
<tr>
<td>xsizeTP</td>
<td>independent</td>
<td>Ratio</td>
<td>Number of employees at start of the firm in rubber and plastic product industry</td>
<td>Number of employees</td>
</tr>
<tr>
<td>ageTP</td>
<td>independent</td>
<td>Ratio</td>
<td>Age of the firm in rubber and plastic product industry</td>
<td>Number of years</td>
</tr>
<tr>
<td>xinvTP</td>
<td>independent</td>
<td>Ratio</td>
<td>Investment value of firm in rubber and plastic product industry</td>
<td>Amount in baht</td>
</tr>
<tr>
<td>xgempGE</td>
<td>Dependent</td>
<td>Ratio</td>
<td>Measuring jewelry and related articles industry (Number of persons engaged at present – number of persons engaged at start)/Age of the firm</td>
<td>Rate of employment</td>
</tr>
<tr>
<td>locGE</td>
<td>independent</td>
<td>Nominal (0,1)</td>
<td>Location of the firm in jewelry and related articles industry 0= In inner city 1= In inter city and outer city</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 3.2 (Continued)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Independent/ Dependent</th>
<th>Measurement level</th>
<th>Description</th>
<th>Unit of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>estGE</td>
<td>independent</td>
<td>Nominal (0,1)</td>
<td>Operation in the industrial estate of the firm in jewelry and related articles industry</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0= In the industrial estate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1= Not in the industrial estate</td>
<td></td>
</tr>
<tr>
<td>xsizeGE</td>
<td>independent</td>
<td>Ratio</td>
<td>Number of persons engaged at start of the firm in jewelry and related articles industry</td>
<td>Number of employees</td>
</tr>
<tr>
<td>ageGE</td>
<td>independent</td>
<td>Ratio</td>
<td>Age of the firm in jewelry and related articles industry</td>
<td>Number of years</td>
</tr>
<tr>
<td>xinvGE</td>
<td>independent</td>
<td>Ratio</td>
<td>Investment value of the firm in jewelry and related articles industry</td>
<td>Amount in baht</td>
</tr>
<tr>
<td>xgempEL</td>
<td>Dependent</td>
<td>Ratio</td>
<td>Measuring electrical and electronics industry</td>
<td>Rate of employment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Number of persons engaged at present – number of persons engaged at start) / Age of the firm</td>
<td></td>
</tr>
<tr>
<td>locEL</td>
<td>independent</td>
<td>Nominal (0,1)</td>
<td>Location of the firm in electrical and electronics industry</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0= In inner city</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1= In inter city and outer city</td>
<td></td>
</tr>
<tr>
<td>estEL</td>
<td>independent</td>
<td>Nominal (0,1)</td>
<td>Operation in the industrial estate of the firm in electrical and electronics industry</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0= In industrial estate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1= Not in industrial estate</td>
<td></td>
</tr>
</tbody>
</table>
Table 3.2 (Continued)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Independent/Dependent</th>
<th>Measurement Level</th>
<th>Description</th>
<th>Unit of Measurement</th>
</tr>
</thead>
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<tr>
<td>xsizeEL</td>
<td>independent</td>
<td>Ratio</td>
<td>Number of persons engaged at start of the firm in electrical and electronics industry</td>
<td>Number of employees</td>
</tr>
<tr>
<td>ageEL</td>
<td>independent</td>
<td>Ratio</td>
<td>Age of the firm in electrical and electronics industry</td>
<td>Number of years</td>
</tr>
<tr>
<td>xinvEL</td>
<td>independent</td>
<td>Ratio</td>
<td>Investment value of firm in electrical and electronics industry</td>
<td>Amount in baht</td>
</tr>
<tr>
<td>xgempMP</td>
<td>Dependent</td>
<td>Ratio</td>
<td>Measuring machine, machinery and equipment industry (Number of persons engaged at present – number of persons engaged at start)/Age of firm</td>
<td>Rate of employment</td>
</tr>
<tr>
<td>locMP</td>
<td>independent</td>
<td>Nominal (0,1)</td>
<td>Location of the firm in machine, machinery and equipment industry 0= In inner city 1= In inter city and outer city</td>
<td>-</td>
</tr>
<tr>
<td>estMP</td>
<td>independent</td>
<td>Nominal (0,1)</td>
<td>Operation in the industrial estate of the firm in machine, machinery and equipment industry 0= In the industrial estate 1= Not in the industrial estate</td>
<td>-</td>
</tr>
<tr>
<td>xsizeMP</td>
<td>independent</td>
<td>Ratio</td>
<td>Number of persons engaged at start of the firm in machine, machinery and equipment industry</td>
<td>Number of employees</td>
</tr>
<tr>
<td>Variable</td>
<td>Independent/dependent</td>
<td>Measurement level</td>
<td>Description</td>
<td>Unit of measurement</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------</td>
<td>------------------</td>
<td>-------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>ageMP</td>
<td>independent</td>
<td>Ratio</td>
<td>Age of the firm in machine, machinery and equipment industry</td>
<td>Number of years</td>
</tr>
<tr>
<td>xinvMP</td>
<td>independent</td>
<td>Ratio</td>
<td>Investment value of the firm in machine, machinery and equipment industry</td>
<td>Amount in baht</td>
</tr>
<tr>
<td>xgempS</td>
<td>Dependent</td>
<td>Ratio</td>
<td>Measuring small-scale firm group (Number of persons engaged at present – number of persons engaged at start)/Age of the firm</td>
<td>Rate of employment</td>
</tr>
<tr>
<td>locS</td>
<td>independent</td>
<td>Nominal</td>
<td>Location of firm in small-scale firm group</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0,1)</td>
<td>0= In inner city</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1= In inter city and outer city</td>
<td></td>
</tr>
<tr>
<td>estS</td>
<td>independent</td>
<td>Nominal</td>
<td>Operation in the industrial estate of the firm in small-scale firm group</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0,1)</td>
<td>0= In the industrial estate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1= Not in the industrial estate</td>
<td></td>
</tr>
<tr>
<td>ageS</td>
<td>independent</td>
<td>Ratio</td>
<td>Age of the firm in small-scale firm group</td>
<td>Number of years</td>
</tr>
<tr>
<td>xinvS</td>
<td>independent</td>
<td>Ratio</td>
<td>Investment value of the firm in small-scale firm group</td>
<td>Amount in baht</td>
</tr>
<tr>
<td>xgempM</td>
<td>Dependent</td>
<td>Ratio</td>
<td>Measuring medium-scale firm group (Number of persons engaged at present – number of persons engaged at start)/Age of the firm</td>
<td>Rate of employment</td>
</tr>
</tbody>
</table>
Table 3.2 (Continued)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Independent/ Dependent</th>
<th>Measurement Level</th>
<th>Description</th>
<th>Unit of Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>locM</td>
<td>independent</td>
<td>Nominal (0,1)</td>
<td>Location of the firm in medium-scale firm group</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0= In inner city</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1= In inter city and outer city</td>
<td></td>
</tr>
<tr>
<td>estM</td>
<td>independent</td>
<td>Nominal (0,1)</td>
<td>Operation in the industrial estate of the firm in medium-scale firm group</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0= In the industrial estate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1= Not in the industrial estate</td>
<td></td>
</tr>
<tr>
<td>ageM</td>
<td>independent</td>
<td>Ratio</td>
<td>Age of the firm in medium-scale firm group</td>
<td>Number of years</td>
</tr>
<tr>
<td>xinvM</td>
<td>independent</td>
<td>Ratio</td>
<td>Investment value of firm in medium-scale firm group</td>
<td>Number of employees</td>
</tr>
<tr>
<td>xgempL</td>
<td>Dependent</td>
<td>Ratio</td>
<td>Measuring large-scale firm group</td>
<td>Number of employees</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Number of persons engaged at present – number of persons engaged at start)/Age of the firm</td>
<td></td>
</tr>
<tr>
<td>locL</td>
<td>independent</td>
<td>Nominal (0,1)</td>
<td>Location of the firm in large-scale firm group</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0= In inner city</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1= In inter city and outer city</td>
<td></td>
</tr>
<tr>
<td>estL</td>
<td>independent</td>
<td>Nominal (0,1)</td>
<td>Operation in the industrial estate of the firm in large-scale firm group</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0= In the industrial estate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1= Not in the industrial estate</td>
<td></td>
</tr>
</tbody>
</table>
Table 3.2 (Continued)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Independent/dependent</th>
<th>Measurement level</th>
<th>Description</th>
<th>Unit of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>ageL</td>
<td>independent</td>
<td>Ratio</td>
<td>Age of the firm in large-scale firm group</td>
<td>Number of years</td>
</tr>
<tr>
<td>xinvL</td>
<td>independent</td>
<td>Ratio</td>
<td>Investment value of firm in large-scale firm group</td>
<td>Amount in baht</td>
</tr>
</tbody>
</table>

3.9 Conclusion

As described in Chapter 2, the review of documents, reports and other literature resulted in the design of models and key variables in this study. And so there are five factors which are location, industrial estate, size, age and investment. The unit of analysis is the firms in seven pilot industrial categories according to the National Industrial Development Master Plan, B.E. 2555-2574. The 762 firms are located in Bangkok and were studied in cross-sectional design, which is also popular for economic studies as well as policy studies. This study selected the simple random sampling to use with population in the secondary data collected by the Department of Industrial Works, Ministry of Industry 2012 year-end database.

There are three dimensions which are the overall industrial sector, the industrial category and the firm’s size group. The descriptive statistic and multiple regression analysis facilitated the hypothesis test in achieving the research objectives.
CHAPTER 4

DATA VERIFICATION AND VALIDATION

The present chapter focuses on data check and clarification for the completion for statistical analysis. This verified and validated data are tool to efficiently explore factors to the growth of employment in the industrial sector and to achieve research objectives as follow:

1) To study the factors influencing the employment growth rate in the industrial sector as a whole
2) To study the factors influencing the employment growth rate in each industrial category
3) To study the factors influencing the employment growth rate in each business size in the industrial sector

Prior to corrections and statistic analysis, it is important to ensure database and the relationship between dependent variables that are growth rates of employment and independent variables possible to affect the growth rate. There are five independent variables, both descriptive and quantitative. The quantitative group has three ratio-level variables that are size, age and investment value (Pichit Pithakthepsombat, 2007: 70-71). The descriptive group includes two nominal-level variables which are location and industrial estate that are categorical or dummy variables.

This chapter illustrates how the data and relationship are checked and clarified consecutively.

1) Explanation of the sample
2) Verifying the pattern of normal distribution of data
3) Verifying for multicollinearity
4) Summary of data clarification and relationship analysis for data analysis
4.1 Sample Size

The samples in this study were the enterprises registered by the Department of Industrial Works, Ministry of Industry. The businesses opened in Thailand according to the Factory Act B.E. 2535 are required to register with the Department of Industrial Works which commenced the registration in 1969.

This study selected seven industries from pilot industries specified in the National Industrial Development Master Plan B.E. 2555-2574 of the Ministry of Industry.

1) Manufacture of foods and beverages
2) Manufacture of automobile and automotive parts
3) Manufacture of textile and apparel
4) Manufacture of rubber and rubber product
5) Manufacture of jewelry and articles
6) Manufacture of electric and electronics
7) Manufacture of machine, machinery and equipment

The study excludes the recycled energy industry which is categorized as the 8th pilot industry in the Master Plan because this industry has been introduced recently. Besides this, Thailand is not considered a producer but buyer of recycled technologies and is still in the developing stage to be the producer in the future.

The 762 businesses were samples from the finite population that was taken from the 6,021 businesses in the secondary database of 2012 of the Department of Industrial Works, Ministry of Industry, as already mentioned in section 3.6 of Chapter 3. The samples showed the level of confidence at 95% (Yamane, 1967: 886).

The study used calculation method of Taro Yamane (Yamane, 1967: 886) to randomly select the sample group. The 762 sample businesses are presented in Table 4.1
Table 4.1 The Number of Establishments Used in the Study

<table>
<thead>
<tr>
<th>No.</th>
<th>Category</th>
<th>Number of establishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Food products and beverages</td>
<td>79</td>
</tr>
<tr>
<td>2</td>
<td>Automobiles and automotive parts</td>
<td>265</td>
</tr>
<tr>
<td>3</td>
<td>Textiles and apparels</td>
<td>203</td>
</tr>
<tr>
<td>4</td>
<td>Rubber and plastic product</td>
<td>28</td>
</tr>
<tr>
<td>5</td>
<td>Jewelry and related articles</td>
<td>48</td>
</tr>
<tr>
<td>6</td>
<td>Electrical and electronics</td>
<td>68</td>
</tr>
<tr>
<td>7</td>
<td>Machine, machinery and equipment</td>
<td>71</td>
</tr>
<tr>
<td>8</td>
<td>Renewable and alternative energy</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>762</strong></td>
</tr>
</tbody>
</table>

Bangkok Metropolis is the area of study as it is where all sample businesses of each industry are located. Its area is divided into 1) Inner city and 2) Inter city and outer city.

1) Inner city consists of 21 districts which are Phranakorn, Pomprabsatrupai, Samphanthawong, Patumwan, Bangrak, Yannawa, Sathorn, Bangkorlaem, Dusit, Bangsue, Phayathai, Rajthevi, Huaykwaang, Klongtoey, Chatuchak, Thonburi, Klongsan, Bangkok Noi, Bangkok Yai, Dindaeng, and Wattana.

2) Outer and inter city have 29 districts as follow:

Inter city (18 districts): Phra Kanong, Prawate, Bangkaen, Bangkapi, Ladprao, Bungkoom, Bangplad, Pasee Charoen, Chomthong, Ratburana, Suanluang, Bangna, Toongkru, Bangkae, Wangthonglang, Kannayao, Saphansoong and Saimai.

Outer city (11 districts): Min Buri, Donmeung, Nongjok, Ladkrabang, Talingchan, Nong Khaem, Bangkhunthien, Lak Si, Klongsamwa, Bangbon, and Taweewattana.

This study looks into the differences of growth rate of employment of companies inside and outside the three industrial estates in Bangkok (www.ieat.go.th).
1) Bangchan Industrial Estate, established in 1972 and located in Kannayao and Min Buri, has 91 factories. Most of their businesses concern food and beverages, fertilizer, paint and chemical products, electric appliances and electronics, and science equipment.

2) Ladkrabang Industrial Estate, established in 1978 and located in Ladkrabang District, is the place for 224 factories and most are run for automobile and automotive parts, electric appliances and electronics, science equipment, and machine, machinery and mould machine.

3) Anya Thani Industrial Estate, found in 1993 and located in Prawate District, has 72 factories and all run jewelry and ornament business.

4.2 Data Distribution and Transformation

It is crucial to test all data. This study had data checked and statistically transformed for the analysis.

4.2.1 Normal Distribution

Normal Distribution or Gaussian Distribution is the frequency distribution of normal measurement. Data is showed in a well-formed symmetry or bell-shaped curve and has the coefficient of Skewness of zero (Department of Skill Development, Ministry of Labour. Statistics and Information Technology Research Methodology (Online: www.dsd.go.th)

The normal distribution test reveals that, among 762 samples, there are some descriptive data of independent variables that are not normally distributed. The distribution of both dependent and independent variables is shown in Figure 4.1
Figure 4.1 shows non-normal distribution of independent variables (size and investment) and dependent variables (employment growth rate) and normal distribution in age.

4.2.2 Data Transformation

Due to non-normal distribution found, this study made use of SPSS version 17.0 and employed the Casewise Diagnostic options to remove the extreme value (Suchart Prasitratsin, 2002: 57-58) and transform data for a more normal distribution. Table 2 presents data transformation.
<table>
<thead>
<tr>
<th>NO.</th>
<th>Variable before transform data</th>
<th>Dependent/Independent</th>
<th>N Before transform data</th>
<th>Skewness value Before transform data</th>
<th>Kurtosis Value before transform data</th>
<th>Data Transformation</th>
<th>Variable after transform data</th>
<th>N After transform data</th>
<th>Skewness Value after transform data</th>
<th>Kurtosis Value after transform data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>gemp</td>
<td>dependent</td>
<td>762</td>
<td>6.835</td>
<td>61.203</td>
<td>Ln(gemp)²</td>
<td>xgemp</td>
<td>762</td>
<td>0.191</td>
<td>-0.300</td>
</tr>
<tr>
<td>2</td>
<td>size</td>
<td>Independent</td>
<td>762</td>
<td>10.564</td>
<td>143.369</td>
<td>Ln(size)</td>
<td>xsize</td>
<td>762</td>
<td>0.558</td>
<td>0.107</td>
</tr>
<tr>
<td>3</td>
<td>age</td>
<td>Independent</td>
<td>762</td>
<td>0.354</td>
<td>-0.808</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>inv</td>
<td>Independent</td>
<td>762</td>
<td>14.593</td>
<td>245.560</td>
<td>Ln(inv)</td>
<td>xinv</td>
<td>762</td>
<td>0.067</td>
<td>-0.272</td>
</tr>
</tbody>
</table>
Table 4.2 finds that the directions of Skewness and Kurtosis are close to the standard. The skewness remains at +/- 1.0 while the Kurtosis is +/- 3.0. This implies the more normal distribution of data and ready for statistical analysis. This distribution is presented in Figure 4.2

![Graphs of Independent and Dependent Variables after Transformation](image)

**Figure 4.2** Distribution of Independent and Dependent Variables after Transformation

### 4.3 Test for Multicollinearity

Theoretically, the correlation should exist between independent and dependent variables. The more correlation will facilitate an explanation of changes in dependent variables easier. Nonetheless, independent variables may normally be correlated among themselves, and this affects the statistical value estimation, or the multicollinearity.
Multicollinearity is a phenomenon in which independent variables are correlated with each other, and then produces effects to the analysis, as the following summary (Pluetsan Sutthichaimethee, 2010: 156-157):

1) The correlation (R value) is high in both independent variables.

2) The estimation of high S.E.E. (Bi) results in a reduced T-test value further causes the Reject H0.

3) Models with multicollinearity are highly sensitive which means that any minor changes could hugely affect the model’s structure, such as the directions of coefficient variables that may turn positive into negative, and non-statistically significant value may become statistically significant.

To fix multicollinearity, the following methods are recommended (Virat Panichwong, 2006: 166-167):

1) Increase the number of observations or sample size to stop the presence of multicollinearity.

2) Transform some independent variables to reduce the impact of multicollinearity.

3) Remove some independent variables that are the source of problems such as removing one of two variables that are very highly correlated in the regression equation.

4) Estimate the parameter of regression equation using the ride regression analysis.

To have the model reliable according to the regress analysis, this study employed the Pearson Correlation Coefficient. The value under 0.8 indicates an absence of multicollinearity.

Table 4.3 shows the absence of multicollinearity when each pair of variables in Pearson’s Correlation yield the value of not over +/- 0.8.
Table 4.3 Pearson Correlation Coefficient Matrix

<table>
<thead>
<tr>
<th></th>
<th>xgemp</th>
<th>loc</th>
<th>est</th>
<th>xsize</th>
<th>age</th>
<th>xinv</th>
</tr>
</thead>
<tbody>
<tr>
<td>xgemp</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>loc</td>
<td>0.2225</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>est</td>
<td>0.2581</td>
<td>-0.278</td>
<td>1.000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xsize</td>
<td>0.5816</td>
<td>0.223</td>
<td>-0.409</td>
<td>1.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>age</td>
<td>0.4057</td>
<td>-0.189</td>
<td>-0.049</td>
<td>0.0617</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>xinv</td>
<td>0.5935</td>
<td>0.314</td>
<td>-0.441</td>
<td>0.6059</td>
<td>-0.215</td>
<td>1.000</td>
</tr>
</tbody>
</table>

As shown in Table 4.3, the coefficient of each pair of independent variables ranges between +/- 0.1 and +/- 0.6. The value below +/- 0.8 means the absence of multicollinearity.

4.4 Summary of Analysis

In the analysis, this study brings in the Simple Random Sampling to use with finite population, or 6,021 businesses registered in the 2012 year-end database of Department of Industrial Works, Ministry of Industry. The 762 businesses were samples and suitable for the study because of 95% of confidence level based on the Yamane’s formula (Taro Yamane, 1967:886).

After testing for data distribution, non-normal distribution and extreme value are found. The SPSS Casewise diagnostic function was used to remove the extreme value. After this, the Ln and Power were brought in to transform non-normally distributed data to the normal one. Then, the Histograms, Skewness and Kurtosis were utilized to ensure the greater normal distribution. The Pearson Correlation Coefficient facilitated the correlation analysis. Each paired variable had the value of under 0.8 and this implied the non-existence of multicollinearity. All mentioned transformation and tests produced the reliable statistical data for discussion later on.
CHAPTER 5

FACTORS INFLUENCING THE EMPLOYMENT GROWTH IN THE INDUSTRIAL SECTOR

This chapter exhibits factors that influenced the employment growth in the industrial sector. These factors were explored in each industrial category and firm’s size. Results from regression analysis were discussed for answers to research question I and accompanied with the test of hypotheses H1.1 to H1.5

Figure 5.1 Conceptual Framework for Hypothesis Test to Answer Research Question I
This Chapter contains three sections

1) Descriptive statistic analysis: to clearly illustrate the sample group
2) Analysis of factors to the employment growth in the industrial sector: to discuss and interpret results of the analysis based on the conceptual framework and relevant theories.
3) Summary of the test of hypotheses in Group 1: to answer research question I and objective no. 1.

5.1 Descriptive Statistic Analysis

The univariate data analysis technique is a basic statistical analysis of characteristics of variables in this study. It employed mean, standard deviation, minimum and maximum.

5.1.1 Quantitative Variables: Ratio-scale Variables

5.1.1.1 Employment growth
5.1.1.2 Size
5.1.1.3 Age
5.1.1.4 Investment

Table 5.1 Univariate Descriptive Statistics for Ratio-scale Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Number of Obs</th>
<th>Mean</th>
<th>Std.Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment</td>
<td>762</td>
<td>3.99</td>
<td>22.67</td>
<td>-90.00</td>
<td>289.00</td>
</tr>
<tr>
<td>Size</td>
<td>762</td>
<td>74</td>
<td>219.59</td>
<td>1</td>
<td>3,373</td>
</tr>
<tr>
<td>Age</td>
<td>762</td>
<td>18</td>
<td>10.99</td>
<td>1</td>
<td>44</td>
</tr>
<tr>
<td>Investment</td>
<td>762</td>
<td>42,315,384</td>
<td>210E+6</td>
<td>25,000</td>
<td>3,713,000,000</td>
</tr>
</tbody>
</table>
Table 5.1 shows general characteristics of factors which are employment growth, size, age and investment. Only ratio variables are included in this table. As to nominal variables, they are presented in the next table.

5.1.1.1  Employment Growth

On average, the employment growth of each firm stays at 4 persons per year, which conforms to the proportion of the sample constituted by 573 small-scale firms (75 percent), 124 medium-scale firms (16 percent) and 65 large-scale firms (9 percent). The size categorization was based on the Ministerial Regulation Specifying the Number of Employment and Fixed Asset Value of Medium and Small Firms, B.E. 2545, announced in the Government Gazette No. 119. The small size firm has 1-50 employees, the medium has 51-200 employees and the large has at least 201 employees. The percentage of firm’s size in this analysis is not far from the real percentage of the country’s production sector. That is to say, this sector is composed of small firms more than the others or 98.58 percent for small firms, 0.94 percent for medium firms and 0.48 percent for large firms (Report on the Situation of Medium and Small Scale Firms, Year 2011 -2012: 4-4) as detailed in Table 5.2.

Table 5.2 Percentage and Number of Small, Medium and Large Firm in Production Sector

<table>
<thead>
<tr>
<th>Firm size</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>467,741</td>
<td>98.58%</td>
</tr>
<tr>
<td>Medium</td>
<td>4,454</td>
<td>0.94%</td>
</tr>
<tr>
<td>Large</td>
<td>2,274</td>
<td>0.48%</td>
</tr>
<tr>
<td>Total</td>
<td>474,469</td>
<td>100%</td>
</tr>
</tbody>
</table>

In general, the employment growth of a firm remains at four persons a year, meaning that the employment of the firm in the industrial sector increases by four employees a year. The most influential factor comes from the highest percentage of small firms that make up 98.58 percent of Thailand’s industrial sector. This general growth rate brings the overall situation of employment into sight. Such situation implies a positive trend, rather a negative one. And so the sector is likely to experience an increase in employment as it is composed of mostly of small firms in accordance with the study of Liedholm, McPherson, Chuta (1994: 1179) and Mead (1994: 1883).

The minimum employment growth is -90, indicating that the highest regression of employment is 90 persons per year. This phenomenon resides in the textiles and apparel industry, the market of middle size enterprises that employ 51-200 persons. The minimum employment growth stands for the regression of Thailand’s apparel industry that is happening at present. The reason is due to the higher wages in Thailand compared to other countries in South East Asia, especially in Cambodia, Lao PDR, Myanmar and Viet Nam or the CLMV. This has caused investment transfer to these countries that have lower wages even though the workers with skills are like those in Thailand (Report on Labor Problems in Textiles and Apparel Industry, Department of Industrial Works, 2010: 1)). The transfer consequently has contributed a great impact on this industry. If continued, the situation may spread to the country’s overall economy. It is because the apparel industry is made up of 1,023,000 workers or 19 percent in the production sector. Also, this industry produces an economic value in GDP of 245 billion baht or 2.2 percent of GNP (Office of Small and Medium Enterprises Promotion, 2012a: 2).

The minimum value presented above can push forward both government and private sector as well as other concerning parties to realize how to find methods and solutions for this industry to better respond to global changes. However, details about this are written in Chapter 8.

As to the maximum employment rate of 289 persons a year, it is found in the automobile and automotive parts industry. This is the current situation as this industry has a high capacity and potential to grow further and even gain all-round supports from the government such as investment promotion, development of labor
productivity and market expansion. Generally, the enterprises in this industry start their operation with only 34 workers, which is considered small-scale. However, because of the economic situation that favors this industry, many of its enterprises are provided with business opportunities and finally can employ up to 289 employees per year. This maximum value points out that small and medium firms in the automobile industry can expand their business and generate more employment.

5.1.1.2 Size

This study determines the size of the enterprise from the employment at the start of the enterprise and finds that most sample, or 91 percent, have 74 employees on average. It implies that most firms in Thailand’s industrial sector are small and medium enterprises (SMEs) and start their businesses with 74 employees. Similar to the picture of Thailand’s production sector, SMEs make up 99.52 percent (Office of Small and Medium Enterprises Promotion, 2012a: 4-4-4-6).

The minimum or the smallest size firm has only one employee. Most of these firms are operated by the firm’s owner and in two industries which are the automobile and the machinery. Despite the small size, the two industries are capable of supporting SMEs because both have demands for spare parts that can be supplied by these SMEs. That is to say, SMEs can be the suppliers operating at the upper stream as well as the middle stream. Also, there is a possibility for SME’s to start with one employee and expand more.

The maximum employment of 3,373 workers appears in a large enterprise in the automobile and auto parts industry. This is the current economic situation that Thailand is in - a leader in vehicle and auto parts production in ASEAN as well as a major trading partner of vehicle producers of Japan and USA.

5.1.1.3 Age

Generally, most firms in Thailand’s industrial sector have been operating for 18 years. We can say that they are strong, able to overcome economic, social and political changes domestically and internationally. The 18-year operation is closely aligned with the Learning and Selection Model (Jovanovic, 1982) that, an efficient firm is the one with an ability to adjust for its survival. The long year existence means the period of accumulated experiences of business operation and staff’s knowledge and skills for achieving an expertise in the business.
As for the minimum age of the enterprise, only one year of operation can signify an opportunity and capacity of investors and entrepreneurs to run business in Thailand’s industrial sector. The explanation of this statement maybe is that, the country has economic stability along with the politics and domestic and foreign demands favorable to such significance.

The maximum age of enterprise is 44 years, meaning that the enterprise had passed through years of economic, social and political instabilities. This enterprise is in the rubber and plastic product industry which is also an old industry in Thailand.

5.1.1.4 Investment

The analysis includes the investment which accords with the total investment set by Department of Industrial Works, Ministry of Industry. Each presents different costs of machines and properties, and circulating capital. All these different values are legally effective for the firm’s having shareholders. However, to small firms or single proprietorship firms, they may not take the property into account as their firms are located in their housing areas. In other cases, some may not include the value of machines because of inheritance. Some may exclude the circulating capital because they are sub-contractors or their workers are family members. These examples show that any purchase for investment or payment for labor is not considered necessary.

The average investment costs around 42,315,384 baht including the land, machines and circulating capital. This amount is rather high for the start of the firm and leads to a sign that it is a barrier for entrepreneurs having not much resources to invest in this sector. This may push them aside to run trading or service companies instead.

The minimum investment is 25,000 baht at the start of the firm. Therefore, new entrepreneurs with small budget still get a chance to invest in the industrial sector. They may begin with purchasing inexpensive machines and utilizing their available resources such as existing buildings.

The maximum investment at the start is 3,713,000,000 baht in the automobile and auto parts industry. So, this business requires a high investment due to expensive technologies and machines and skilled labors. Nonetheless, this high cost
also ensures the growth of the business and helps them to seek funding sources to start their business.

5.1.2 Descriptive Variables: Nominal Variables

Descriptive variables may be transformed into categorical variables or dummy variables.

5.1.2.1 Location

5.1.2.2 Industrial estate

Table 5.3 Descriptive Statistics of Location

<table>
<thead>
<tr>
<th>Variable</th>
<th>Inner city</th>
<th>Inter city and outer city</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Obs</td>
<td>Number of Obs</td>
<td>Number of Obs</td>
</tr>
<tr>
<td>Location</td>
<td>262</td>
<td>34 500</td>
<td>762</td>
</tr>
</tbody>
</table>

Nominal variables are grouped into:

1) Inner city consists of 21 districts which are Phranakorn, Pomprabsattrupai, Samphanthawong, Patumwan, Bangrak, Yannawa, Sathorn, Bangkorlaem, Dusit, Bangsue, Phayathai, Rajthevi, Huaykwaang, Klongtoey, Chatuchak, Thonburi, Klongsan, Bangkok Noi, Bangkok Yai, Dindaeng, and Wattana

2) Inter and Outer city have 29 districts as follow:

   - Inter city (18 districts): Phra Kanong, Prawate, Bangkaen, Bangkapi, Ladprao, Bungkoom, Bangplad, Pasee Charoen, Chomthong, Ratburana, Suanluang, Bangna, Toongkru, Bangkae, Wangthonglang, Kannayao, Saphansoong and Saimai
   - Outer city (11 districts): Min Buri, Donmeung, Nongjok, Ladkrabang, Talingchan, Nong Khaem, Bangkhunthien, Lak Si, Klongsamwa, Bangbon, and Taweewattana.
Most samples, 500 firms or 66 percent, are located in the inter city and outer city. The remaining 262 firms or 34 percent are in the inner city.

**Table 5.4** Descriptive Statistics of the Industrial Estate

<table>
<thead>
<tr>
<th>Variable</th>
<th>In the industrial estate</th>
<th>Not in the industrial estate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Obs</td>
<td>%</td>
<td>Number of Obs</td>
</tr>
<tr>
<td>Industrial estate</td>
<td>98</td>
<td>13</td>
<td>664</td>
</tr>
</tbody>
</table>

Table 5.4 presents two nominal variables which are:

1) In the industrial estate: Bangkok has three industrial estates which are:
   (1) Bangchan Industrial Estate located in Kannayao and Min Buri District
   (2) Ladkrabang Industrial Estate located in Ladkrabang District
   (3) Anya Thani Industrial Estate located in Prawate District

2) Not in the industrial estate

   Only 13 percent or 98 firms have the operation in the industrial estates. So mostly, 87 percent or 664 firms, operate their business outside the industrial estate.

**5.2 Analysis of Factors to the Employment Growth in the Industrial Sector**

The conceptual framework in Chapter 3 (Figure 3.2 and Model 1 of Section 3.2) guided the following mathematical models to find factors that influence the employment growth as follows:
Equation 1: Factors Influencing the Employment Growth

\[ x_{\text{gemp}_i} = a + b_1 \text{loc}_i + b_2 \text{est}_i + b_3 \text{xsize}_i + b_4 \text{age}_i + b_5 \text{xinv}_i + u_i \]

- \( x_{\text{gemp}_i} \): Employment growth in firm \( i \)
- \( \text{loc}_i \): Location of firm \( i \)
  - \( \text{loc}_i = 0 \) if firm \( i \) is located in the inner city
  - \( \text{loc}_i = 1 \) if firm \( i \) is located in the inter city and outer city
- \( \text{est}_i \): Operation in the industrial estate of firm \( i \)
  - \( \text{est}_i = 0 \) if firm \( i \) is located in the industrial estate
  - \( \text{est}_i = 1 \) if firm \( i \) is not located in the industrial estate
- \( \text{xsize}_i \): Number of persons engaged at the start of firm \( i \)
- \( \text{age}_i \): Total operational years from the start of firm \( i \)
- \( \text{xinv}_i \): Investment value at the start of firm \( i \)
- \( a \): Constant
- \( b_1, b_2, \ldots, b_5 \): Standardized regression coefficient
- \( u_i \): Error term

The multiple regression analysis was employed after this and reveals the following statistical results:
Table 5.5 Factors Influencing the Employment Growth

| No of obs | 762 |
| F (5,756) | 195.84 |
| Prob > F  | 0.0000 |
| R         | 0.75 |
| R²        | 0.56 |

| xempg  | Coef   | Std.Err | t    | P>|t| | Beta (β) |
|--------|--------|---------|------|------|----------|
| loc    | -0.210 | 0.197   | -1.07| 0.285| -0.027   |
| est    | 0.144  | 0.300   | 0.48 | 0.630| 0.013    |
| xsize  | 1.255  | 0.839   | 14.97| 0.000*| 0.473    |
| age    | -0.127 | 0.008   | -14.97| 0.000*| -0.388   |
| xinv   | 0.417  | 0.058   | 7.10 | 0.000*| 0.238    |
| a      | -7.652 | 0.984   | -7.77| 0.000 |

Note: Statistical significance is at 0.05.

The acquired statistics in Table 5.5 shows the relationship how independent variables influence the employment growth.

The F-statistic is a mean to test for model significance. The Prob > F = 0.0000 is 0.05, giving 95 percent of confidence level. The F-statistic close to 0 indicates that the equation appropriately represents the population. This means that, after having the equation tested, the results are similar to the test with population.

The T-test was used to find a significant relationship between dependent variables and independent variables in the equation. The P>|t| presents the relationship of these variables. If the P-value is close to 0, the coefficient of independent variables is considered significant and positive.

Table 5.5 presents three variables that influenced the employment growth. They are size, age and investment. The multiple correlation of R=0.75 interprets that size, age and investment are associated with the employment growth.

The value of R-square tells that all three variables yield 56 percent of influence to an explanation of employment growth. The influence of these variables was assessed using the beta weight. And with a beta weight of 0.473, 0.388 and 0.238,
the size became the most influential factor to the employment growth as it had the strongest importance.

From the aforementioned, the size, age and investment are different significant factors to the overall employment growth in this sector. The factor of size and investment value contributes a positive relationship to the growth while the age of the factories contributes negatively influences to the growth rate of the industrial sector. However, the size is considered the most influential factor.

The statistical results shown in Table 5.5 are in the equation below:

\[ x_{gemp} = -7.652 + 1.255x_{size} - 0.127x_{age} + 0.417x_{inv} + u_i \]

The summary of Group 1 Hypotheses analysis is presented in Table 5.6

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Factors</th>
<th>Dependent variables</th>
<th>Direction of relationship according to hypothesis</th>
<th>Direction of relationship after testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1.1</td>
<td>Location</td>
<td>Employment growth</td>
<td>Different</td>
<td>Not different •</td>
</tr>
<tr>
<td>H1.2</td>
<td>Industrial estate</td>
<td>Employment growth</td>
<td>Different</td>
<td>Not different •</td>
</tr>
<tr>
<td>H1.3</td>
<td>Size</td>
<td>Employment growth</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>H1.4</td>
<td>Age</td>
<td>Employment growth</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>H1.5</td>
<td>Investment</td>
<td>Employment growth</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

**Note:** Statistical Insignificance is at 0.05.

The size, age and investment are growth determinants of the employment growth that can be explained through three concepts altogether. They are Gibrat’s
Law, Structure-Conduct-Performance and the Firm Growth Theory’s Learning and Selection.

The firm’s size and employment growth move in the same direction, as stated in Javanovic’s Learning and Structure Model (1982) and Gibrat’s Law. Also, in keeping with Evans’ finding (1987), an efficient firm needs to grow to a certain point until it reaches a minimum efficient size which is the maximum size. The firm will stay at this point for good. During the growth, an explanation using the Structure-Conduct-Performance model is possible. In other words, the growing structure results in increasing production and capacity will in turn enlarge the structure. The firm’s structure and capacity boost each other in this continuous cycle.

Considering the age, this study finds a result similar to Leidholm’s (1994) and Mead’s (1994) that a firm of a few year of operation can produce employment and grow more than a firm with many years of operation. About the investment at the start, a firm with high investment is likely to generate high employment. On the contrary, if the investment is low, the firm’s employment tends to fall. These statements agree with the finding of Carpenter and Petersen (2002) that if there is a limitation of investment fund, the firm’s capacity to grow will possibly go down.

Results in Table 5.6 are further explained by models in Figure 5.2.

![Figure 5.2 Models from Factor Analysis](image)
CHAPTER 6

FACTORS INFLUENCING THE EMPLOYMENT GROWTH IN EACH INDUSTRIAL CATEGORY

This chapter explores the factors that influenced the employment growth in each industrial category. It looks into each industry to find first the influential factors and then discusses the results from the multiple regression analysis. It answers research question II and tests 35 hypotheses in Group 2, from H 2.1 - H 2.35. The conceptual framework for hypothesis test to answer this question is presented in Figure 6.1
Figure 6.1 Conceptual Framework for Hypothesis Test
Chapter 6 contains two parts:

1) Analysis of descriptive statistics and analysis results in seven industrial categories

   (1) Analysis of descriptive statistics
   
   This is to study all samples’ characteristics using mean, standard deviation, minimum and maximum. It is divided into two sections in order to explain the two variable groups.

      (1.1) Quantitative variables: Ratio scale variables
              - Employment growth
              - Size
              - Age
              - Investment

      (1.2) Descriptive variables: Nominal variables
              - Location
              - Industrial Estate

2) Analysis of factors to the employment growth in each industrial category using evidence-based situations and related theories

2) Summary of hypothesis test of Group 2 Hypotheses
6.1 Analysis of Descriptive Statistics

6.1.1 Food Products and Beverages

Table 6.1 Univariate Descriptive Statistics for Ratio-scale Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment growth</td>
<td>79</td>
<td>6</td>
<td>28.94</td>
<td>-20</td>
<td>180</td>
</tr>
<tr>
<td>Size</td>
<td>79</td>
<td>72</td>
<td>169.168</td>
<td>2</td>
<td>1,134</td>
</tr>
<tr>
<td>Age</td>
<td>79</td>
<td>22</td>
<td>11.202</td>
<td>1</td>
<td>43</td>
</tr>
<tr>
<td>Investment</td>
<td>79</td>
<td>4,731,371</td>
<td>120E+5</td>
<td>100,000</td>
<td>871,171,500</td>
</tr>
</tbody>
</table>

Table 6.1 presents the characteristics of the four variables such as the employment growth, size, age and investment. Generally, firms in the food products and beverages industry experience the employment growth of six employees annually which is a positive trend. Thus, a minimum growth of -20 indicates that the employment rate can drop to 20 people a year.

The annual employment of 180 persons is a maximum. This goes in line with the global trend on the food industry which is growing due to demands that resulted from economic recovery domestically and globally. However, most firms employ 72 employees. At least two employees are employed by smallest firms and 1,134 employees for the largest.

As for the age, most firms have been operating for 22 years. The minimum age is one year and the maximum age is 43 years. The median investment at the start is quite high, 4,731,371 baht. Nonetheless, because of having upper stream, middle stream and down stream, the industry opens opportunities for small firms to get into. Besides this, the minimum investment is relatively low - 100,000 baht. This may be attractive for small investors. As for the maximum investment, it is 871,171,500 baht.
Table 6.2 Descriptive Statistics of Location

<table>
<thead>
<tr>
<th>Variable</th>
<th>Inner city</th>
<th>Inter city and outer city</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Obs</td>
<td>% of Obs</td>
<td>Number of Obs</td>
</tr>
<tr>
<td>Location</td>
<td>22</td>
<td>27.8</td>
<td>57</td>
</tr>
</tbody>
</table>

Table 6.2 shows that 72.2 percent or 57 firms are located in the inter city and outer city. The rest of them, 27.8 percent or 22 firms, are in the inner city.

Table 6.3 Descriptive Statistics of the Industrial Estate

<table>
<thead>
<tr>
<th>Variable</th>
<th>In the industrial estate</th>
<th>Not in the industrial estate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Obs</td>
<td>% of Obs</td>
<td>Number of Obs</td>
</tr>
<tr>
<td>Industrial estate</td>
<td>12</td>
<td>19.2</td>
<td>67</td>
</tr>
</tbody>
</table>

Table 6.3 reveals that only 19.2 percent or 12 firms have the operation in the industrial estate. So, the majority, 67 firms or 84.8 percent, is operating outside the estate.

Equation 2: Factors Influencing the Employment Growth in Food Products and Beverages Industry

\[ x_{gempFB_i} = a + b_1 loc_{FB_i} + b_2 est_{FB_i} + b_3 size_{FB_i} + b_4 age_{FB_i} + b_5 inv_{FB_i} + u_i \]

\[ x_{gempFB_i} = \text{Employment growth in firm } i \]

\[ loc_{FB_i} = \text{Location of firm } i \]

\[ loc_{FB_i} = 0 \text{ if firm } i \text{ is located in the inner city} \]

\[ loc_{FB_i} = 1 \text{ if firm } i \text{ is located in the inter city and outer city} \]
estFB_i = Operation in the industrial estate of firm i
   estFB_i = 0 if firm i is located in the industrial estate
   estFB_i = 1 if firm i is not located in the industrial estate
xsizeFB_i = Number of persons engaged at the start of firm i
ageFB_i = Total operation years from the start of firm i
xinvFB_i = Investment value at the start of firm i
a = Constant
b_1, b_2, \ldots, b_5 = Standardized regression coefficient
u_i = Error Term

\textbf{Table 6.4} Factors Influencing the Employment Growth in Food Products and Beverages Industry

|                      | Coef  | Std.Err | t     | P>|t| | Beta (β) |
|----------------------|-------|---------|-------|------|----------|
| locFB                | 0.062 | 0.707   | 0.09  | 0.929| 0.006    |
| estFB                | 2.481 | 1.082   | 2.29  | 0.025*| 0.212    |
| xsizeFB              | 1.671 | 0.323   | 5.17  | 0.000*| 0.553    |
| ageFB                | 0.131 | 0.028   | -4.58 | 0.000*| 0.347    |
| xinvFB               | 0.548 | 0.234   | 2.33  | 0.022*| 0.265    |
| a                    | -13.08| 4.005   | -3.27 | 0.002|          |

\textbf{Note:} Statistical significance is at 0.05.

The F-test was performed with the Prob > F = 0.0000. The equation gives a 95 percent confidence with a value of 0.05, making the sample a representation of population.

The T-test was used to find a significant relationship between a dependent variable and independent variables in the equation. The P>|t| presents the relationship
of these variables. If the P-value is close to 0, the coefficient of independent variables is considered significant and positive.

In Table 6.4, the P>|t| reveals a significance of industrial estate, size, age and investment to the employment growth. The R=0.79 proves that all these variables are interrelated.

The R-square in the equation is 0.62, interpreting that all four independent variables such as industrial estate, size, age and investment are highly significant to an explanation of dependent variable or employment growth. Each independent variable has a beta weight of 0.212, 0.553, 0.347 and 0.265 respectively. The size is the most influential factor to the employment growth as it has the strongest importance. Furthermore, differing from the other three variables, the size presents a negative relationship with the employment growth.

The next equation was derived from analytical results in Table 6.4.

\[
x_{\text{gempFB}} = -13.08 + 2.481estFB + 1.617x_{\text{sizeFB}} - 0.131ageFB + 0.548x_{\text{invFB}} + u_i
\]

### 6.1.2 Automobile and Automotive Parts Industry

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment growth</td>
<td>265</td>
<td>7</td>
<td>27.45</td>
<td>-12</td>
<td>289</td>
</tr>
<tr>
<td>Size</td>
<td>265</td>
<td>50</td>
<td>297.05</td>
<td>1</td>
<td>3,373</td>
</tr>
<tr>
<td>Age</td>
<td>265</td>
<td>15</td>
<td>10.625</td>
<td>1</td>
<td>41</td>
</tr>
<tr>
<td>Investment</td>
<td>265</td>
<td>64,735,116.55</td>
<td>339E+6</td>
<td>25,000</td>
<td>3,713,000,000</td>
</tr>
</tbody>
</table>

The automobile and automotive parts industry has an average annual employment growth of seven employees. The minimum is -12 and the maximum is 289.
As for the size, the firms generally have an average number of 50 employees. The smallest firm has only one employee while the largest has 3,373 employees.

A large number of firms are old firms aging around 15 years. The youngest is one year and the oldest is 43 years. The investment value is 64,735,116 baht averagely. The lowest is only 25,000 baht and the highest is up to 3,713,000,000 baht.

Table 6.6 Descriptive Statistics of Location

<table>
<thead>
<tr>
<th>Variable</th>
<th>Inner city</th>
<th>Inter city and outer city</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Obs</td>
<td>%</td>
<td>Number of Obs</td>
<td>%</td>
</tr>
<tr>
<td>Location</td>
<td>98</td>
<td>167</td>
<td>265</td>
</tr>
</tbody>
</table>

Table 6.6 displays the inter city and outer city as the major location which is accounted for 63 percent (167 firms). The remaining 37 percent reports the location in the inner city (98 firms).

Table 6.7 Descriptive Statistics of the Industrial Estate

<table>
<thead>
<tr>
<th>Variable</th>
<th>In the industrial estate</th>
<th>Not in the industrial estate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Obs</td>
<td>%</td>
<td>Number of Obs</td>
<td>%</td>
</tr>
<tr>
<td>Industrial Estate</td>
<td>25</td>
<td>240</td>
<td>265</td>
</tr>
</tbody>
</table>

Operation in the industrial estate contributes a small percentage, 9.4 percent (25 firms). Most firms, 90.6 percent, are operated outside the estate (240 firms).

The conceptual framework presented in Figure 6.1 was transformed to the next mathematical model.
Equation 3: Factors Influencing the Employment Growth in Automobile and Automotive Parts Industry

\[ x_{\text{gempAP}_i} = a + b_1 \text{locAP}_i + b_2 \text{estAP}_i + b_3 \text{xsizeAP}_i + b_4 \text{ageAP}_i + b_5 \text{xinvAP}_i + u_i \]

- \( x_{\text{gempAP}_i} \): Employment growth in firm \( i \)
- \( \text{locAP}_i \): Location of firm \( i \)
  - \( \text{locAP}_i = 0 \) if firm \( i \) is located in the inner city
  - \( \text{locAP}_i = 1 \) if firm \( i \) is located in the inter city and outer city
- \( \text{estAP}_i \): Operation in the industrial estate of firm \( i \)
  - \( \text{estAP}_i = 0 \) if firm \( i \) is located in the industrial estate
  - \( \text{estAP}_i = 1 \) if firm \( i \) is not located in the industrial estate
- \( \text{xsizeAP}_i \): Number of persons engaged at the start of firm \( i \)
- \( \text{ageAP}_i \): Total operation years from the start of firm \( i \)
- \( \text{xinvAP}_i \): Investment value at the start of firm \( i \)
- \( a \): Constant
- \( b_1, b_2, \ldots, b_5 \): Standardized regression coefficient
- \( u_i \): Error Term

Table 6.8 Factors Influencing the Employment Growth in Automobile and Automotive Parts Industry

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of obs</td>
<td>265</td>
</tr>
<tr>
<td>F (5,259)</td>
<td>72.93</td>
</tr>
<tr>
<td>Prob &gt; F</td>
<td>0.0000</td>
</tr>
<tr>
<td>R</td>
<td>0.76</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.57</td>
</tr>
</tbody>
</table>
Table 6.8 (Continued)

| xempgAP | Coef | Std.Err | t     | P>|t|  | Beta (β) |
|---------|------|---------|-------|------|----------|
| locAP   | -0.004 | 0.346  | -0.01 | 0.989 | -0.000   |
| est AP  | 1.282 | 0.652  | 1.96  | 0.050* | 40.098   |
| xsizeAP | 1.474 | 0.186  | 7.90  | 0.000* | 0.447    |
| ageAP   | -0.136 | 0.016  | -8.30 | 0.000* | -0.382   |
| xinvAP  | 0.496 | 0.095  | 5.18  | 0.022* | 0.301    |
| A       | -10.390 | 1.733 | -5.99 | 0.000 |

**Note:** Statistical significance is at 0.05.

The F-test with Prob > F = 0.0000 is significant at a 0.05 level. The T-test finds that at 0.05 significance level, industrial estate, size, age and investment are factors influencing the employment growth. And the multiple correlation (R) is 0.76 which means that these four factors and employment growth are interrelated.

Considering the R-square, all the above independent variables contribute 57 percent explanatory power. The beta weight of industrial estate, size, age and investment is 0.098, 0.447, 0.382 and 0.301 respectively. The size gains the highest importance and so it becomes the most powerful factor for explanation.

In terms of the relationship between all independent variables and the employment growth, the age yields a negative relationship with the growth while the other three do not.

The statistical findings in Table 6.8 were converted into this equation.

\[ x_{gempAP} = -10.390 + 1.282estAP + 1.474xsizeAP - 0.136ageAP + 0.496xinvAP + u_i \]
6.1.3 Textiles and Apparels Industry

Table 6.9 Univariate Descriptive Statistics for Ratio-scale Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment growth</td>
<td>203</td>
<td>-1</td>
<td>11.080</td>
<td>-90</td>
<td>55</td>
</tr>
<tr>
<td>Size</td>
<td>203</td>
<td>106</td>
<td>204.754</td>
<td>4</td>
<td>2,092</td>
</tr>
<tr>
<td>Age</td>
<td>203</td>
<td>20</td>
<td>10.512</td>
<td>1</td>
<td>42</td>
</tr>
<tr>
<td>Investment</td>
<td>203</td>
<td>17,420,294.69</td>
<td>347E+5</td>
<td>200,000.00</td>
<td>264,000,000.00</td>
</tr>
</tbody>
</table>

As shown in Table 6.9, the textiles and apparels industry experiences a fall of annual employment growth to one employee which is negative. The minimum growth is -90 and the maximum is 55 employees per year and per firm. The average size of firms is 106 employees. The smallest firms hire only one employee and the larger firms hire up to 2,092 employees.

The median age of firms is 20 years, but some firms are only one year old and some are 42. The investment value is approximately 17,420,294 baht. The minimum investment is 200,000 baht and the maximum is 264,000,000 baht.

Table 6.10 Descriptive Statistics of Location

<table>
<thead>
<tr>
<th>Variable</th>
<th>Inner city</th>
<th>Inter city and outer city</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Obs</td>
<td>%</td>
<td>Number of Obs</td>
</tr>
<tr>
<td>Location</td>
<td>74</td>
<td>36.5</td>
<td>129</td>
</tr>
</tbody>
</table>

Table 6.10 shows that the larger percentage belongs to firms located in the inter city and outer city (63.5 percent or 129 firms). So, the smaller percentage is those located in the inner city (36.5 percent or 74 firms).
Table 6.11 Descriptive Statistics of the Industrial Estate

<table>
<thead>
<tr>
<th>Variable</th>
<th>In the industrial estate</th>
<th>Not in the industrial estate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Obs</td>
<td>%</td>
<td>Number of Obs</td>
</tr>
<tr>
<td>Industrial estate</td>
<td>12</td>
<td>5.9</td>
<td>191</td>
</tr>
</tbody>
</table>

Table 6.11 shows that only 5.9 percent or 12 enterprises are operating in the industrial estate. The rest, 94.1 percent or 191 enterprises, is operating elsewhere.

The mathematical model for this is presented in Equation 4.

**Equation 4: Factors Influencing the Employment Growth in the Textiles and Apparels Industry**

\[
x_{gempGT_i} = a + b_1locGT_i + b_2estGT_i + b_3xsizeGT_i + b_4ageGT_i + b_5xinvGT_i + u_i
\]

- \(x_{gempGT_i}\) = Employment growth in firm \(i\)
- \(locGT_i\) = Location of firm \(i\)
  - \(locGT_i = 0\) if firm \(i\) is located in the inner city
  - \(locGT_i = 1\) if firm \(i\) is located in the inter city and outer city
- \(estGT_i\) = Operation in the industrial estate of firm \(i\)
  - \(estGT_i = 0\) if firm \(i\) is located in the industrial estate
  - \(estGT_i = 1\) if firm \(i\) is not located in the industrial estate
- \(xsizeGT_i\) = Number of persons engaged at the start of firm \(i\)
- \(ageGT_i\) = Total operation years from the start of firm \(i\)
- \(xinvGT_i\) = Investment value at the start of firm \(i\)
- \(a\) = Constant
- \(b_1, b_2, \ldots, b_5\) = Standardized regression coefficient
- \(u_i\) = Error Term
The multiple regression analysis reveals the following statistical results.

**Table 6.12** Factors Influencing the Employment Growth in Textile and Wearing Apparel Industry

| Coef   | Std.Err | t   | P>|t|  | Beta (β) |
|--------|---------|-----|------|----------|
| locGT  | -0.357  | 0.296 | -1.21 | 0.228     | -0.058   |
| est GT | -0.462  | 0.601 | -0.77 | 0.443     | -0.037   |
| xsizeGT| 1.537   | 0.147 | 10.42 | 0.000*    | 0.587    |
| ageGT  | -0.125  | 0.014 | -8.95 | 0.000*    | -0.448   |
| xinvGT | 0.133   | 0.103 | 1.29  | 0.198     | 0.075    |
| A      | -3.966  | 1.697 | -2.34 | 0.020     |          |

Note: Statistical significance is at 0.05.

With $\text{Prob}>F = 0.000$ and a confidence level of 0.05, the t-test at 0.05 level of significance was applied. Its result shows that size and age influence the employment growth. The multiple correlation of 0.77 also shows a positive relationship between these two variables and the growth.

The R-square equals to 0.59, implying an influential explanation by the size and age. Considering the beta weight of 0.587 for the size and 0.448 for the age, the size therefore yields more influence than the age. Furthermore, the size positively relates to the growth but the age does not.

All statistical results in Table 6.12 were transformed to this equation.

$$x_{\text{gempGT}} = -3.966 + 1.537x_{\text{sizeGT}} - 0.125x_{\text{ageGT}} + u_i$$
6.1.4 Rubber and Plastic Product Industry

Table 6.13 Univariate Descriptive Statistics for Ratio-scale Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment Growth</td>
<td>28</td>
<td>1</td>
<td>5.30</td>
<td>-15</td>
<td>14</td>
</tr>
<tr>
<td>Size</td>
<td>28</td>
<td>88</td>
<td>118.43</td>
<td>5</td>
<td>550</td>
</tr>
<tr>
<td>Age</td>
<td>28</td>
<td>25</td>
<td>11.29</td>
<td>2</td>
<td>44</td>
</tr>
<tr>
<td>Investment</td>
<td>28</td>
<td>38,049,035.46</td>
<td>878E+5</td>
<td>500,000.00</td>
<td>353,000,000.00</td>
</tr>
</tbody>
</table>

Table 6.13 presents the annual growth of one employee on average, the minimum of -15 and the maximum of 14 employees. As for the size, the average firm size is 88 employees, but the minimum size is five and the maximum is 550.

The median age is 25 years. Some firms are only two years old while some are 44. Generally, new firms need approximately 38,049,035.46 baht for investment. Moreover, 500,000 baht is the minimum and 353,000,000 baht is the maximum.

Table 6.14 Descriptive Statistics of Location

<table>
<thead>
<tr>
<th>Variable</th>
<th>Inner city</th>
<th>Inter city and outer city</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Obs</td>
<td>%</td>
<td>Number of Obs</td>
<td>%</td>
</tr>
<tr>
<td>Location</td>
<td>3</td>
<td>10.7</td>
<td>25</td>
</tr>
</tbody>
</table>

Table 6.14 shows that nearly all firms, 89.3 percent or 25 firms, are located in the inter city and outer city. Only three firms or 10.7 percent are in the inner city.
Table 6.15 Descriptive Statistics of the Industrial Estate

<table>
<thead>
<tr>
<th>Variable</th>
<th>In the industrial estate</th>
<th>Not in the industrial estate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Obs</td>
<td>%</td>
<td>Number of Obs</td>
</tr>
<tr>
<td>Industrial Estate</td>
<td>5</td>
<td>17.9</td>
<td>23</td>
</tr>
</tbody>
</table>

Table 6.15 shows that only five firms or 17.9 percent are situated in the industrial estate. The remaining, 23 firms or 82.1 percent are not.

The conceptual framework in Figure 6.1 facilitated the creation of Equation 5.

Equation 5: Factors Influencing the Employment Growth in Rubber and Plastic Product Industry

\[
x_{\text{gempTP}_i} = a + b_1\text{locTP}_i + b_2\text{estTP}_i + b_3\text{xsizeTP}_i + b_4\text{ageTP}_i + b_5\text{xinvTP}_i + u_i
\]

- \(x_{\text{gempTP}_i}\) = Employment growth in firm i
- \(\text{locTP}_i\) = Location of firm i
  - \(\text{locTP}_i = 0\) if firm i is located in the inner city
  - \(\text{locTP}_i = 1\) if firm i is located in the inter city and outer city
- \(\text{estTP}_i\) = Operation in the industrial estate of firm i
  - \(\text{estTP}_i = 0\) if firm i is located in the industrial estate
  - \(\text{estTP}_i = 1\) if firm i is not located in the industrial estate
- \(\text{xsizeTP}_i\) = Number of persons engaged at the start of firm i
- \(\text{ageTP}_i\) = Total operation years from the start of firm i
- \(\text{xinvTP}_i\) = Investment value at the start of firm i
- \(a\) = Constant
- \(b_1, b_2, \ldots, b_5\) = Standardized regression coefficient
- \(u_i\) = Error Term
The multiple regression analysis reveals the following statistical results:

**Table 6.16** Factors Influencing the Employment Growth in Rubber and Plastic Product Industry

<table>
<thead>
<tr>
<th>No of obs</th>
<th>28</th>
</tr>
</thead>
<tbody>
<tr>
<td>F (5, 22)</td>
<td>4.91</td>
</tr>
<tr>
<td>Prob &gt; F</td>
<td>0.0036</td>
</tr>
<tr>
<td>r</td>
<td>0.69</td>
</tr>
<tr>
<td>R²</td>
<td>0.52</td>
</tr>
</tbody>
</table>

| xempgTP | Coef | Std.Err | t | P>|t| | Beta (β) |
|---------|------|---------|---|-----|---------|
| locTP   | 1.088 | 1.504 | 0.72 | 0.477 | 0.110 |
| est TP  | 1.132 | 1.288 | 0.88 | 0.389 | 0.141 |
| xsizeTP | 0.205 | 0.561 | 0.37 | 0.718 | 0.096 |
| ageTP   | -0.037 | 0.041 | -0.90 | 0.380 | -0.134 |
| xinvTP  | 1.187 | 0.438 | 2.71 | 0.013* | 0.655 |
| A       | -20.282 | 6.196 | -3.27 | 0.003 |

**Note:** Statistical significance is at 0.05.

A statistical significance at 0.05 exists as predicted by the equation. The T-test at 0.05 significant level indicates the investment as the sole influential factor to the employment growth. The correlation coefficient (r) equals 0.69 means that the investment and the employment growth are interrelated.

The R-square is 0.52, interpreting that the investment contributes a great influence to explanatory power on the employment growth that has also a positive relationship with the investment.

The analytical results in Table 6.16 created the following equation:

\[ x_{gemp} = -20.282 + 1.187x_{inv} + u_i \]
6.1.5 Jewelry and Related Articles Industry

Table 6.17 Univariate Descriptive Statistics for Ratio-scale Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment growth</td>
<td>48</td>
<td>9</td>
<td>35.46</td>
<td>-50</td>
<td>167</td>
</tr>
<tr>
<td>Size</td>
<td>48</td>
<td>120</td>
<td>121.55</td>
<td>6</td>
<td>400</td>
</tr>
<tr>
<td>Age</td>
<td>48</td>
<td>15</td>
<td>7.12</td>
<td>1</td>
<td>29</td>
</tr>
<tr>
<td>Investment</td>
<td>48</td>
<td>38,350,741.10</td>
<td>668E+5</td>
<td>550,000.00</td>
<td>402,961,000.00</td>
</tr>
</tbody>
</table>

Table 6.17 reveals the overall employment growth of nine employees per year. The minimum is -50 and the maximum is 167 employees per year and per firm.

The average firm size is 120 employees. The smallest size has six employees while the biggest size has 400 employees. The average age is 15 years. One year represents the minimum age and 29 years for the maximum. The average amount for the investment is 38,350,741 baht. However, it can be started from 550,000 to 402,961,000 baht.

Table 6.18 Descriptive Statistics of Location

<table>
<thead>
<tr>
<th>Variable</th>
<th>Inner city</th>
<th>Inter city and outer city</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Obs</td>
<td>Number of Obs</td>
<td>Number of Obs</td>
</tr>
<tr>
<td>Location</td>
<td>21</td>
<td>27</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>43.8%</td>
<td>56.3%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 6.18 shows that 56.3 percent is accounted for firms situated in the inter city and outer city while 43.8 percent is accounted for those in the inner city.
Table 6.19 Descriptive Statistics of the Industrial Estate

<table>
<thead>
<tr>
<th>Variable</th>
<th>In the industrial estate</th>
<th>Not in the industrial estate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Obs</td>
<td>%</td>
<td>Number of Obs</td>
</tr>
<tr>
<td>Industrial estate</td>
<td>24</td>
<td>50</td>
<td>24</td>
</tr>
</tbody>
</table>

Table 6.19 shows the percentages of places of operation which are equal. Both are equivalent to 50 percent.

**Equation 6: Factors Influencing the Employment Growth in Jewelry and Related Articles Industry**

\[
x_{gempGEi} = a + b_1locGE_i + b_2estGE_i + b_3xsizeGE_i + b_4ageGE_i + b_5xinvGE_i + u_i
\]

- \(x_{gempGEi}\) = Employment growth in firm i
- \(locGE_i\) = Location of firm i
  - \(locGE_i = 0\) if firm i is located in the inner city
  - \(locGE_i = 1\) if firm i is located in the inter city and outer city
- \(estGE_i\) = Operation in the industrial estate of firm i
  - \(estGE_i = 0\) if firm i is located in the industrial estate
  - \(estGE_i = 1\) if firm i is not located in the industrial estate
- \(xsizeGE_i\) = Number of persons engaged at the start of firm i
- \(ageGE_i\) = Total operation years from the start of firm i
- \(xinvGE_i\) = Investment value at the start of firm i
- \(a\) = Constant
- \(b_1, b_2, ..., b_5\) = Standardized regression coefficient
- \(u_i\) = Error Term
Table 6.20  Factors Influencing the Employment Growth in Jewelry and Related Articles Industry

No of obs = 48  
F (5,42) = 2.34  
Prob > F = 0.0584  
r = 0.39  
R² = 0.21

| xempgGE     | Coef  | Std.Err | t    | P>|t|  | Beta (β) |
|-------------|-------|---------|------|------|----------|
| locGE       | -1.441| 1.767   | -0.82| 0.419| 0.238    |
| est GE      | -1.680| 1.856   | -0.91| 0.370| 0.279    |
| xsizeGE     | 0.610 | 0.414   | 1.47 | 0.148| 0.233    |
| ageGE       | -0.173| 0.063   | -2.73| 0.009*| 0.406    |
| xinvTP      | -0.134| 0.331   | -0.41| 0.686| 0.069    |
| A           | 7.211 | 5.901   | 1.22 | 0.229|          |

Note: Statistical significance is at 0.05.

A 95 percent confidence is given by the equation. The T-test which is at 0.05 level of significance implies that only the age influences the employment growth. The correlation coefficient of age and the employment growth is 0.39. This means that both are interrelated.

The R-square is 0.22, reveals that the age has 22 percent explanatory power to predict the change in employment growth. Also, age has a positive direction with the growth.

Statistical results in Table 6.20 are translated into the equation below.

\[ x_{gempGE} = 7.211 - 0.173ageGE + u_i \]
6.1.6 Electrical and Electronics Industry

Table 6.21 Univariate Descriptive Statistics for Ratio-scale Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment growth</td>
<td>68</td>
<td>8</td>
<td>21.95</td>
<td>-14</td>
<td>168</td>
</tr>
<tr>
<td>Size</td>
<td>68</td>
<td>83</td>
<td>110.55</td>
<td>3</td>
<td>450</td>
</tr>
<tr>
<td>Age</td>
<td>68</td>
<td>20</td>
<td>8.71</td>
<td>3</td>
<td>41</td>
</tr>
<tr>
<td>Investment</td>
<td>68</td>
<td>56,789,377.24</td>
<td>115E+6</td>
<td>150,000.00</td>
<td>715,563,000.00</td>
</tr>
</tbody>
</table>

The employment growth in this industry is eight employees per year. The lowest employment is -14 and the highest employment is 168 employees per year.

The overall size is 83 persons. The smallest-sized firms hire three employees and the biggest firms hire 450 employees. 20 years represents the median age. The minimum age is one and the maximum is 41. When starting the firm, the required investment is around 56,798,377 baht. However, the investment is possible from 150,000 baht or up to 715,563,000 baht.

Table 6.22 Descriptive Statistics of Location

<table>
<thead>
<tr>
<th>Variable</th>
<th>Inner city</th>
<th>Inter city and outer city</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Obs</td>
<td>%</td>
<td>Number of Obs</td>
</tr>
<tr>
<td>Location</td>
<td>13</td>
<td>19.1</td>
<td>55</td>
</tr>
</tbody>
</table>

Nearly all firms in this industry, 80.9 percent or 55 firms, are situated in the inter city and outer city. The other 13 firms or 19.1 percent are in the inner city.
Table 6.23 Descriptive Statistics of Industrial Estate

<table>
<thead>
<tr>
<th>Variable</th>
<th>In the industrial estate</th>
<th>Not in the industrial estate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Obs</td>
<td>%</td>
<td>Number of Obs</td>
</tr>
<tr>
<td>Industrial Estate</td>
<td>18</td>
<td>26.5</td>
<td>50</td>
</tr>
</tbody>
</table>

Table 6.23 shows that 18 firms (26.5 percent) are operating in the industrial estate while 50 firms are not (73.5 percent).

Equation 7: Factors Influencing the Employment Growth in Electrical and Electronics Industry

\[ x_{gempEL_i} = a + b_1locEL_i + b_2estEL_i + b_3xsizeEL_i + b_4ageEL_i + b_5xinvEL_i + u_i \]

\[ x_{gempEL_i} = \] Employment growth in firm i

\[ locEL_i = \] Location of firm i

\[ locEL_i = 0 \] if firm i is located in the inner city
\[ locEL_i = 1 \] if firm i is located in the inter city and outer city

\[ estEL = \] Operation in the industrial estate of firm i

\[ estEL_i = 0 \] if firm i is located in the industrial estate
\[ estEL_i = 1 \] if firm i is not located in the industrial estate

\[ xsizeEL_i = \] Number of persons engaged at the start of firm i

\[ ageEL_i = \] Total operation years from the start of firm i

\[ xinvEL_i = \] Investment value at the start of firm i

\[ a = \] Constant

\[ b_1, b_2, \ldots, b_5 = \] Standardized regression coefficient

\[ u_i = \] Error Term
Table 6.24  Factors Influencing the Employment Growth in Electrical and Electronics Industry

No of obs = 68
F (5,62) = 16.24
Prob > F = 0.0000
R = 0.75
R^2 = 0.56

| xempgEL | Coef  | Std.Err | T    | P>|t| | Beta (β) |
|---------|-------|---------|------|-----|---------|
| locEL   | 0.698 | 0.838   | 0.83 | 0.408| 0.081   |
| est EL  | -0.718| 0.765   | -0.94| 0.351| -0.094  |
| xsizeEL | 0.782 | 0.343   | 2.28 | 0.026*| 0.305   |
| ageEL   | -0.100| 0.037   | -2.71| 0.009*| -0.259  |
| xinvEL  | 0.580 | 0.238   | 2.43 | 0.018*| 0.334   |
| a       | -9.461| 3.836   | -2.47| 0.016|         |

Note: Statistical significance is at 0.05.

The F-test with Prob > F = 0.0000 is significant at a 0.05 level. The T-test finds that at 0.05 significance level, size, age and investment are factors to the employment growth. The multiple correlation (R) of these three independent variables is 0.75. This means that these three are closely associated with the employment growth.

Considering the R-square, all independent variables contribute 56 percent explanatory power to the change of employment growth. The beta weights of size, age and investment are 0.305, 0.259 and 0.334 respectively. The investment is the most powerful factor for explanation. In terms of the relationship between all independent variables and the dependent variable, only the investment and size have a positive relationship with the growth.

The equation below is derived from statistical results in Table 6.24.

\[ x_{\text{empgEL}} = -9.461 + 0.782x_{\text{sizeEL}} - 0.100a_{\text{gEL}} + 0.580x_{\text{invEL}} + u_i \]
6.1.7 Machine, Machinery and Equipment Industry

Table 6.25  Univariate Descriptive Statistics for Ratio Scale Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment growth</td>
<td>71</td>
<td>2</td>
<td>4.05</td>
<td>-5</td>
<td>19</td>
</tr>
<tr>
<td>Size</td>
<td>71</td>
<td>29</td>
<td>53.55</td>
<td>1</td>
<td>285</td>
</tr>
<tr>
<td>Age</td>
<td>71</td>
<td>23</td>
<td>12.95</td>
<td>1</td>
<td>43</td>
</tr>
<tr>
<td>Investment</td>
<td>71</td>
<td>14,745,281.85</td>
<td>592E+5</td>
<td>30,000.00</td>
<td>495,160,000.00</td>
</tr>
</tbody>
</table>

The average annual growth of employment is two employees, which is considered positive. The least employment growth is -5 and the highest growth is 19 persons per year and per firm. Firms in general hire 29 employees, but some hire just one employee or up to a maximum of 285 employees.

The firm’s age is mainly 23 years. Some firms have been operating for one year and 43 years. The average investment for a start is 14,745,281 baht. Thus, some entrepreneurs may start from 30,000 baht to 495,160,000 baht.

Table 6.26  Descriptive Statistics of Location

<table>
<thead>
<tr>
<th>Variable</th>
<th>Inner city</th>
<th>Inter city and outer city</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Obs</td>
<td>%</td>
<td>Number of Obs</td>
</tr>
<tr>
<td>Location</td>
<td>31</td>
<td>43.7</td>
<td>40</td>
</tr>
</tbody>
</table>

Table 6.26 shows that 56.3 percent represents enterprises in the inter city and outer city (40 enterprises) and 43.7 percent is those in the inner city (31 enterprises).
Table 6.27 Descriptive Statistics of the Industrial Estate

<table>
<thead>
<tr>
<th>Variable</th>
<th>In the industrial estate</th>
<th>Not in the industrial estate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Obs</td>
<td>% Number of Obs</td>
<td>Number of Obs</td>
</tr>
<tr>
<td>Industrial estate</td>
<td>2</td>
<td>2.8</td>
<td>69</td>
</tr>
</tbody>
</table>

Table 6.27 shows that only two enterprises are engaged in the industrial estate (2.8 percent) and 69 enterprises are not (97.2 percent).

**Equation 8: Factors Influencing the Employment Growth in Machine, Machinery and Equipment Industry**

\[
x_{gempMP_i} = a + b_1locMP_i + b_2estMP_i + b_3xsizeMP_i + b_4ageMP_i + b_5xinvMP_i + u_i
\]

- \(x_{gempMP_i}\) = Employment growth in firm \(i\)
- \(locMP_i\) = Location of firm \(i\)  
  \(locMP_i = 0\) if firm \(i\) is located in the inner city \(locMP_i = 1\) if firm \(i\) is located in the inter city and outer city
- \(estMP_i\) = Operation in the industrial estate of the firm \(i\)  
  \(estMP_i = 0\) if firm \(i\) is located in the industrial estate \(estMP_i = 1\) if firm \(i\) is not located in the industrial estate
- \(xsizeMP_i\) = Number of persons engaged at the start of firm \(i\)
- \(ageMP_i\) = Total operation years from the start of firm \(i\)
- \(xinvMP_i\) = Investment value at the start of firm \(i\)
- \(a\) = Constant
- \(b_1, b_2, ..., b_5\) = Standardized regression coefficient
- \(u_i\) = Error Term
### Table 6.28 Factors Influencing the Employment Growth in Machine, Machinery and Equipment Industry

|                | Coef  | Std.Err | T    | P>|t|  | Beta (β) |
|----------------|-------|---------|------|------|----------|
| locEL          | 0.085 | 0.656   | 0.13 | 0.897| 0.012    |
| est EL         | -1.581| 1.735   | -0.91| 0.366| -0.079   |
| xsizeEL        | 1.011 | 0.335   | 3.01 | 0.004*| 0.352    |
| ageEL          | -0.116| 0.023   | -4.97| 0.000*| -0.453   |
| xinvEL         | 0.326 | 0.208   | 1.56 | 0.123| 0.194    |
| a              | -4.126| 3.637   | -1.13| 0.261|          |

**Note:** Statistical significance is at 0.05.

The F-test with Prob > F = 0.0000 is significant at a 0.05 level. The T-test finds that at 95 percent confidence level, size and age are influential factors to the employment growth. The multiple correlation (R) of the size, age and the employment growth is 0.74. This means that these three are interrelated.

The R-square reveals the 55 percent explanatory power of the size and age to the change of employment growth. The beta weights of size and age equal 0.352 and 0.453 respectively. Therefore, the age has more influential explanatory power. However, both contribute different relationships with the employment growth. That is to say, size has a positive relationship with employment growth. On the other hand, age has a negative relationship with the same.

The equation gained from this analysis is:

$$x_{gempMP} = -4.126 + 1.011x_{sizeMP} - 0.116ageMP + u_i$$
6.2 Summary of Hypothesis Test

Table 6.29 presents the summarized results from hypothesis test.

**Table 6.29 Results of Hypothesis Test in Each Industrial Category**

<table>
<thead>
<tr>
<th>Industrial category</th>
<th>Hypothesis</th>
<th>Independent variable</th>
<th>Dependent variable</th>
<th>Direction of relationship according to hypothesis</th>
<th>Direction of relationship after testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food products and beverages</td>
<td>H2.1</td>
<td>Location</td>
<td>Employment growth</td>
<td>Different</td>
<td>Not different •</td>
</tr>
<tr>
<td></td>
<td>H2.2</td>
<td>Industrial estate</td>
<td>Employment growth</td>
<td>Different</td>
<td>Different with positive direction</td>
</tr>
<tr>
<td></td>
<td>H2.3</td>
<td>Size</td>
<td>Employment growth (growth)</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>H2.4</td>
<td>Age</td>
<td>Employment growth</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td></td>
<td>H2.5</td>
<td>Investment</td>
<td>Employment growth</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>H2.6</td>
<td>Location</td>
<td>Employment growth</td>
<td>Different</td>
<td>Not different •</td>
</tr>
<tr>
<td></td>
<td>H2.7</td>
<td>Industrial estate</td>
<td>Employment growth</td>
<td>Different</td>
<td>Different with positive direction</td>
</tr>
<tr>
<td>Automobile and automotive parts</td>
<td>H2.8</td>
<td>Size</td>
<td>Employment growth</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>H2.9</td>
<td>Age</td>
<td>Employment growth</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td></td>
<td>H2.10</td>
<td>Investment</td>
<td>Employment growth</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
### Textiles and apparels

<table>
<thead>
<tr>
<th>Industrial category</th>
<th>Hypothesis</th>
<th>Independent variable</th>
<th>Dependent variable</th>
<th>Direction of relationship according to hypothesis</th>
<th>Direction of relationship after testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>H2.11</td>
<td>Location</td>
<td>Employment growth</td>
<td>Different</td>
<td>Not different •</td>
<td></td>
</tr>
<tr>
<td>H2.12</td>
<td>Industrial estate</td>
<td>Employment growth</td>
<td>Different</td>
<td>Not different •</td>
<td></td>
</tr>
<tr>
<td>H2.13</td>
<td>Size</td>
<td>Employment growth</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>H2.14</td>
<td>Age</td>
<td>Employment growth</td>
<td>_</td>
<td>_</td>
<td></td>
</tr>
<tr>
<td>H2.15</td>
<td>Investment</td>
<td>Employment growth</td>
<td>+</td>
<td>+ •</td>
<td></td>
</tr>
<tr>
<td>H2.16</td>
<td>Location</td>
<td>Employment growth</td>
<td>Different</td>
<td>Not different •</td>
<td></td>
</tr>
<tr>
<td>H2.17</td>
<td>Industrial estate</td>
<td>Employment growth</td>
<td>Different</td>
<td>Not different •</td>
<td></td>
</tr>
<tr>
<td>H2.18</td>
<td>Size</td>
<td>Employment growth</td>
<td>+</td>
<td>+ •</td>
<td></td>
</tr>
<tr>
<td>H2.19</td>
<td>Age</td>
<td>Employment growth</td>
<td>_</td>
<td>_ •</td>
<td></td>
</tr>
<tr>
<td>H2.20</td>
<td>Investment</td>
<td>Employment growth</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>
Table 6.29 (Continued)

<table>
<thead>
<tr>
<th>Industrial category</th>
<th>Hypothesis</th>
<th>Independent variable</th>
<th>Dependent variable</th>
<th>Direction of relationship according to hypothesis</th>
<th>Direction of relationship after testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jewelry and related articles</td>
<td>H2.21</td>
<td>Location</td>
<td>Employment growth</td>
<td>Different</td>
<td>Not different •</td>
</tr>
<tr>
<td></td>
<td>H2.22</td>
<td>Industrial estate</td>
<td>Employment growth</td>
<td>Different</td>
<td>Not different •</td>
</tr>
<tr>
<td></td>
<td>H2.23</td>
<td>Size</td>
<td>Employment growth</td>
<td>+</td>
<td>+ •</td>
</tr>
<tr>
<td></td>
<td>H2.24</td>
<td>Age</td>
<td>Employment growth</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>H2.25</td>
<td>Investment</td>
<td>Employment growth</td>
<td>+</td>
<td>+ •</td>
</tr>
<tr>
<td></td>
<td>H2.26</td>
<td>Location</td>
<td>Employment growth</td>
<td>Different</td>
<td>Not different •</td>
</tr>
<tr>
<td></td>
<td>H2.27</td>
<td>Industrial estate</td>
<td>Employment growth</td>
<td>Different</td>
<td>Not different •</td>
</tr>
<tr>
<td>Electrical and electronics</td>
<td>H2.28</td>
<td>Size</td>
<td>Employment growth</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>H2.29</td>
<td>Age</td>
<td>Employment growth</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>H2.30</td>
<td>Investment</td>
<td>Employment growth</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
### Table 6.29 (Continued)

<table>
<thead>
<tr>
<th>Industrial category</th>
<th>Hypothesis</th>
<th>Independent variable</th>
<th>Dependent variable</th>
<th>Direction of relationship according to hypothesis</th>
<th>Direction of relationship after testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine, machinery and equipment</td>
<td>H3.31</td>
<td>Location</td>
<td>Employment growth</td>
<td>Different</td>
<td>Not different •</td>
</tr>
<tr>
<td></td>
<td>H3.32</td>
<td>Industrial estate</td>
<td>Employment growth</td>
<td>Different</td>
<td>Not different •</td>
</tr>
<tr>
<td></td>
<td>H3.33</td>
<td>Size</td>
<td>Employment growth</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>H3.34</td>
<td>Age</td>
<td>Employment growth</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>H3.35</td>
<td>Investment</td>
<td>Employment growth</td>
<td>+</td>
<td>+ •</td>
</tr>
</tbody>
</table>

**Note:** Statistical insignificance is at 0.05.

This chapter illustrates a clearer picture of Thailand’s industrial sector that is composed of various sub-industries or categories. Each category has different influential factors to the employment growth. Therefore, after these factors are pointed out, the promotion of certain industries for the economic growth may be essential.

Factors that influence the industry rely on the industry’s life cycle. However, these factors comply with three major principles under the Firm Growth Theory. The size has a positive relationship with the employment growth according to Javanovic’s Learning and Selection (1982) and Evan’s Gibrat’s Law (1987). Furthermore, the Structure-Conduct-Performance simplifies the reinforcement between the structure (representing the firm’s size) and the capacity (representing the firm’s growth).

As for the age, investment and industrial estate, they follow the evolution in the Gibrat’s Law. The age of firm brings a negative relationship with the employment
of firm. This means that a new establishment produces more employment. Similar to the finding of Liedholm (1994) and Mead (1994), money for investment at the start of the firm produces a positive relationship with the firm’s growth. This statement agrees with Carpenter and Petersen (2002) that the firm with limited investment of money will obtain a slower growth than the firm with more investment capacity. The industrial estate visualizes how the government provides supports to the firms. The firms in some industrial estates achieve the employment growth greater than those operated outside the estate. This finding is not different from Storey (1994) that the firms with supports from the government are those with a rapid growth.

Table 6.29 exhibits findings from the test of Group 2 Hypotheses.
**Figure 6.2** Models from Analyses of Factors Influencing the Employment Growth in Each Industrial Category
CHAPTER 7

FACTORS INFLUENCING THE EMPLOYMENT GROWTH
IN EACH FIRM’S SIZE

This chapter investigates the influence of the factors to the employment growth in each firm’s size. It studies into the firm’s size separately using four independent variables which are location, industrial estate, age and investment. The reason for excluding the size is that, it is already divided for group study.

The multiple regression analysis was employed and also the hypothesis test for Group 3 Hypotheses was conducted to find answers to research question III. The conceptual framework for this hypothesis test is shown in Figure 7.1
762 firms in the industrial sector

Small-scale firm
- locS
- estS
- ageS
- xinvS
- gempS
- obs=57

Medium-scale firm
- locM
- estM
- ageM
- xinvM
- gemp
- obs=12

Large-scale firm
- locL
- estL
- ageL
- xinvL
- gempL
- obs=65

Figure 7.1 Conceptual Framework for Hypothesis Test
Chapter 7 is made up of two parts which are:

1) Analysis of descriptive statistics in three firm’s sizes: small, medium and large.

   (1) Analysis of descriptive statistics
   The analysis uses mean, standard deviation, minimum and maximum. It divides variables for better explanation into:

   (1.1) Quantitative variables: Ratio-scale variables
         - Employment growth
         - Age
         - Investment

   (1.2) Descriptive variables: Nominal variables using dummy variables
         - Location
         - Industrial estate

   (2) Analysis of factors to the employment growth in each firm’s size using evidence-based situations and related theories

   Summary of hypothesis test of Group 3 Hypotheses

   2) Analysis


7.1 Analysis of Descriptive Statistics

7.1.1 Small-scale Firm

Table 7.1 Univariate Descriptive Statistics for Ratio-scale Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment growth</td>
<td>573</td>
<td>4</td>
<td>21.170</td>
<td>-11</td>
<td>289</td>
</tr>
<tr>
<td>Age</td>
<td>573</td>
<td>18</td>
<td>11.217</td>
<td>1</td>
<td>43</td>
</tr>
<tr>
<td>Investment</td>
<td>573</td>
<td>13,499,627.20</td>
<td>371E+5</td>
<td>25,000</td>
<td>468,280,000</td>
</tr>
</tbody>
</table>

Table 7.1 shows that the small-sized firms experience the employment growth of four employees annually and this is positive. It also shows a minimum growth of -11 and maximum of 287 employees per year and per firm.

The median age for these firms is 18 years. Young firms are one year old and the oldest ones are 43 years. The investment at the start is 13,499,627 baht averagely. However the minimum can be 25,000 baht and up to a maximum of 468,280,000 baht.

Table 7.2 Descriptive Statistics of Location

<table>
<thead>
<tr>
<th>Variable</th>
<th>Inner city</th>
<th>Inter city and outer city</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Obs</td>
<td>%</td>
<td>Number of Obs</td>
<td>%</td>
</tr>
<tr>
<td>Location</td>
<td>226</td>
<td>39.4</td>
<td>347</td>
</tr>
</tbody>
</table>

The majority of small firms are located in the inter city and outer city (60 percent or 347 firms). The remaining firms are in the inner city (39.4 percent or 27 firms).
Table 7.3 Descriptive Statistics of the Industrial Estate

<table>
<thead>
<tr>
<th>Variable</th>
<th>In the industrial estate</th>
<th>Not in the industrial estate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Obs</td>
<td>%</td>
<td>Number of Obs</td>
</tr>
<tr>
<td>Industrial estate</td>
<td>29</td>
<td>5.1</td>
<td>544</td>
</tr>
</tbody>
</table>

A very small percentage of small firms have manufacturing operation in the industrial estate (5.1 percent or 29 firms). Most have operations elsewhere (94.9 percent or 544 firms).

The following mathematical model was created to predict factors that influenced the employment growth.

**Equation 9: Factors Influencing the Employment Growth in Small-scaled Firms**

\[ x_{gmpS_i} = a + b_1locS_i + b_2estS_i + b_3ageS_i + b_4xinvS_i + u_i \]

- \( x_{gmpS_i} \) = Employment growth in firm \( i \)
- \( locS_i \) = Location of firm \( i \)
  - \( locS_i = 0 \) if firm \( i \) is located in the inner city
  - \( locS_i = 1 \) if firm \( i \) is located in the inner city and outer city
- \( estS_i \) = Operation in the industrial estate of firm \( i \)
  - \( estS_i = 0 \) if firm \( i \) is located in the industrial estate
  - \( estS_i = 1 \) if firm \( i \) is not located in the industrial estate
- \( ageS_i \) = Total operational years from the start of firm \( i \)
- \( xinvS_i \) = Investment value at the start of firm \( i \)
- \( a \) = Constant
- \( b_1, b_2, \ldots, b_5 \) = Standardized regression coefficient
- \( u_i \) = Error Term
Table 7.4 Factors Influencing the Employment Growth in Small-scaled Firms

|                | Coef | Std.Err | t     | P>|t|  | Beta (β) |
|----------------|------|---------|-------|------|---------|
| locS           | -0.145 | 0.231  | -0.63 | 0.530 | -0.020  |
| est S          | -0.379 | 0.513  | -0.74 | 0.460 | -0.024  |
| Ages           | -0.135 | 0.010  | -12.67| 0.000*| -0.445  |
| xinvS          | 0.650  | 0.068  | 9.56  | 0.000*| 0.344   |
| A              | -7.269 | 1.321  | -5.50 |       |         |

Note: Statistical significance is at 0.05.

The F-test was performed with the Prob > F = 0.0000. The equation gives a 95 percent confidence with a value of 0.05, making the sample a representation of population.

The T-test was used to find a significant relationship between a dependent variable and independent variables in the equation. The P>|t| presents the relationship of these variables. If the P-value is close to 0, the coefficient of independent variables is considered significant and applicable.

The P>|t| demonstrates a significance of age and investment to the employment growth. The R=0.66 means that all these variables are interrelated.

The R-square interprets that the age and investment gain 44 percent explanatory power on the change of employment growth. The age has a beta weight of 0.445 and the investment has 0.344. Hence, the age has more influence than the investment in explanatory power. Both variables have different relationships with the employment growth. That is to say, the age presents a negative relationship with the growth while the investment has a positive relationship with the same.

Analytical results above produced the next equation.

\[ x_{gempS} = -7.269 - 0.135ageS + 0.650xinvS + u_i \]
7.1.2 Medium-scaled Firm

Table 7.5 Univariate Descriptive Statistics for Ratio-scale Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment growth</td>
<td>124</td>
<td>4</td>
<td>21.380</td>
<td>-90</td>
<td>173</td>
</tr>
<tr>
<td>Age</td>
<td>124</td>
<td>20</td>
<td>10.436</td>
<td>1</td>
<td>44</td>
</tr>
<tr>
<td>Investment</td>
<td>124</td>
<td>81,180,357.06</td>
<td>171E+6</td>
<td>300,000</td>
<td>1,304,768,000</td>
</tr>
</tbody>
</table>

The medium firms have an average annual employment growth of four employees. The minimum is -90 and the maximum is 173 employees per firm annually.

A large number of firms are 20 years. The youngest firms are one year and the oldest is 44 years. About the investment value, 81,180,357 baht represents the average, 300,000 baht represents the minimum and 1,304,768,000 baht represents the maximum.

Table 7.6 Descriptive Statistics of Location

<table>
<thead>
<tr>
<th>Variable</th>
<th>Inner city</th>
<th>Inter city and outer city</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Obs</td>
<td>%</td>
<td>Number of Obs</td>
</tr>
<tr>
<td>Location</td>
<td>27</td>
<td>21.8</td>
<td>97</td>
</tr>
</tbody>
</table>

The inter city and outer city are major locations, accounted for 78.2 percent (97 firms). The remaining 21.8 percent reports the location in the inner city (27 firms).
**Table 7.7 Descriptive Statistics of the Industrial Estate**

<table>
<thead>
<tr>
<th>Variable</th>
<th>In the industrial estate</th>
<th>Not in the industrial estate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Obs</td>
<td>%</td>
<td>Number of Obs</td>
</tr>
<tr>
<td>Industrial estate</td>
<td>35</td>
<td>28.2</td>
<td>89</td>
</tr>
</tbody>
</table>

The operation in the industrial estate contributes a small percentage, 28.2 percent (35 firms). Most firms, 71.8 percent are operating outside the estate (89 firms).

The conceptual framework in Figure 7.1 was transformed to the next mathematical model.

**Equation 10: Factors Influencing the Employment Growth in Medium-Scaled Firms**

\[
x_{gmpM_i} = a + b_1l_{ocM_i} + b_2e_{stM_i} + b_3a_{geM_i} + b_4x_{invM_i} + u_i
\]

\[
x_{gempM_i} = \text{Employment growth in firm } i
\]

\[
l_{ocM_i} = \text{Location of firm } i
\]

\[
l_{ocM_i} = 0 \text{ if firm } i \text{ is located in the inner city}
\]

\[
l_{ocM_i} = 1 \text{ if firm } i \text{ is located in the inter city and outer city}
\]

\[
e_{stM_i} = \text{Operation in the industrial estate of firm } i
\]

\[
e_{stM_i} = 0 \text{ if firm } i \text{ is located in the industrial estate}
\]

\[
e_{stM_i} = 1 \text{ if firm } i \text{ is not located in the industrial estate}
\]

\[
a_{geM_i} = \text{Total operational years from the start of firm } i
\]

\[
x_{invM_i} = \text{Investment value at the start of firm } i
\]

\[
a = \text{Constant}
\]

\[
b_1, b_2, \ldots, b_s = \text{Standardized regression coefficient}
\]

\[
u_i = \text{Error Term}
\]
Table 7.8 Factors Influencing the Employment Growth in Medium-scaled Firms

No of obs = 124
F (4,119) = 5.65
Prob > F = 0.0003
R = 0.39
R² = 0.16

|       | Coef  | Std.Err | t     | P>|t|  | Beta (β) |
|-------|-------|---------|-------|-----|----------|
| locM  | -0.183| 0.610   | -0.30 | 0.765| -0.027   |
| est M | 0.311 | 0.577   | 0.54  | 0.591| 0.050    |
| ageM  | -0.067| 0.222   | -3.01 | 0.003*| -0.255   |
| xinvM | 0.473 | 0.142   | 3.32  | 0.001*| 0.311    |
| A     | -4.287| 2.624   | -1.63 | 0.1058|          |

Note: Statistical significance is at 0.05.

The F-test with Prob > F = 0.0003 is an appropriate representation of population with a 95 percent confidence level. The T-test at 0.05 statistical significance shows that the age and investment are influential factors to the employment growth. The multiple correlation (R) of 0.39 means that the age, investment and employment growth are interrelated.

The R-square reveals the 16 percent explanatory power of the age and investment on the employment growth. The beta weights are equal to 0.255 and 0.311 for age and investment respectively. Therefore, the investment has more influence. The negative relationship with the growth appears in the age of the firm. On the other hand, the positive relationship with the same is seen in the investment.

The equation gained from this analysis is:

\[ x_{gempM} = -4.287 - 0.067ageM + 0.473xinvM + u_i \]
7.1.3 Large-scaled Firm

Table 7.9 Univariate Descriptive Statistics for Ratio-scale Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of Obs</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment growth</td>
<td>69</td>
<td>3</td>
<td>35.017</td>
<td>-50</td>
<td>179</td>
</tr>
<tr>
<td>Age</td>
<td>69</td>
<td>23</td>
<td>8.405</td>
<td>5</td>
<td>42</td>
</tr>
<tr>
<td>Investment</td>
<td>69</td>
<td>222,194,950.72</td>
<td>643E+6</td>
<td>1,900,000</td>
<td>3,713,000</td>
</tr>
</tbody>
</table>

The annual employment of the three employees represents the average growth. The minimum is -50 and the maximum is 179 employees per year and per firm. Firms have been run mainly for 23 years. The youngest year is five and the oldest year is 42. The average investment to start is 222,194,950 baht; the minimum and the maximum are 1,900,000 baht and 3,713,000,000 baht respectively.

Table 7.10 Descriptive Statistics of Location

<table>
<thead>
<tr>
<th>Variable</th>
<th>Inner city</th>
<th>Inter city and outer city</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Obs</td>
<td>%</td>
<td>Number of Obs</td>
</tr>
<tr>
<td>Location</td>
<td>9</td>
<td>13.8</td>
<td>56</td>
</tr>
</tbody>
</table>

86.2 percent stands for enterprises in the inter city and outer city (56 enterprises) and 13.8% percent indicates those in the inner city (9 enterprises).
Table 7.11 Descriptive Statistics of the Industrial Estate

<table>
<thead>
<tr>
<th>Variable</th>
<th>In the industrial estate</th>
<th>Not in the industrial estate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Obs</td>
<td>%</td>
<td>Number of Obs</td>
</tr>
<tr>
<td>Industrial Estate</td>
<td>34</td>
<td>52.3</td>
<td>31</td>
</tr>
</tbody>
</table>

The larger percentage goes to those with operation in the industrial estate (52.3 percent or 34 firms). The smaller percentage belongs to those operating outside the estate (47.7 percent or 31 firms).

Equation 11: Factors Influencing the Employment Growth in Large-scale Firms

\[
x_{gmpL_i} = a + b_1 l_{ocL_i} + b_2 e_{stL_i} + b_3 a_{geL_i} + b_4 x_{invL_i} + u_i
\]

\[
x_{gempL_i} = \text{Employment growth in firm } i
\]

\[
l_{ocL_i} = \text{Location of firm } i
\]

\[
l_{ocL_i} = 0 \text{ if firm } i \text{ is located in the inner city}
\]

\[
l_{ocL_i} = 1 \text{ if firm } i \text{ is located in the inter city and outer city}
\]

\[
e_{stL_i} = \text{Operation in the industrial estate of firm } i
\]

\[
e_{stL_i} = 0 \text{ if firm } i \text{ is located in the industrial estate}
\]

\[
e_{stL_i} = 1 \text{ if firm } i \text{ is not located in the industrial estate}
\]

\[
a_{geL_i} = \text{Total operational years from the start of firm } i
\]

\[
x_{invL_i} = \text{Investment value at the start of firm } i
\]

\[
a = \text{Constant}
\]

\[
b_1, b_2, \ldots, b_5 = \text{Standardized regression coefficient}
\]

\[
u_i = \text{Error Term}
\]
Table 7.12  Factors Influencing the Employment Growth in Large-scaled Firms

No of obs = 65  
F (4,60) = 3.09  
Prob > F = 0.0224  
R = 0.41  
R² = 0.17

|     | Coef | Std.Err | t     | P>|t| | Beta (β) |
|-----|------|---------|-------|-----|-----------|
| locL| -0.612 | 0.962 | -0.64 | 0.527 | -0.088 |
| est L | 0.597 | 0.645 | 0.92 | 0.359 | 0.124 |
| ageL | -0.089 | 0.034 | -2.57 | 0.013* | -0.310 |
| xinvL | 0.545 | 0.227 | 2.39 | 0.020 | 0.313 |
| A   | -3.192 | 4.096 | -0.77 | 0.445 |

Note: Statistical significance is at 0.05.

The Prob > F = 0.0224 gets close to zero and so the equation gives a 95 percent confidence. The T-test at 0.05 significance level and multiple correlation (R) equaling to 0.41 imply that the age, investment and employment growth have an interrelated relationship.

The R-square reveals that the age and investment have 17 percent explanatory power to predict the change in employment growth. The beta weights of age and investment show a close similarity, 0.310 and 0.313 respectively. Thus, the investment has more importance and so it is more powerful for explanation. Moreover, the investment has a positive relationship with the employment growth while the age has not.

The next equation is derived from the above statistical results.

\[ x_{\text{empgL}} = -3.152 - 0.089 \text{ageL} + 0.545 \text{xinvL} + u_i \]
### 7.2 Summary of hypothesis test

**Table 7.13** Results of Hypothesis Test in Each Firm’s Size

<table>
<thead>
<tr>
<th>Firm’s size</th>
<th>Hypothesis</th>
<th>Factor</th>
<th>Dependent variable</th>
<th>Direction of relationship according to hypothesis</th>
<th>Direction of relationship after the test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small-scale</td>
<td>H3.1</td>
<td>Location</td>
<td>Employment growth</td>
<td>Different</td>
<td>Not different •</td>
</tr>
<tr>
<td></td>
<td>H3.2</td>
<td>Industrial estate</td>
<td>Employment growth</td>
<td>Different</td>
<td>Not different •</td>
</tr>
<tr>
<td></td>
<td>H3.3</td>
<td>Age</td>
<td>Employment growth</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td></td>
<td>H3.4</td>
<td>Investment</td>
<td>Employment growth</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>H3.5</td>
<td>Location</td>
<td>Employment growth</td>
<td>Different</td>
<td>Not different •</td>
</tr>
<tr>
<td></td>
<td>H3.6</td>
<td>Industrial estate</td>
<td>Employment growth</td>
<td>Different</td>
<td>Not different •</td>
</tr>
<tr>
<td>Medium-scale</td>
<td>H3.7</td>
<td>Age</td>
<td>Employment growth</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td></td>
<td>H3.8</td>
<td>Investment</td>
<td>Employment growth</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>H3.9</td>
<td>Location</td>
<td>Employment growth</td>
<td>Different</td>
<td>Not different •</td>
</tr>
<tr>
<td></td>
<td>H3.10</td>
<td>Industrial estate</td>
<td>Employment growth</td>
<td>Different</td>
<td>Not different •</td>
</tr>
<tr>
<td>Large-scale</td>
<td>H3.11</td>
<td>Age</td>
<td>Employment growth</td>
<td>_</td>
<td>_</td>
</tr>
<tr>
<td></td>
<td>H3.12</td>
<td>Investment</td>
<td>Employment growth</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

**Note:** Statistical insignificance is at 0.05.
All three-sized groups feature quite similar factors that influence the employment growth that are age and investment. Thus, such factors produced influences differently as the employment growth in small-sized firms is largely influenced by age. On the other side, the investment influenced the employment growth in medium and large firms.

The mean of employment growth in small and medium firms is four employees per year and per firm. The large-sized firms generally have three employees annually. These findings are linked with Jovanovic’s Learning and Selection (1982) and the evolution in Gibrat’s Law. Furthermore, Evans (1987) says that the medium and small-sized firms can expand until reaching the minimum efficient size when the firm’s growth gains a balance. As for large firms, they appear to have a low employment growth because their growth has already reached the minimum efficient size. At these points, new small firms and medium firms should be promoted as they have more chances to create more employment.

**Figure 7.2** Models from Analyses of Factors Influencing the Employment Growth in Each Firm’s Size
CHAPTER 8

SUMMARY AND RECOMMENDATION

Chapter 8 is about the summary of findings and discussion for answers to all research questions and policy recommendation for future studies.

8.1 Summary

This study applied the Firm Growth Theory utilizing Simple Random Sampling Technique to 762 firms as samples from the finite population of 6,021 firms in Bangkok listed in the 2012 year-end database of the Department of Industrial Works, Ministry of Industry. The cross-sectional data in this database was collected from seven industries categorized in the Ministry of Industry’s National Industrial Development Master Plan B.E. 2555-2574.

The five growth determinants which are location, industrial estate, size, age and investment were hypothesized to influence the employment growth that also represented the firm’s growth.

The multiple regression analysis was conducted in three dimensions as follows:

1) The study on factors influencing the overall employment growth in the industrial sector
2) The study on factors influencing the employment growth in each industrial category
3) The study on factors influencing the employment growth by firm’s size

This chapter investigates the influence of the factors to the employment growth in each firm’s size. It studies into the firm’s size separately using four independent variables which are location, industrial estate, age and investment. The reason for excluding the size is that, it is already divided for group study.
The Firm Growth Theory with its 3 components which are, the Evolutions of Gibrat’s Law (the Law of Proportionate Effect), the Structure- Conduct- Performance Framework and the Learning and Selection Mode is the major contributory factor to this study. By relying on these concepts and other relevant literature, this study determined the employment growth to be the only one dependent variable that would draw out the firm’s growth (economic dimension) and employment growth (social dimension).

The three objectives are:

1) To study the factors influencing the employment growth rate in the industrial sector as a whole

2) To study the factors influencing the employment growth rate in each industrial category

3) To study the factors influencing the employment growth rate in each business size in the industrial sector

Hypotheses were based on the objectives and conceptual framework.

8.1.1 Hypothesis

**Group 1 Hypotheses**

H 1.1 Firm’s location influences the difference in the overall employment growth.

H 1.2 Firm’s operation in the industrial estate influences the difference in the overall employment growth in the industrial sector.

H 1.3 Firm’s size positively influences the overall employment growth in the industrial sector

H 1.4 Age of the firm negatively influences the overall employment growth in the industrial sector.

H 1.5 Investment value at the firm’s start positively influences the overall employment growth in the industrial sector.
Group 2 Hypotheses

**Hypothesis 2.1 Manufacture of Food Products and Beverages**

H 2.1 Firm’s location influences the difference in the employment growth in the manufacture of food products and beverages.

H 2.2 Firm’s operation in the industrial estate influences the difference in the employment growth in the manufacture of food products and beverages.

H 2.3 Firm’s size positively influences the employment growth in the manufacture of food products and beverages.

H 2.4 Age of the firm negatively influences the employment growth in the manufacture of food products and beverages.

H 2.5 Investment at the firm’s start positively influences the employment growth in the manufacture of food products and beverages.

**Hypothesis 2.2 Manufacture of Automobiles and Automotive Parts**

H 2.6 Firm’s location influences the difference in the employment growth in the manufacture of automobiles and automotive parts.

H 2.7 Firm’s operation in the industrial estate influences the difference in the employment growth in the manufacture of automobiles and automotive parts.

H 2.8 Firm’s size positively influences the employment growth in the manufacture of automobiles and automotive parts.

H 2.9 Age of the firm negatively influences the employment growth in the manufacture of automobiles and automotive parts.

H 2.10 Investment at the firm’s start positively influences the employment growth in the manufacture of automobiles and automotive parts.

**Hypothesis 2.3 Manufacture of Textiles and Apparels**

H 2.11 Firm’s location influences the difference in the employment growth in the manufacture of textiles and apparels.

H 2.12 Firm’s operation in the industrial estate influences the difference in the employment growth in manufacture of textiles and apparels.

H 2.13 Firm’s size positively influences the employment growth in the manufacture of textiles and apparels.
H 2.14 Age of the firm negatively influences the employment growth in the manufacture of textiles and apparels.

H 2.15 Investment at the firm’s start positively influences the employment growth in the manufacture of textiles and apparels.

**Hypothesis 2.4 Manufacture of Rubber and Plastic Products**

H 2.16 Firm’s location influences the difference in the employment growth in the manufacture of rubber and plastic products.

H 2.17 Firm’s operation in the industrial estate influences the difference in the employment growth in the manufacture of rubber and plastic products.

H 2.18 Firm’s size positively influences the employment growth in the manufacture of rubber and plastic products.

H 2.19 Age of the firm negatively influences the employment growth in the manufacture of rubber and plastic products.

H 2.20 Investment at the firm’s start positively influences the employment growth in the manufacture of rubber and plastic products.

**Hypothesis 2.5 Manufacture of Jewelry and Related Articles**

H 2.21 Firm’s location influences the difference in the employment growth in the manufacture of jewelry and related articles.

H 2.22 Firm’s operation in the industrial estate influences the difference in the employment growth in the manufacture of jewelry and related articles.

H 2.23 Firm’s size positively influences the employment growth in the manufacture of jewelry and related articles.

H 2.24 Age of the firm negatively influences the employment growth in the manufacture of jewelry and related articles.

H 2.25 Investment at the firm’s start positively influences the employment growth in the manufacture of jewelry and related articles.

**Hypothesis 2.6 Manufacture of Electrical and Electronics**

H 2.26 Firm’s location influences the difference in the employment growth in the manufacture of electrical and electronics.
H 2.27 Firm’s operation in the industrial estate influences the difference in the employment growth in the manufacture of electrical and electronics.

H 2.28 Firm’s size positively influences the employment growth in the manufacture of electrical and electronics.

H 2.29 Age of the firm negatively influences the employment growth in the manufacture of electrical and electronics.

H 2.30 Investment at the firm’s start positively influences the employment growth in the manufacture of electrical and electronics.

Hypothesis 2.7 Manufacture of Machine, Machinery and Equipment

H 2.31 Firm’s location influences the difference in the employment growth in the manufacture of machine, machinery and equipment.

H 2.32 Firm’s operation in the industrial estate influences the difference in the employment growth in the manufacture of machine, machinery and equipment.

H 2.33 Firm’s size positively influences the employment growth in the manufacture of machine, machinery and equipment.

H 2.34 Age of the firm negatively influences the employment growth in the manufacture of machine, machinery and equipment.

H 2.35 Investment at the firm’s start positively influences the employment growth in the manufacture of machine, machinery and equipment.

Group 3 Hypotheses

Hypothesis 3.1 Small-scale Firm Group

H 3.1 Firm’s location influences the difference in the employment growth in small-scale firm group.

H 3.2 Firm’s operation in the industrial estate influences the difference in the employment growth in small-scale firm group.

H 3.3 Age of the firm negatively influences the employment growth in small-scale firm group.

H 3.4 Investment at the firm’s start positively influences the employment growth in small-scale firm group.
Hypothesis 3.2 Medium-scale Firm Group
H 3.5 Firm’s location influences the difference in the employment growth in medium-scale firm group.
H 3.6 Firm’s operation in the industrial estate influences the difference in the employment growth in medium-scale firm group.
H 3.7 Age of the firm negatively influences the employment growth in medium-scale firm group.
H 3.8 Investment at the firm’s start positively influences the employment growth in medium-scale firm group.

Hypothesis 3.3 Large-scale Firm Group
H 3.9 Firm’s location influences the difference in the employment growth in large-scale firm group.
H 3.10 Firm’s operation in the industrial estate influences the difference in the employment growth in large-scale firm group.
H 3.11 Age of the firm negatively influences the employment growth in large-scale firm group.
H 3.12 Investment at the firm’s start positively influences the employment growth in large-scale firm group.

Findings from this study created better understandings among policy makers in the factors that influenced the employment growth. Consequently, key persons in both public and private sector can lay down appropriate measures and plans for employment growth in the industrial sector, categories and firm’s sizes, too. However, findings from this study revealed some differences from other studies.

8.1.2 Different issues
8.1.2.1 Most studies put an emphasis on business unit analysis. This study, on the other hand, focused on structural development with in-depth analyses in each industrial category and firm’s size to reveal more dimensions in the industrial sector and insightful situations that would yield policy recommendations suitable for the country’s development.
8.1.2.2 This study provided the labor demand a priority while other studies prioritized the labor supply and wage. That is to say, it concerns factors that will produce demands for labor and its findings help elaborate these factors and provided knowledge for policy making for the industrial sector development and more employment.

8.2 Summary of Findings and Answers to Research Questions

As aforementioned, the study was segregated into three dimensions which comprised of (1) The study of factors influencing employment growth rate in overall Thai industry, (2) The study of factors influencing employment growth rate in each production sector of Thai industry, and (3) The study of factors influencing employment growth rate in each size of business.

Beginning with the first dimension, the study of the overall Thai industry, the most important aspect, the findings shows that the firm’s size, age and investment influenced the overall employment growth in the industrial sector. The size is considered the most influential one. Thus, each has a different direction of relationship with the employment growth. The size and the growth positively go together. The larger the size implies that the employment will increase. In contrast with the age that comes with an opposite direction with the growth, it means that the employment tends to decrease when the firm gets older. If the firm is still young, its opportunity to grow tends to increase. Finally, the investment and employment growth have the same direction. If the investment is high, the employment is likely to become high.

In the second dimension, growth determinants in the industrial categories are illustrated. Regarding the food and beverage industry, the size becomes the greatest influential determinant to the employment growth compared to the industrial estate, age and investment. The age has a negative direction with the growth while the other three do not. The automobile and automotive part industry has the same influential determinants with the relationship directions to the growth as the food and beverages.

The textiles and apparel industry has only two influencing factors that are size and age. Thus, the former has a more influence and positive direction with the growth
while the latter does not. The rubber and plastic product industry’s sole factor to the growth is investment. The high investment will increase the employment as well.

The jewelry and related articles industry has only one factor which is the age that also negatively affects the employment growth. Different from the electrical and electronics industry, it has three factors that are size, age and investment. Its most powerful factor is the investment. However, it is the age that negatively influences the growth while the others positively do. Lastly, the machine, machinery and equipments industry has two factors which are the size and age. However, the age influences the employment growth more than the size and has a negative direction with the growth.

In regard to the third dimension, the size was excluded in the hypothesis tests in each firm’s size. All of the three firm’s sizes have the age and investment as determinants to the employment growth. Nonetheless, the age posed a great influence on small firms’ employment while medium and large firms’ employment was influenced by the investment.

8.2.1 Research Question 1

What are the factors that influenced the overall employment growth in the industrial sector? Generally, each firm experienced an employment growth of four employees per year. The small-sized firm shared the largest percentage or 98.58 percent in the industrial sector followed by the medium- sized and large- sized or 0.94 percent and 0.48 percent respectively (Report on the Situation of Medium and Small-Scale Firms, 2011-2012, p. 4-4).

The size, age and investment were the factors to the general employment growth as summarized in Table 8.1
**Table 8.1** Relationship Direction and Importance of Independent Variables

<table>
<thead>
<tr>
<th>Independent variables that influenced dependent variable</th>
<th>Relationship direction with dependent variable</th>
<th>Importance</th>
<th>The most influential independent variable to dependent variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>+</td>
<td>0.473</td>
<td>✓</td>
</tr>
<tr>
<td>Age</td>
<td>-</td>
<td>0.388</td>
<td></td>
</tr>
<tr>
<td>Investment</td>
<td>+</td>
<td>0.238</td>
<td></td>
</tr>
</tbody>
</table>

**8.2.2 Research Question 2**

The question, “What are the factors that existed in each industrial category that influenced the employment growth?” lies beneath the second objective aimed to explore factors to the employment growth in seven industries listed in the National Industrial Development Master Plan, B.E. 2555-2574 as follows:

1) Food products and beverages  
2) Auto and automotive parts  
3) Textiles and apparels  
4) Rubber and plastic products  
5) Jewelry and related articles  
6) Electrical and electronics  
7) Machine, machinery and equipment

Different powerful factors were found in industries. In the food products and beverages industry, its firms averagely experienced the growth of six employees per year with the factors of industrial estate, size, age and investment affecting the growth. The automobile and automotive parts industry experienced an increase of seven employees per year and had the same factors as of the food industry.

Most firms in the textiles and apparel industry experienced the growth of minus one employee per year interpreting that each firm generally had an annual decrease of one employee in employment. The size and age were determinants to the
employment in this category. Manufacturers in the rubber and plastic products category add only one employee per year averagely and had investment as the only one determinant. However, in the jewelry and related articles industry, its manufacturers had an increase of 10 employees annually and age was the powerful factor to the growth.

The electrical and electronics industry experienced the employment increase of five workers per year and had three factors affecting the increase which were size, age and investment. Thus, the size and age matter to the increase in the machine, machinery and equipment industry which firms averagely experienced the increase of two persons per year.

Table 8.2 Relationship Direction and Importance of Independent Variables in Each Industrial Category

<table>
<thead>
<tr>
<th>No.</th>
<th>Industrial category</th>
<th>Independent variables that influenced the dependent variable</th>
<th>Relationship direction with the dependent variable</th>
<th>Importance</th>
<th>The most influential independent variable to the dependent variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Food products and beverages</td>
<td>Industrial estate</td>
<td>+</td>
<td>0.212</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Size</td>
<td>+</td>
<td>0.553</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age</td>
<td>-</td>
<td>0.347</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Investment</td>
<td>+</td>
<td>0.265</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Automobile and automotive parts</td>
<td>Industrial estate</td>
<td>+</td>
<td>0.988</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Size</td>
<td>+</td>
<td>0.447</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age</td>
<td>-</td>
<td>0.382</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Investment</td>
<td>+</td>
<td>0.301</td>
<td></td>
</tr>
</tbody>
</table>
### Table 8.2 (Continued)

<table>
<thead>
<tr>
<th>No.</th>
<th>Industrial category</th>
<th>Independent variables that influenced the dependent variable</th>
<th>Relationship direction with the dependent variable</th>
<th>Importance</th>
<th>The most influential independent variable to the dependent variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Textiles and apparels</td>
<td>Size</td>
<td>+</td>
<td>0.587</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age</td>
<td>-</td>
<td>0.448</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Rubber and plastic products</td>
<td>Investment</td>
<td>+</td>
<td>Only one variable that influenced dependent variable</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Jewelry and related articles</td>
<td>Age</td>
<td>-</td>
<td>Only one variable that influenced dependent variable</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Electrical and electronics</td>
<td>Size</td>
<td>+</td>
<td>0.305</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age</td>
<td>-</td>
<td>0.259</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Investment</td>
<td>+</td>
<td>0.334</td>
<td>✓</td>
</tr>
<tr>
<td>7</td>
<td>Machine, machinery and equipment</td>
<td>Size</td>
<td>+</td>
<td>0.352</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age</td>
<td>-</td>
<td>0.453</td>
<td>✓</td>
</tr>
</tbody>
</table>

#### 8.2.3 Research Question 3

The third objective is to explore factors influencing the employment growth in each firm’s size. The analysis was divided into three groups based on the sizes identified in the Ministerial Regulation Specifying the Number of Employment and Fixed Asset Value of Medium and Small Firms, B.E. 2545 which was announced in the Government Gazette No. 119.
1) Small-scale firm with 1-50 employees
2) Medium-scale firm with 51-200 employees
3) Large-scale firm with a minimum of 201 employees

Each firm’s size presented not much different in factors that influence the growth. Nevertheless, the importance of independent variables showed that each factor influenced differently.

In the small-scale group, the average growth stays at five employees per year with two factors affecting the growth that were age and investment. The age had a beta weight of 0.445 while the investment had 0.355. This means that the former contributed a greater influence to the growth than the latter.

Regarding the medium firm, there was an average of four employees increasing per year. The age and investment were influencing factors. However, the investment was more powerful due to its beta weight of 0.311 when compared to 0.255 for the age.

The large firm had grown approximately with four employees per year with the same determinants as of the small and medium-scale firm. Thus, the beta weights of age and investment were nearly the same (0.310 for age and 0.313 for investment), but the latter was slightly higher.

Table 8.3 exhibits the summary of analyses of the third research question.

| Table 8.3 Relationship Direction and Importance of Independent Variables in Each Firm’s Size |
|---|---|---|---|
| No | Firm’s size | Independent variables that influenced the dependent variable | Relationship direction with the dependent variable | The most influential independent variable to the dependent variable |
| 1 | Small | Age | - | 0.445 | ✓ |
| | | Investment | + | 0.344 | |
Table 8.3 (Continued)

<table>
<thead>
<tr>
<th>No</th>
<th>Firm’s size</th>
<th>Independent variables that influenced the dependent variable</th>
<th>Relationship direction with the dependent variable</th>
<th>Importance</th>
<th>The most influential independent variable to the dependent variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Medium</td>
<td>Age</td>
<td>-</td>
<td>0.255</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Investment</td>
<td>+</td>
<td>0.311</td>
<td>✅</td>
</tr>
<tr>
<td>3</td>
<td>Large</td>
<td>Age</td>
<td>-</td>
<td>0.310</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Investment</td>
<td>+</td>
<td>0.313</td>
<td>✅</td>
</tr>
</tbody>
</table>

Both variables have similar importance

8.3 Summary and Recommendations

All three objectives of this study were met, and so were the answers to all research questions. The study of the overall industrial sector found that the employment growth was influenced by the firm’s size, age and investment. Upon looking into each industrial category, the employment growth was determined by different factors. And when considering the firm’s size, factors to the growth in each firm’s size were the same, but with different beta weights that implied different explanatory powers.

8.3.1 Theoretical Recommendations

The empirical evidences in testing to obtain the factors influencing the rate of employment growth pointed out the rate of employment growth in Thai industrial sector was in line with the firm growth theory. It can be said that the three conceptual theories the following:
1) The Evolution of Gibrat’s Law

2) The Structure- Conduct- Performance

3) The Learning and Selection

The findings indicated that employment growth in Thailand’s industrial sector have gained influence from size of the firm. This is in line with the Learning and Selection concept of Jovanovic (1982) and Evolution concept of Gibrat’s Law that studied by Evans (1987), which can be explained that a rate of firm’s growth will expand higher when the size of the firm has more extension. Furthermore, the concept of Structure-Conduct-Performance also explained more clearly the continuing effect of the structure of the firm influencing the firm’s productivity. When the size of the firm is increased, its productivity is also higher. And increased productivity will reflect positively to the firm’s size expansion. However, Thailand’s industrial sector had not had merely employment growth. Some firm which is in moving back situation would also face the regression of employment growth such as in the manufacturing of textile and garment. From such situation, the Learning and Selection concept of Jovanovic (1982) can be used to explain the regression of the firm that the firm would make smaller size until the firm is in its most efficient condition or it can be called the Maximum Efficient Size.

The firm’s age, investment value and industrial estate had test results to keep with the evolution concept of Gibrat’s Law. The finding exposed that the firm’s age was inversely related to the rate of employment. Initial firm or newborn firm would have an effect in establishing formal job more than the firm conducting for a long period of time. This complies with the study of Ledholm (1994) and Mead (1994) regarding investment at the start of the firm. This is to say that when a firm gain vast investment, it then has a higher rate of growth more than a firm that has a limited investment according to the study of Carpenter and Peterson (2002) regarding joining into the industrial estate. This was reflected in taking assistance from the government. The results of this study on the industrial sector in Thailand is the same as the finding of Storey (1994) which found that the firm that have gained assistance from the government would have faster growth rate than the one that did not.

While the major findings of this study could be well supported by the firm growth and employment growth theories, some points are worthwhile to be mentioned
as the contribution to the theories. There were the relationship between factors influencing employment growth in the industry and the potential to compete in the global market of each industrial sector as describe follows;

1) The industrial sectors that possesses high potential to compete in the global market and quickly expand

   (1) Industrial sectors comprise of
       - Food and beverage manufacturing
       - Automobile and parts manufacturing

   (2) Factors influencing employment growth
       - Joining industrial estate
       - Size of firms
       - Age of firms
       - Initial investment of business

2) The industrial sectors that possesses medium marketing potential and demand government supports on their competing capability

   (1) Industrial sectors comprise of
       - Rubber and plastic manufacturing
       - Electrical equipment manufacturing

   (2) Factors influencing employment growth
       - Initial investment of business

3) The industrial sectors that possesses low marketing potential and being await to the opportunity to develop their competing capability

   (1) Industrial sectors comprise of
       - Textile and apparels manufacturing
       - Machine, machinery and equipment manufacturing

   (2) Factors influencing employment growth
       - Size of firms
       - Age of firms

Therefore, the relationship between factors influencing employment growth in the industry and the potential to compete in the global market of each industrial sector is discovered from the findings in this study. This fact would help the government to oriented to the essential factors that well support industrial capability.
8.3.2 Policy Recommendations

The following are the four recommendations for policy implication:

1) There should be more increase in the promotion more in small and medium enterprises in the industrial sectors of food and beverages, vehicles and automotive parts, and electrical and electronics. At present, there has been market concentration in the manufacture of vehicles and automotive parts and electrical and electronics (the results from analyzing indicators and guidelines for eliminating weak point of the country deriving from competitiveness ranking by WEF and IMD; Office of the National and Social Development Board, 2011: 16). Nevertheless, both industry including food and beverages industry are with high potential and would generate added value to the country (National Industrial Development Master Plan B.E 2555-2574, Kor 1-8). This is for global competitiveness of the industrial sector at the same time it supports the government sector controlling monopoly in the industrial sector which increases more income distribution. Empirical evidence deriving from this study showed that the increase in the amount of both small and medium-sized entrepreneurs would bring out employment growth rate. Consequently, there should be a promotion for the expansion of the remaining and newborn SMEs among three industrial categories by implementing the policy of business incubation. Such policy would enhance those businesses running on steadily and sustainably.

2) The government should have robust measures on changing loan conditions of SMEs for procuring low-cost financial sources for investment.

From the results, it was found out that the investment value at the start of the firm was a factor influencing the employment growth among SMEs. Yet, considering the financial source of SMEs at present either from the government financial institutions or private financial institutions, it is found out that the conditions and interest rate for loan are not different from general loan products owing to various financial institutions which are limited beneath the condition on risk management and the profit earned from loan. Such situation then does not imply that SMEs entrepreneurs have lesser opportunity than large entrepreneurs in capturing fund sources.

Consequently, the government sector should pay attention to solve this grave problem urgently. Because it is the responsibility of the government and private
financial institutions as financial sources, they placed conditions and particulars to facilitate the operation of financial institutions regardless of the absolute benefits contributing to entrepreneurs. So, the government sector should be considerate about the conditions and interest rates for loan granting SMEs and adjust all conditions appropriately and comfortably. Besides this, the government sector should provide subsidy for entrepreneurs having the opportunity to access financial sources by which financial institutions are go-betweens for financial services. Simultaneously, such subsidy would relieve financial institutions in terms of risk management and profit-from-loan administration.

3) The government should stipulate the policy inciting demand of the industrial sector in generating employment growth by addressing specific policy for each industrial categories and different firm’s sizes.

Currently, a policy to stimulate employment in the industrial sector is to stimulate mostly the labor demand that is to accentuate skill enhancement and increase productivity among labor. Yet, stimulating demand in the industrial sector lacks a comprehensive policy. Most policies do not directly stimulate employment growth rate but for other matters, and not particularizing any kind of industrial sectors.

The issued policy should have appropriateness for all industrial categories and size group of firms. This is because each industrial categories and size group have different rate of employment growth and are sensitive to stimulating factors differently. A policy appropriated to each industrial categories and size group of firms would cause achievement exceeding policies applied as a whole. As for the policy results in the rate of employment growth in the industrial sector, the government can present the measure promoting factors that are influential to the demand on employment such as the measure promoting the extension and growth of firms by which the government sector pay attention on market development, or support information on fresh business opportunity capping from recent business, the measure on promoting new enterprise or diversification by enhancing the firm in the manner of upper, middle, and down stream, etc.

Policy makers or measures being on fundamental understanding regarding factors influencing the employment growth of industrial categories and
firm’s size group would determine the policy causing an achievement which stimulates the employment growth rate in the industrial sector.

From the results of this study showed that the factors influencing the stimulation of the rate of the employment growth in the industrial sector have differences in each industrial sector and influential level of firm’s size group. The government should therefore settle on two levels of policies: (1) principal policy for each industrial sector, (2) additional policy to promote complete stimulation of the rate of the employment growth through the dimension of firm’s size group. The details are the following:

(1) Principal policy for each industrial sector

A principal policy should have differences following the situation and influence of stimulating factors. Food and beverage industry and garments and clothing industry should focus on business growth. The government should establish the policy promoting the market opportunity especially ASEAN market which is coming in the near future. Nevertheless, apart from the industry of garments and clothing in Thailand, before conducting market development policy, should be an adjustment on manufacturing pattern which increases value added. Business on garments in Thailand would have to move out from old competitive market that is an original equipment manufacturing (OEM) and should compete with production cost. This would be a progression into the new market which is an original equipment manufacturing (ODM) and compete with creativity. The expansion to foreign market would help stimulate firms to expand a manufacturing workforce and increase employment.

As for rubber and plastic product industry, and electrical and electronics industry, the government should have a policy assisting a particular loan for entrepreneurs of these specified industrial categories. Conditions and repayment time should be appropriate to performance of industrial categories. Besides, the government should make available specialists who give advice about fund management to gain the most efficiency operation and yield to the extension of the manufacturing force and employment.

Regarding vehicles and automobile parts, the government should focus on facilitating the industrial estate. Taking part in the industrial estate,
enterprises should be provided with a promotion in terms of accessible benefits on investment taxation of joining clusters on training personnel generating specific skill appropriate for the industry. If the government sector is able to develop a comprehensive and complete industrial estate to serve the industrial trend, it would yield to the ability of the industrial sector to develop potentials on the manufacturing force and employment growth.

Regarding jewelry and related articles industry and machinery and equipment industry, the government should pay attention on building new enterprises. This is because the jewelry and related articles industry is a field that needs a skillful and high specialized workforce. The rate of employment therefore is not due to the age of the firm but due to lack of skillful and experienced workforce. For machinery and equipment industry, Thailand still lacks skill in producing high-technological machinery mold such as hydraulic machines. Thailand is the producer of basic technological machine which is applied in agricultural industry only. Therefore, the government should take responsibility on enhancing new-comer entrepreneurs regarding these industrial sectors accessible to business incubation so as to operate their own businesses with stability. Concurrently, there should be supportive entrepreneurs to provide trainings to personnel to gain competence particularly in the industrial fields and also in the manufacture of goods in accordance with the market demand at present. So that increasing the number of firm initially from business incubation would further result to the rate of employment growth.

(2) Additional policy promoting each firm’s size group of industry

To acquire more achievement of employment promotion policy, the government should have the policy in assisting further all firm’s size groups of industrial categories. The details are the following:

The supplemental policies for small-sized entrepreneurs in the industrial categories is that the government should provide support and enhancement on novice entrepreneurs and provide business incubation until firms are able to operate with stability. For medium-sized entrepreneurs, the government should establish a policy on financial assistance and make specialists available in giving advice regarding fund management. For large-sized firms, the government should take
responsibility on the enhancement toward novice entrepreneurs; concomitantly, take charge in fund provision and management.

**Table 8.4** Proper Management of the Policy on Industrial Categories and Group-sized Firms

<table>
<thead>
<tr>
<th>Size</th>
<th>Food and beverages</th>
<th>Automobile and automotive parts</th>
<th>Textiles and Apparels</th>
<th>Rubber and plastic products</th>
<th>Jewelry and related articles</th>
<th>Electrical and electronics</th>
<th>Machine, Machinery and equipment</th>
</tr>
</thead>
</table>

**Note:** Abbreviations on the Table that Represent Policies are as Follow:

Mar.Opp = The policy on market opportunity
Bus.Inc = The policy on business incubation
Loan = The policy on loan
Ind.Est = The policy on industrial estate

4) There should be a setting specified for industrial park for industries that needed support from clusters.

The optimal goal of industrial settlement is to boost the industrial firms joining the area of the industrial estate by providing attractive benefits in
taxation, supporting the board of investment launching business center to facilitate the industries in the area, and setting development center and educational institute for developing human resources which are necessary for the settlement of the industry. Nevertheless, it was found out that the industrial estate in Thailand have not emphasized any particular industrial estate yet.

The results pointed out that the rate of employment growth in the manufacture of food and beverages and automobile and automotive parts industry gained an influential factor in joining the industrial estate. This reflects that taking assistance from the government affects these two industrial categories having potential in the increase of employment rate. Both industrial categories have common characteristics; that is, interrelated. These are the characteristic confederating to be clusters which compose of upper stream, middle stream, and down stream altogether in the same industrial area.

All these characteristics of uniting into clusters is obvious seen in the industrial estate. Therefore, this study would recommend establishing unique industrial estate in the manufacturing of food and beverages and in the manufacturing of automobiles and automotive parts. This is due to the government aid focusing on acquiring suitable benefits especially for each industry irrespective of the benefit on land, taxation and investment promotion, market encouragement, and skill development. The enterprises located in the industrial estate also gained indirect advantage (spill over) from joining clusters.

8.4 Limitations of the Study

This study has some limitations in terms of database due to the use of secondary data collected from the Department of Industrial Works, Ministry of Industry. This study is only based on the cross-sectional data. The limitations are the following:

1) The database is the information of enterprises registered with the Department of Industrial Works as scheduled in Factory Act, B.E. 2535 (1992). Therefore, this database have no information of informal enterprises and mostly are small and medium enterprises. Informal enterprises conducting industrial sectors were not covered for this study.
2) The Department of Industrial Works collected the data in 1969. Consequently, the data in 1969 had included enterprises established in 1969 and before 1969 on the record concerning the year the registration number issued. So, this study had to employ the industries established and have registration numbers in 1969 that are the oldest in the sample size of this study.

3) Collection of data conducted by the Department of Industrial Works all sizes of firms - large, medium, and small. With this, information on investment value at the start of the firms is likely different among the firm’s size group. This is because most of the large-scaled firms have recorded all items of accounting cost - either cost of land, building, machinery, or circulated money. This yields to complete information on investment value. Meanwhile, small firms and medium firms do not pay attention to the record of accounting cost. For example, in case of the machinery used since ancestor period, land or building used for housing and operation were not recorded in the accounting cost due to incomplete information.

4. This study specifically selected the pilot industry following the National Industrial Development Master Plan B.E 2555-2574 of the Ministry of Industry. All these are in the master plan and specified as eight pilot industrial categories; but, seven industrial categories were selected for this study. The industry of alternative energy is excluded due to a novice industrial sector in Thailand. Thailand was not able to produce products completely, purchasing it from foreign countries.

8.5 Recommendations for Future Study

Conducting this study, the researcher has seen the opportunity to advance this research topic in the future. This will be bring an extension of knowledge and explain more varying phenomena regarding the study of firm’s growth of employment in the industrial sector. It would also benefit the economic and social development of the country in the future.

The findings have shown the relationship between factors influencing employment growth in the industry and the potential to compete in the global market of each industrial sector. Therefore, the study on the existing relationship would be the essential instruments of the government to develop Thai industry.
Based on the cross-sectional analysis, there could be some biases on the endogenous variables calculated from ages of firms which were shown in the form of number of years. The source of the existing bias rooted from the drastic employment growth of small firms in the early period. The older firms would generally experience lower employment growth and quite stable growth rate. Time series analysis should be done in the future to enhance knowledge on factors influencing employment growth in Thai industrial sector. Including the longitudinal database in the analysis is recommended to comprehend both wide aspect and long aspect of the overall picture of the industry.

The quantitative study analyzing the outside factors using the characteristics of enterprises to analyze data provided that in the future there will be a study further study regarding a qualitative approach which will investigate the characteristics of entrepreneurs (sex, age, work experience, attitude in management) and workforce manners (skill level, competency, work experience, goal-oriented). The study of these characteristics would extend the scope of study on the factors influencing the rate of employment growth.

Furthermore, a comparative study on industrial settlement should be conducted in different locations in other provinces such as Samut Prakarn, Samut Sakorn, Rayong, or Ayutthaya, etc. would cover the samples which are different from the samples of Bangkok area which were used for this study. Moreover, it would help in knowing the influence of government support in building industrial places in other provinces.

Considering the relative aspect, comparing stock-exchange firms and non stock-exchange firms would help the government to issue the comprehensive policies that well support stable industrial growth. These comprehensive policies would involve the financial policies and measures that suit to both stock-exchange firms and non stock-exchange firms.

Migrant workers who work in Thai industrial sector should be included in the future analysis. Under the current shortage of Thai workers, activities of Thai industry can still move forward which partly due to the essential supply of migrant labor both formal and informal labor. Therefore, study of employment growth which compare the rate of Thai and migrant workers would well enhance the social, social security, national security, and health policies.
The last issue is the study of comparison on employment growth and outcome growth of the firms. This is an important point which should have further investigation. This is because manufacturing factors like labor and capital are interchangeable. For example, firms that have decreased employment growth rate but they still have increased productions show that the firms have invested in technology for manufacturing replacing labor force. It also shows that there is a transition on certain industrial categories from intensive labor to intensive capital. This study would be a sign for the government and the private sectors to prepare in coping with the changed production patterns which is the result of the change in the productivity of the industrial sector.


Virat Panitchwong. 2006. **Regression Analysis.** Bangkok: King Mongkut’s University of Technology North Bangkok Press. (In Thai)


BIOGRAPHY

NAME
Thitima Holumyong

ACADEMIC BACKGROUND
B.B.A. International Business Management
The Faculty of Commerce and Accountancy
Chulalongkorn University, 1998

M.A. International Economics and Finance
The Faculty of Economics
Chulalongkorn University, 1999

M.B.A. Marketing
Haworth College of Business
Western Michigan University, 2002

EXPERIENCES
Administrative Officer, IBMSD, Thailand, 2003
Marketing Executive, Luxasia, Thailand, 2004
E-Business Marketing Officer, KBANK, 2005
Senior Marketing Officer, Advance Mpay, 2006
Account Executive Specialist, AIS, 2007-2012