Employment Structure in the Regulatory Transition

Evidences from the Linked Microdata in Japan

Hitoshi Hayami

Keio Economic Observatory
Keio University

Hayami *Employment Structure in the Regulatory Transition*

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Monograph No. 9

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Preface

If there is a substitute for the controlled experiments in economics, a change of the existing regulations should be one of the possible alternatives and be a good opportunity to investigate the economic behaviour. This study focuses on demands for labour in such an occasion, whereas my previous study was on working hours in case of the revision of the labour standard law (Hayami [1993]).

The Japanese labour market has been experienced at least two kinds of legal changes. One is revisions of the labour standard law with respect to weekly hours worked and overtime premium on holiday works, which influence labour demand for hours directly through the firm's cost structure. The other is deregulation on production activity, such as the revisions of the Large Scale Retail Store's Law. The impact of the Large Scale Retail Store's Law on labour demand are not straightforward, because the law are not directly to regulate labour market, but to limit the entry of production market.

My purpose here is to explain characteristics of the firm's economic behaviour under the regulatory transitions, using the employer-employees linked micro data. I would like to give one of the examples that exhibit unintended side effects of changing legal restrictions.

I have estimated simple equations, and organised the results in a way that will tell the story simply. Some of the economic conditions hardly holds constant during the regulatory transition, even though I mainly use cross-section micro data. As a result, interpretations of the results might include unexpected or uncontrolled systematic error. I, therefore, should be very grateful if you would let me know of any comment on both the subject and this study.

Chapter 2 was originally printed as a discussion paper Hayami

and Nakajima [1997], and Chapter 3 was originally prepared as a conference paper Hayami and Abe [1998]. I thank Mr Abe and Mr Nakajima for their generosity, although all errors and shortcomings remained attributable solely to the author. Since this study is quite preliminary, I still hesitate to write the names of many people who gave me precious comments. I am greatly indebted to the members of Keio Economic Observatory, though I could not follow some of the comments that I was given. I would like to express my special thanks to them all, especially to Prof Seike; he provided me an opportunity joining the research in Economic Planning Agency to access sufficient micro data otherwise not available.

March 2000

Hitoshi Hayami

Chapter 1

Introduction

This study consists two parts: one is on employment structure in the manufacturing industry; the other is also on employment structure in the commercial industry. The analysis on the commercial industry focuses the effects of changing the product market's deregulation on employment. Because of insufficient data, I cannot identify policy effects on the manufacturing industry using the employer-employees linked micro data, though the manufacturing experienced part of deregulation, which might be not so significant as the retail industry.

One of the most apparent regulatory changes in the commercial industry is the revision of the Large Scale Retail Store's Law. A simple comparison between the retail and the wholesale industries, however, does not directly refers to different reaction of the firm's behaviour due to the regulatory transition. This study intends to such a comparison, because we initially aimed the different research purpose, that is, the first attempt to link employee's and employer's micro data in Japan.

There are two major problems that we must solve before the research continues further. First of all, the micro data on the manufacturing industry are difficult to link the employer's micro data with the employee's. Second, the formulation of labour demand function by age and gender faces censored observation such as in the consumption of durable goods. This means that not all the establishments employs all kind of workers, therefore most of establishments have missing observations on some kind of worker. Third, as a result, we cannot apply any well-established production function or cost function, which all take logarithm of the number of employee. For these reasons, this study is a preliminary attempt, and needs further improvements.

I will give a few remarks for the first problem as follows. As explained Chapter 2, the manufacturing industry's employer's data Census of Manufactures had a different identification code from the employee's data Basic Survey on Wage Structure; this complicates the linking method.[1] But the commercial industry's employer's data Census of Commerce use the same identification code of establishment as Basic Survey on Wage Structure. The identification code gives the unique number to each establishment in Japan at the time of Census of Establishments that is held every five years.[2] Non-existence of the common identification code illustrates significant loss of information and loss of matching probability, comparing to a case when the same identification code is available.

The plan of this book is as follows: Chapter 2 describes the manufacturing industry's labour demand. This chapter shows how employment structure by age and gender depends on the output value of establishment, the plant space, the size of employment and the book value of fixed assets.

Chapter 3 describes the commercial industry's labour demand. This chapter first illustrates the wage difference by gender and the other attributes of both workers and establishments. Second, it shows gross and net job creations and destructions according to the method of Davis and Haltiwanger [1992], and third it shows how employment structure by age and gender depends on the sales scale of the establishment, with special respect to the revision of the Large Scale Retail Store's Law.

Finally, the appendix shows the descriptive statistics, the lists of the estimated results, and the figures; the reference is not a complete list of the bibliography on this field, but includes directly cited

[1] According to Prof Higuchi (Keio University), Census of Manufactures has been changed to use the same identification code as Census of Establishments, on which Basic Survey on Wage Structure depends.

[2] There are still uncertainty on the definition of the establishment. According to Prof Yoshioka (Keio University), when a relatively small establishment exists in the field of a large scale plant, producing different products from each other, it depends on a person who answers the questionnaire whether the small establishment is recognised as an independent establishment or as a dependent on a large establishment.

materials.

Chapter 2

Labour Demand by Age and Gender in the Manufacturing Industries: Evidences from Linked Microdata in Japan

2.1 Introduction

This chapter attempts to investigate labour demand by age and gender in Japan, using microdata in which demographic structure of employment, labour conditions and production activities are paired with each other at the level of individual questionnaires. This paper has two purposes: to address the methodology of construction of data sets, and to address estimations of labour demand.

The labour demand function in Japan has been estimated by using time series data which are combined with aggregated data derived from different sources. Academic research on labour demand has been insufficient because of insufficient data, and labour demand has often been estimated simply to solve macroeconomic models. Our analysis is the first attempt to estimate labour demand by age and by gender in Japan using microdata which contain both demographic structure of employment and output information for the same establishment. While there are several investigations using microdata to estimate labour input function, they do not break down labour into subcategories because of insufficient information (Komiya [1962], Ozaki [1966,1970], Lau and Tamura [1972], Nakamura [1990]). These previous analyses suggest that there exists economy of scale at plant level, and the estimations support that the type of demand function is factor limitational rather than Cobb-Douglas or factor substitutional.

As far as the author knows, there does not exist in Japan microdata which include both production activities and demographic structure of employment. This is because there is a lack of sufficient information and coordination among surveys on production activities and on employment structure. We will cope with these difficulties in applying a minimum distance method to find pairs from the surveys, Census of Manufactures and Basic Survey on Wage Structure.

Even though we have a much more detailed data set than before, it still is insufficient to estimate wage elasticities since wages by age and gender are more correlated with wages themselves than with employment level.

But our analysis can show the dependency of employment structure on size of output and size of plant area as in our previous analysis (Hayami and Nakajima[1997], also refer to Chapter 3 of this book). These results suggest that there exists sustainable distribution of establishment size given the demographic labour force structure. And comparison of the intercept and the coefficient of the labour input function expresses relative flexibility of employment by categories. Davis and Haltiwanger [1992] suggest that gross job creation and destruction are the main causes of employment adjustment in the U. S., and if the same tendency also dominates the Japanese labour market, we will be able to observe a fixity of employment which is not affected by output fluctuation and a relatively high turn over rate for such employment with fixity.

Since there hasn't been such a data set in Japan before this attempt, we believe our investigation can accurately explore the Japanese demand for labour by demographic category. Unfortunately, unlike our previous analysis (Hayami and Nakajima [1997] and Chapter 3 of this book), each record of employment and production status we have constructed might not be exactly derived from the same establishment, due to a lack of information from questionnaires. So we have estimated data pairs assignable to the same establishment based on properties of each establishment.

Not every enterprise has all categories of labour, so this creates difficulties in estimation. That is, there is no data for some categories because not all establishments employ in labour every category. This might be due to the environment of the enterprise, i. e. production conditions or availability of labour supply. If the model permits such a zero employment level, one cannot use most of the flexible functional forms in cross-section data, such as logarithmic types of production functions including Translog production functions as well as cost functions and aggregator functions. Therefore we must extend the model to permit for a zero level of employment for each category, but not for all categories at the same time.

The following discussions are first of all explanations of how we obtained the data set. The difficulty remains in construction of such data, because the survey was not executed at the same sample base.

The formulation of labour demand or labour input function is examined. We use the factor limitation type of labour demand on an establishment base, and the formulation allows nonhomothetic production functions and does not assume perfect substitution among categories of labour or allowance of joint production and non-separability between capital and labour.

2.2 Data Construction

2.2.1 On the Data Sources

There are no published data based on samples which contain both productive activities and labour conditions by age and gender in Japan.

Statistics for production activities in the manufacturing industry are complied by the Ministry of International Trade and Industry (MITI). Pusblished every year, the Census of Manufactures is the most comprehensive statistics on establishments. It is divided into two censuses; a census for an establishment which employs more than or equal to 30 persons, and for an establishment which employs less than 30 persons. The census for an establishment, which employs more than or equal to 30 persons reports sales value of products, book value of capital, purchasing value of materials, number of employed persons by gender, gross area of plant and buildings sites and amount of water consumption. It does not include the establishment sorting code of the Establishment Census.

Thus, it is basically impossible to match an establishment record from the Census of Manufactures and its corresponding establishment record from the Establishment Census. We have to select the most plausible record from indirect information such as district, size of plant and industry classification code from over ten thousand possible candidates (See Table 3.1 and 3.2).

Statistics for labour based on age and gender are compiled by the Ministry of Labour every year, published as the Basic Survey on Wage Structure. As we mentioned in our previous paper (Hayami and Nakajima [1997]) and also in Chapter 3, the Basic Survey on Wage Structure is the most comprehensive survey on labour conditions in Japan; it reports mainly on regular worker's wages and hours worked by industry, occupation, education, age and gender.

The sampling in the Basic Survey on Wage Structure is based on the Establishment Census which is complied by the Statistics Bureau of the Management and Coordination Agency, every five years. Basic Survey on Wage Structure covers establishments which employ at least 10 regular workers. The questionnaire includes the same establishment identification number as in the Establishment Census, but for the manufacturing industry it offers no additional information.

Table 3.1 shows the year surveyed and the sampling base of the Establishment Census. And Table 3.2 shows the sample size of the Basic Survey on Wage Structure. The sample size used in the Basic Survey on Wage Structure is smaller than in the Establishment Census. But the reason is not straightforward, because of how employed workers are defined. Basic Survey on Wage Structure lists establishments which employ a population of at least 10 regular workers. Establishment Census lists establishments which employ at least 30 persons including non-regular workers, which is comparable to the Census of Manufactures; the 1991 Establishment Census includes 68,651 establishments which employed at least 30 persons, while the 1991 Census of Manufactures includes 62,170 establishments which employed at least 30 persons. The difference between both statistics is measured by the following formula:

$$d = \frac{2(EstCen91 - CenMan91)}{EstCen91 + CenMan91} = 0.09908,$$

where $EstCen91 = 68,651$ denotes the number of establishments from the 1991 Establishment Census; $CenMan91 = 62,170$ denotes the number of establishments from the 1991 Census of Manufactures.

We will first compare the difference between the Establishment Census and the Basic Survey on Wage Structure, because the Basic Survey on Wage Structure is based on the Establishment Census and as in Table 3.1, it uses the same establishment identification code as that of the Establishment Census. The only difficulty in doing this however is the time period reported on in the Establishment Census on which the Basic Survey on Wage Structure is based. There is at least two year lags between the Basic Survey on Wage Structure and the Establishment Census. So we will try to match the 1992 version of the Basic Survey on Wage Structure with the 1991 version of the Establishment Census. Basic Survey on Wage Structure is based on the previous 1986 Establishment Census. If the 1991 Establishment Census did not change the establishment identification code, then a successful match can be expected between the 1992 Basic Survey on Wage Structure and the 1991 version of the Establishment Census.

We can generate over 9,000 establishment pairs from the two statistics in Table 3.3. Although the two statistics do not share precisely the same population, this is a high rate of successful matches. Because the Basic Survey on Wage Structure includes 22,506 establishments in 1992 and 16,355 establishments in 1993, the matching number divided by the total numbers of establishments from the Basic Survey on Wage Structure is 0.4213 in 1992 and 0.5716 in 1993.

Consistency of data for the number of employees should be evaluatedas we must employ the number of regular workers as one of the variables in making matches between the Census of Manufactures and the Basic Survey on Wage Structure. Establishment Census classifies the numbers of employees according to whether they are regular workers, part-time workers, owners of the establishment, or top executives

Table 2.1: Sampling base year of the statistics

Statistics	Surveyed year	Referenced sampling base of Establishment Census
Basic Survey on Wage Structure	1992	1986
	1993	1991
	1994	1991
Statistics	Surveyed year	Total reported establishments with at least 30 persons
Establishment Census	1991	68,651

Ministry of Labour, Basic Survey on Wage Structure.

Statistics Bureau of the Management and Coordination Agency, Establishment Census. From the original data, the authors selected establishments employing at least 30 people.

Table 2.2: Available data from the surveys

Basic Survey on Wage Structure,
Manufacturing Industries
Establishments employing at least 10 regular employees

Year	Total employees	Total establishments
1992	1,097,664	22,506
1993	888,851	16,355

Census of Manufactures
Establishments employing at least 30 regular employees

Year	Total establishments
1990	60,892
1991	62,170
1992	61,474
1993	59,711

Ministry of Labour, Basic Survey on Wage Structure.

Ministry of International Trade and Industry, Census of Manufactures.

Table 2.3: Sample size of the matched data between BWS and EC

	Number of establishments	Number of reported employees
BSWS 1992 and EC 1991	9,481	338,571
BSWS 1993 and EC 1991	9,349	355,047

BWS: Ministry of Labour, Basic Survey on Wage Structure.

EC: Statistics Bureau of the Management and Coordination Agency, Establishment Census. From the original data, the authors selected establishments employing at least 30 people.

and it classifies between them according to gender. The number of regular workers listed by gender in the Establishment Census is comparable to that in the Basic Survey on Wage Structure. Table 3.4–3.5 shows the distribution of establishments with a distance measure $\mathtt{d}$. $\mathtt{d}$ is defined as before, that is, it denotes the ratio of difference for regular employees described by the two statistics for the same establishment. If there is no time difference and no difference of definition, $\mathtt{d}$ is zero. But in this case there are possible sources for differences, mainly the time difference between the two statistics. In 1992, 80.03 per cent of total establishments have a difference within 30 per cent. In 1993, 75.89 per cent of total establishments have a difference within 30 per cent. A positive difference means a greater value in the Establishment Census than in the Basic Survey on Wage Structure. Therefore, the number of regular employees declined during 1991, 1992 and 1993.

The method of matching data from the Basic Survey on Wage Structure and the Establishment Census is exactly the same as the method used in our previous analysis (Hayami and Nakajima [1997]) and in Chapter 3 of. Both statistics have the same establishment identification number given the district sorting code. If you can sort records of the two statistics according to the identification number and the district sorting code, then matching can be executed sequentially.

But the Census of Manufactures does not include the same identification number or the minor district sorting code; it includes the city code, the major district sorting code and the number of regular workers which are the same as listed in the Basic Survey on Wage Structure. In the next subsection we will explain hot to generate matches from

Table 2.4: Distribution of the differences reported in numbers of regular workers between BWS and EC (1)

Number of Establishments
BWS 1992 and EC 1991

Difference of Numbers of Employees	Male	Female	Composition
$d < -0.3$	804	1,331	0.1126
$-0.3 \leq d < -0.2$	453	581	0.0545
$-0.2 \leq d < -0.1$	1,034	950	0.1046
$-0.1 \leq d < -0.05$	1,022	778	0.0949
$-0.05 \leq d < 0$	1,404	722	0.1121
$0 \leq d < 0.05$	1,997	1,864	0.2036
$0.05 \leq d < 0.1$	812	857	0.0880
$0.1 \leq d < 0.2$	869	971	0.0970
$0.2 \leq d < 0.3$	392	470	0.0455
$0.3 \leq d$	694	957	0.0871
Total	9,481	9,481	1.00

BWS: Ministry of Labour, Basic Survey on Wage Structure.

EC: Statistics Bureau of the Management and Coordination Agency, Establishment Census. From the original data, the authors selected establishments employing at least 30 persons.

d: $d = \frac{2(EstCen91 - BWS)}{EstCen91 + BWS}$,

where $EstCen91$ denotes the number of regular workers in an establishment reported by Establishment Census, and BWS denotes the number of regular workers in the same establishment reported by Basic Survey on Wage Structure.

Table 2.5: Distribution of the differences reported in numbers of regular workers between BWS and EC (2)

Number of Establishments
BWS 1993 and EC 1991

Difference of Numbers of Employees	Male	Female	Composition
$d < -0.3$	801	1,291	0.1119
$-0.3 \leq d < -0.2$	521	589	0.0594
$-0.2 \leq d < -0.1$	1,067	962	0.1085
$-0.1 \leq d < -0.05$	982	652	0.0874
$-0.05 \leq d < 0$	1,126	533	0.0887
$0 \leq d < 0.05$	1,528	1,289	0.1507
$0.05 \leq d < 0.1$	818	810	0.0871
$0.1 \leq d < 0.2$	990	1,145	0.1142
$0.2 \leq d < 0.3$	521	657	0.0630
$0.3 \leq d$	995	1,421	0.1292
Total	9,349	9,349	1.00

BWS: Ministry of Labour, Basic Survey on Wage Structure.

EC: Statistics Bureau of the Management and Coordination Agency, Establishment Census. The authors selected establishments employing at least 30 persons from the original data.

d: $d = \frac{2(EstCen91 - BWS)}{EstCen91 + BWS}$,

where $EstCen91$ denotes the number of regular workers in an establishment reported by Establishment Census, and BWS denotes the number of regular workers in the same establishment reported by Basic Survey on Wage Structure.

statistics which do not include enough complete information to allow for the identification of each record.

2.2.2 Matching Method in General

When survey establishment data are insufficient to allow for the identification of the same establishment reported in other surveys, we must estimate the most similar establishment by using variables reported in both surveys.

Let x denote the $(n_x \times 1)$ vector of an establishment identification code from one survey, and y denote the $(n_y \times 1)$ vector of an establishment identification code from another survey, where n_x is the number of establishments involved in x and n_y is the number of establishments involved in y. The purpose is to find a transformation matrix T $(n_y \times n_x)$ which relates the same establishment between the two surveys; $y = Tx$. In principle each element of the transformation matrix T takes zero or a value of one.

If we do not have enough information in order to determine all the elements of the transformation matrix, we must estimate the element t_{ij} of T using incomplete information such as number of employees, stock value of capital, where $i = 1, \ldots, n_x$, and $j = 1, \ldots, n_y$. Let Z_x denote a $(n_x \times m)$ matrix of these variables which characterise an establishment reported by the survey which includes the identification code x, and let Z_y denote a $(n_y \times m)$ matrix of side-information variables reported by the survey with the identification code y, where m is the number of kinds of side-information.

When matching between two surveys is perfect and the values of side-information include no error, the following relation is established by definition of T:

$$Z_y = TZ_x.$$

Because of the difference of the period surveyed, Z_x and Z_y for the same establishment do not necessarily assign the same value.

We should introduce the $m \times 1$ weighting vector w which denotes the relative importance of side-information variables, because some side-information may have greater variances (uncertainties) than those of others. We must determine the value of w with a priori information.

But once we determine w, we can write the relationship between Z_x and Z_y and we can introduce the squared distance S between the two matrices:

$$\begin{aligned} S &= (Z_y w - TZ_x w)'(Z_y w - TZ_x w) \\ &= w'(Z_y - TZ_x)'(Z_y - TZ_x)w \end{aligned}$$

The problem is to find a T which minimize S with constraints on the element of T. The value of each element of T takes zero or a value of one, and there is at most one element which takes one for each column and each row data. If all elements of row or column take a zero value, the establishment cannot be matched to its pair in the other survey. If n_x is greater than n_y, T has columns of all zero elements. This means some establishments in x do not have a corresponding establishment in the survey y.

In order to find the matrix T, first all elements of T are set to zero, and starting from the first row we can find the column of one which minimizes S. If we cannot find a further improvement on S, all values of the row are set to zero. Next starting from the first column we can find the row of one which minimizes S in order to avoid multiple assignment. More generally we can apply quadratic programming to this problem.

2.2.3 Specific Matching Method

In this research while we have only a few side-information variables, we have unambiguous information such as the city code of each establishment and an industry classification code which is assumed to be determined under the same rule. We apply the number of regular employees as a side-information variable to match the two surveys. And we permit a 30 per cent difference in the number to choose the pair, because Table 3.4 and 3.5 show there is still a discrepancy in the number of employees even for the same establishments.

The results of the matching are shown in Table 3.6. The results suggest that matching is not successful at high probabilities. Because the probabilities of matching between the Establishment Census and the Basic Survey on Wage Structure were very high in Table 3.3, the

Table 2.6: Sample size of the matched data

	Number of Establishments	Number of Reported Employees
BSWS 1992 and CM 1992	570	11,711
BSWS 1993 and CM 1993	260	5,045

BWS: Ministry of Labour, Basic Survey on Wage Structure.
CM: Ministry of International Trade and Industry, Census of Manufactures.

difference of coverage of an establishment between the surveys is not its cause. The cause is lack of sufficient information to find a pair from the two surveys. As we use the total number of employees only, an improvement could be achieved by using other information such as the ratio of male and female workers, or by permitting more than a 30 per cent difference in the number of employees.

But in this study we decided to concentrate on our next aim, that is an estimation of labour demand. Because the focus of this study is to estimate labour demand by age and gender, we must construct employment data from the Basic Survey on Wage Structure. The original employment data reported in the survey do not include the records of all employees; that is, the sampling is executed in each establishment. But at the same time, because it reports the total number of employees by gender, we can adjust the figures of each record into the figures of an establishment using its multiplier. Of course the adjustment does not imply a replication of the existing distribution of employees precisely.

2.3 Formulation of Labour Demand

Since we do not have long-term panel data on enterprises that enable us to elucidate the dynamic properties of labour demand more precisely, we have to rely on the static theory of labour. But as we reviewed in the previous paper (Hayami and Nakajima [1997]), the existing static theory of labour demand is designed to fit the model using time series data, hence the assumptions of getting inner solutions and homogeneous enterprises in the theory has difficulties when we use cross-section data. The difficulties are classified into three types as follows:

The first difficulty arises from the corner solution of labour demand. There are many null (zero) employees in categorised labour demand, such as a 60-year-old female worker.

The second difficulty stems from homogeneous enterprises, because one enterprise does not employ such kind of persons, but another enterprise does. Each enterprise has similar characteristics in the same industry and for the same size of employment.

We have to consider heterogeneity both in theory and in estimation. In theory, we used to assume that all enterprises had the same technology which is described by the production function. It can be shown that every categorised kind of labour is employed at each enterprise. But in reality such a case is rare; an enterprise does not always employ all categories of labour.

In estimation, we have to face the problem of truncated sample biases. This issue is well known by the facts of durable consumption goods or labour supply behaviors of households.

The third difficulty is the mechanism of the labour market. If the labour market mechanism works well, a single price is established for a single category of labour. That is, a 60-year-old female with 10 years experience and 12 years education has the same wage rate in every enterprise. In that case, one cannot estimate the wage elasticity of labour demand using cross-section data, because one category always has one wage. If one can estimate the wage elasticity of labour demand using cross-section data, there are three possibilities.

One is that the estimated labour demand function is not appropriate; it surrogates the quality differences of labour which cannot be traced by category. That is from aggregation of a different type of labour in an inadequate way.

The second possibility is that there are segmented labour markets for the same category of labour by region and other properties. In this case, the wage elasticity of labour demand is not a reaction of an enterprise's behavior but a compound effect of market imperfections.

The third possibility is that the estimated labour demand is not a labour demand but a misspecified response function of the monopolistic behaviour of an enterprise.

Therefore it is very difficult to estimate wage elasticity using cross-section data. Furthermore we must face the other difficulty in order to estimate labour demand by category of labour, which is the problem of missing observations.

2.3.1 Difficulties of Logarithmic Production Functions

It is very common to estimate the Translog production function, but there is difficulty because of its convenience: the logarithmic function cannot be defined for a zero level of input.

With the Translog function, we have to estimate share elasticity, which is the parameter of the Translog function. But the elasticity depends on the formulation of whether the Translog function is defined by price or by quantity. Furthermore, separability among aggregate inputs (K, L, Energy, Material) is often assumed in the Translog function to be much simpler. Under the separablitiy condition, the aggregator function of labour can be expressed independently from other economic variables like amount of production or amount of capital stock (services).

For example, a separable Translog aggregator function is assumed as follows,

$$
\begin{aligned}
f(X(X_1, \ldots, X_{n_X}), L(L_1, \ldots, L_{n_L}), K(K_1, \ldots, K_{n_K}), \\
M(M_1, \ldots, M_{n_M})) = 1.
\end{aligned}
$$

In this case, the aggregator function of labour is defined in Translog form as,

$$\begin{aligned}
\ln L &= \ln L(L_1, L_2, \ldots, L_{n_L}) = \alpha + \sum_{i=1}^{n_L} \alpha_i \ln L_i \\
&\quad + \frac{1}{2} \sum_{i=1}^{n_L} \sum_{j=1}^{n_L} \alpha_{ij} \ln L_i \ln L_j, \\
\alpha_{ij} &= \alpha_{ji}, \quad (i, j = 1, \ldots, n) \\
\sum_{j=1}^{n_L} \alpha_{ij} &= 0, \quad (i = 1, \ldots, n) \\
\sum_{i=1}^{n_L} \alpha_i &= 1.
\end{aligned}$$

When we assume this Translog aggregator function, the labour input elasticity of production is given as follows:

$$\begin{aligned}
\frac{\partial \ln X}{\partial \ln L_j} &= \frac{\partial \ln X}{\partial \ln L} \frac{\partial \ln L}{\partial \ln L_j} \\
&= s_L s_j = \frac{\partial \ln X}{\partial \ln L} \left(\alpha_j + \sum_{i=1}^{n_L} \alpha_{ij} \ln L_i \right).
\end{aligned}$$

If one labour input falls to zero, the labour input elasticity of production cannot be defined. Before the labour input L_i reaches zero, the cost share of labour input s_i becomes zero; this means that the price of the labour input w_i is zero. This is the property of the quantity Translog aggregator function.

When we define the Translog cost function (3.1), it can be shown that the share elasticity of each labour input $\frac{\partial s_i}{\partial \ln w_j} = \beta_{ij}$ is constant:

$$\begin{aligned}
\ln C_L &= \sum_{i=1}^{n_L} \beta_i \ln w_i + \sum_{i=1}^{n_L} \sum_{j=1}^{n_L} \beta_{ij} \ln w_i \ln w_j \\
&\quad + \beta_X \ln X + \sum_{i=1}^{n_L} \beta_{iX} \ln X \ln w_i, \qquad (2.1)
\end{aligned}$$

$$s_i = \beta_i + \sum_{j=1}^{n_L} \beta_{ij} \ln w_j + \beta_{iX} \ln X \quad (i = 1, \ldots, n_L).$$

In this case the functional form allows zero input of labour with a positive price (wage). But unfortunately this type of share function cannot be estimated by using cross-section data, which has only one level of wage for one category of labour because of the competitive labour market mechanism.[1] We cannot observe the wage elasticity of share function for employment. But if the labour market is not competitive, the share function is no longer valid.

Other types of production functions called factor limitational production function have also been investigated. Komiya [1962] distinguished between the substitution model (Cobb-Douglas type production function) and the limitational model, which is described by the input-output relationships as a log-linear function. For example, for the labour input $L = AX^{\beta x} X_u{}^{\beta x}$, X is the level of output and X_u is the number of production units at the same plant. Because this formulation assumes perfect substitutablity among the labour inputs, the aggregator function of labour is simply the average number of employees per production unit.

These formulations are an extension of the Leontief production function (Leontief [1951]). Among others, Ozaki [1966] and [1970] estimated extensively the factor limitational production functions in Japanese industry using plant-base data. Ozaki concluded that economies of scale for labour inputs in a wide range of industries exist:

$$\ln L = \alpha_L + \beta_L \ln X, \tag{2.2}$$

where L is the level of employment and X is the level of output, α_L and β_L are coefficients to be estimated.

The results are ascertained by Lau and Tamura [1972] in a more general functional formulation for the Japanese petrochemical processing industry and by Nakamura [1990] in comparison of more general functional forms for the Japanese manufacturing industry:

[1] In fact, we have tried to estimate this type of share function and cost function using a seemingly unrelated estimation. But the resulting moment matrix became singular. And we must use only positive wage data for positive employment levels, but for zero employment we have no wage data. This problem arises in a similar way as the truncated regression model, but in this case it is the truncated regression system (multiple simultaneous equations) that should be estimated. These issues will remain for future investigation.

$$\begin{aligned} \ln L &= \alpha_L + \beta_L \ln X + \gamma_L v \\ \frac{L}{X} &= \beta_{LL} X^{\beta_{XL}} \exp(\beta_{Lt}) + \sum_{j \neq L} \beta_{jL} \sqrt{\left(\frac{p_j}{w_L}\right)} X^{\beta_X} \exp(\beta_t t), \end{aligned}$$

where v is vintage of capital, t is time, X is the level of output, p_j is the price of input other than labour, w_L is the unit labour cost. α_L, β_L, β_{LL}, β_{XL}, β_{Lt}, β_{jL}, β_X, β_t and γ_L are coefficients to be estimated.

But because all of these analyses assume that any category of labour is a perfect substitute for another, they use summation of labour input i.e. $L = \sum_{i=1}^{n_L} L_i$. The reason why all the above estimations use only total labour input is simply because of the limitation of data, which are now available in this research.

This paper intends to examine demand for labour by demographic category, if all demographic categories of labour have the same role in production activities, the estimated parameters have almost the same value across the category. In that case, the issues on employment and unemployment by demographic category come either from the supply of labour or from changes in location of an enterprise through creation and extinction, as has been recently suggested by Davis and Haltiwanger [1992] and Bertin et al. [1996]. Then the issues on demand for labour relate only to the total amount of labour.

If we straightforwardly generalise the factor limitational type of production functions to estimate labour demand by category, we can get a nonhomothetic generalised Leontief cost function in Lau and Tamura [1972] and Nakamura [1990]. The above labour demand function is derived by the following Fuss class cost function, under the assumption of competitiveness in the labour market:

$$\frac{C(p, X, t)}{X} = \sum_{i=1}^{n} \sum_{j=1}^{n} \sqrt{p_i p_j} h_{ij}(X, t), \tag{2.3}$$

where p_i is the factor price, X is the output level, t is time, h_{ij} is the nonhomothetic function, and C is the cost function.

The development of production theory since the 1970s has not taken into consideration production technology which was first described by Chenery [1949, 1953] and by Ozaki [1966, 1970]. Since Lau and Tamura [1972] have said only a little about vintage of capital, they still seek a technological relationship between labour and output. Komiya [1962] was aware of the treatment of production units and plants, although he did not succeed in finding a stable relationship between labour and production activity. If attention has been paid to the technological relationship, the formulation of labour input ignores price effects; but if not, the labour input is derived from the cost function by dualism under competitive factor markets and the formulation ignores quantity effects. When the production function is based on the factor limitational type, it becomes

$$X = \min\{f(L_1, L_2, \ldots, L_{n_L}), K, M\},$$

where X is output level, f is labour aggregator function, K is stock of capital, and M is material (to be omitted).

In the next section, we will not assume this aggregation of labour inputs, and will introduce a factor limitational production function in order to investigate labour demand by age and by gender.

2.4 A Formulation of Labour Demand by Demographic Category

There are three points we should take into account to estimate labour demand function by age and gender using cross-sectional micro data.

First, labour demand defined by demographic category does not express a technological relationship with output level, because demographic category is not a good approximation to represent skill required in production activities, and it does not represent the type of jobs and tasks required. In order to construct labour demand from production functions, it is inadequate to formulate labour input categorised by demographic factors directly in production functions. Since occupational requirement is much more closely related to production activity than demographic factors, we should start with labour input categorised by occupation in order to formulate demand for labour categorised by demographic factors. Therefore we need bridge functions between occupational labour demand and demographical labour demand, which have not yet been well formulated.

Second, we can not always define all categorical labour demand for an establishment. Many establishments do not employ all categories of labour at the same time, thus we cannot estimate logarithmic functions using establishment data. But it is required that labour demand becomes zero, when output level is equal to zero. This means labour demand functions should not have a positive intercept. To avoid this difficulty, the existing analyses which are described in the previous section and our paper (Hayami and Nakajima [1997]) seem to have serious limitations in analyzing labour demand by demographic category, because they assume perfect substitutability among all demographic types of labour. If we assume perfect substitutability within types of labour, the problem of applying logarithmic functions to categorised labour disappears. Even if some categories of labour are not required for production, we can estimate labour demand for total labour input without any difficulty.

Third, data based on establishments sometimes include not only a single production process but also multiple production processes, hence the output data might include several kinds of products. Basically what we must take into account is the case of multiple production. If we should precisely take into account of all kinds of products, there are at least two difficulties; one is the lack of degree of freedom to estimate thousands of varieties of products as in the case of a pharmaceutical establishment, and another is the lack of information of product prices. In this paper we ignore this problem and this means that we accept the hypothesis that output has a linear aggregator function; $pX = \sum_{i=1}^{n} p_i X_i$, where X is an aggregate output, p is a general price index of output, p_i is a price of ith output, and X_i is the production amount of ith output, and n is the number of products.

In the next subsection we introduce the bridge matrix between occupational category and demographic category of labour. We shall cope with the first problem mentioned in this section.

2.4.1 Labour Demand for Occupational Category and Demographic Category

If labour inputs are classified by occupational category, it is reasonable by definition to assume that all categories of labour entered in the production function are indispensable for production. But in that case the classification of occupation is not so definite as in the demographic classification, especially for office workers. This would mean that office workers are more substitutable with one another.

If all the occupations are defined explicitly, the bridge matrix $\Lambda = \{\lambda_{ij}\}$ between demographic classification and occupational classification can be defined as follows:

$$\begin{pmatrix} L_1 \\ L_2 \\ \vdots \\ L_{n_L} \end{pmatrix} = \begin{pmatrix} \lambda_{11} & \lambda_{12} & \cdots & \lambda_{1n_O} \\ \lambda_{21} & \lambda_{22} & \cdots & \lambda_{2n_O} \\ \vdots & \vdots & & \vdots \\ \lambda_{n_L 1} & \lambda_{n_L 2} & \cdots & \lambda_{n_L n_O} \end{pmatrix} \begin{pmatrix} Lo_1 \\ Lo_2 \\ \vdots \\ Lo_{n_O} \end{pmatrix} \tag{2.4}$$

$$L_i = \sum_{j=1}^{n_O} \lambda_{ij} Lo_j, \quad (i = 1, \ldots, n_L) \tag{2.5}$$

$$\sum_{j=1}^{n_O} Lo_j (1 - \sum_{i=1}^{n_L} \lambda_{ij}) = 0 \tag{2.6}$$

$$\sum_{i=1}^{n_L} \lambda_{ij} = 1 \tag{2.7}$$

where L_i $(i = 1, \ldots, n_L)$ is the number of employees by demographic category, n_L is the number of demographic classifications, Lo_j $(j = 1, \ldots, n_O)$ is the number of employees by occupational category, and n_O is the number of occupational classifications.

If for all $j = 1, \ldots, n_O$ and for the ith demographic category of labour, $\lambda ij = 0$, then we have $L_i = 0$, and there is no demand for the ith demographic category of labour, but still it remains perfectly complementary to every occupational category of labour.

λ_{ij} is demographic distribution of occupation j; this is easy to observe from existing data. But the difficulty in this bridge matrix is as follows: it is quite possible that $\lambda_{ij} = 0$ for some j, but it hardly occurs that $\lambda_{ij} = 0$ for all $j = 1, \ldots, n_O$. The last conditions are required when the ith demographic category of labour of an establishment have no employees.

When labour inputs are classified by occupational category, the labour input coefficient is defined as:

$$l_j = \frac{Lo_j}{X}, \quad j = 1, \ldots, n_O.$$

In this case, labour inputs by demographic category L_j turn to be the following equations:

$$L_i = \left(\sum_{j=1}^{n_O} \lambda_{ij} l_j \right) X.$$

It is reasonable to assume that l_j is determined by the state of technology, but λ_{ij} depends on the other factors. If λ_{ij} depends on technology, technology requires some specific character of demography such as females in their 20s, males in their 40s, but such a situation is not likely to exist for all types of labour. Hence there is difficulty in interpreting that λ_{ij} belongs to the production function which represents technological relations.

On the contrary, consider the bridge matrix $M = \{\mu_{ij}\}$ from a demographic category of labour to an occupational category of labour. The relation is expressed by:

$$\begin{pmatrix} Lo_1 \\ Lo_2 \\ \vdots \\ Lo_{n_O} \end{pmatrix} = \begin{pmatrix} \mu_{11} & \mu_{12} & \cdots & \mu_{1n_L} \\ \mu_{21} & \mu_{22} & \cdots & \mu_{2n_L} \\ \vdots & \vdots & & \vdots \\ \mu_{n_O 1} & \mu_{n_O 2} & \cdots & \mu_{n_O n_L} \end{pmatrix} \begin{pmatrix} L_1 \\ L_2 \\ \vdots \\ L_{n_L} \end{pmatrix} \tag{2.8}$$

$$Lo_i = \sum_{j=1}^{n_L} \mu_{ij} L_j, \quad (i = 1, \ldots, n_O) \tag{2.9}$$

$$\sum_{j=1}^{n_L} L_j (1 - \sum_{i=1}^{n_O} \mu_{ij}) = 0 \tag{2.10}$$

$$\sum_{i=1}^{n_O} \mu_{ij} = 1 \tag{2.11}$$

where the notations are the same as in the previous equation.

This matrix is important in manpower policy and is used to describe results of training programs or education programs governed by policy makers or suggested by labour economists. μ_{ij} can be interpreted as the ratio of labour force that has an ith occupation in a demographic category of labour.

Although observation of μ_{ij} is more difficult than that of λ_{ij}, μ_{ij} has an advantage in generating a disappearance of labour demand by demographic category, it is more plausible than using λ_{ij}.

It is easy to explain with examples how labour demand can be generated from this scheme. Obviously there are three cases to be considered; $n_O = n_L$, $n_O < n_L$, and $n_O > n_L$.

In case of $n_O = n_L$, we can calculate the inverse matrix of M if the matrix M is not singular. Labour demand by demographic category L is derived from labour demand by occupational category Lo by the inverse matrix M^{-1}; $L = M^{-1}Lo$. Whether L_j has a positive value or not depends on M^{-1} and Lo. In the case of $n_O = n_L = 2$, we have the following equation:

$$\begin{pmatrix} L_1 \\ L_2 \end{pmatrix} = \frac{1}{\mu_{11} + \mu_{22} - 1} \begin{pmatrix} \mu_{22}(Lo_1 + Lo_2) - Lo_2 \\ \mu_{11}(Lo_1 + Lo_2) - Lo_1 \end{pmatrix} \tag{2.12}$$

by $\mu_{11} + \mu_{12} = 1$ and $\mu_{21} + \mu_{22} = 1$.

If $\mu_{11} = 0.5$, $\mu_{22} = 0.2$, $Lo_1 = 1$ and $Lo_2 = 1$, the solution is $L_1 = 2$ and $L_2 = 0$. Therefore it is clear that there is no guarantee that all L_j will have a positive value.

For example we can apply labour input of occupation to the labour input coefficient l_j as we described earlier. In this example existence of a positive value solution is independent of level of output, because the sign of the right hand side of equation (2.12) is determined by parameters not by level of output:

$$\begin{pmatrix} L_1 \\ L_2 \end{pmatrix} = \frac{1}{\mu_{11} + \mu_{22} - 1} \begin{pmatrix} \mu_{22}(l_1 + l_2) - l_2 \\ \mu_{11}(l_1 + l_2) - l_1 \end{pmatrix} X.$$

Existence of labour demand by demographic category means that the above equation has positive value solutions. According to the above right hand side expression, existence of labour demand by demographic category depends on distribution of ability μ_{ij} and (inverse of) labour productivity l_j, and the level of labour inputs is proportional to output X.

But if we assume a nonhomothetic relationship between occupational labour input and output such as $Lo_j = \alpha_j X^{\beta_j}$, $j = 1, \ldots, n_O$, it is clear that the existence of labour demand by demographic category depends on output level X. Because the solution becomes the following equation:

$$\begin{pmatrix} L_1 \\ L_2 \end{pmatrix} = \frac{1}{\mu_{11} + \mu_{22} - 1} \begin{pmatrix} \mu_{22}\alpha_1 X^{\beta_1} + (\mu_{22} - 1)\alpha_2 X^{\beta_2} \\ \mu_{11}\alpha_2 X^{\beta_2} + (\mu_{11} - 1)\alpha_1 X^{\beta_1} \end{pmatrix}.$$

In this case we can calculate the critical point that labour demand by demographic category disappears, which is

$$\begin{aligned} X^{01} &= \left(\frac{(1 - \mu_{22})\alpha_2}{\mu_{22}\alpha_1} \right)^{\frac{1}{\beta_1 - \beta_2}}, \\ X^{02} &= \left(\frac{(1 - \mu_{11})\alpha_1}{\mu_{11}\alpha_2} \right)^{\frac{1}{\beta_2 - \beta_1}}, \end{aligned}$$

where X^{01} is the level of output at which the labour demand L_1 disappeares, and X^{02} is the level of output at which the labour demand L_2 disappeares. Unless the matrix M is singular $\mu_{11} + \mu_{22} = 1$, X^{01} is not equal to X^{02}.

In the case of $n_O < n_L$, there are redundant degrees of freedom in determining the size of labour demand by demographic category. Hence we can specify size of labour demand only for the partial sum of demographic categories, since the solution is not unique. There remains substitutability between demographic categories of labour, and labour demand for each demographic category will be unstable. Demand for labour is defined only on sum of demographic categories. In the case of $n_O = 2$, and $n_L = 3$, one of the solutions is as follows:

$$\begin{aligned} &\begin{pmatrix} (\mu_{11} + \mu_{22} - 1)L_1 + (\mu_{11} - \mu_{13})L_3 \\ (\mu_{11} + \mu_{22} - 1)L_2 + (\mu_{22} + \mu_{13} - 1)L_3 \end{pmatrix} \\ &\quad = \begin{pmatrix} \mu_{22}(Lo_1 + Lo_2) - Lo_2 \\ \mu_{11}(Lo_1 + Lo_2) - Lo_1 \end{pmatrix}. \end{aligned} \tag{2.13}$$

Even if the value of Lo_1 and Lo_2 are determined by output level, there is indeterminacy between L_1, L_2 and L_3. It might seem that labour cost determines the level of labour inputs. But cost consideration has no role in determining labour inputs by demographic category because the productivity is determined by occupation and not by demographic category.

In order to be more precise, we introduce a general production function $X = f(\mathrm{Lo})$, where Lo$= (Lo_1, Lo_2, \ldots, Lo_{n_O})'$, $'$ means transposition, and wages w are defined by demographic category, w_1, w_2, …, w_{n_L} as the $n_L \times 1$ column vector. Equations in (2.8) define constraints between Lo and L, where L is $(L_1, \ldots, L_{n_L})'$. Using vector and matrix notations, equation (2.8) can be expressed as follows,

$$\mathrm{Lo} = (\bar{\mathrm{M}}_1 \bar{\mathrm{M}}_2) \begin{pmatrix} \mathrm{L}_1 \\ \mathrm{L}_2 \end{pmatrix},$$

where L_1 is the $n_O \times 1$ vector of L_j $(j = 1, \ldots, n_O)$, L_2 is the $(n_L - n_O) \times 1$ vector of L_j $(j = n_O + 1, \ldots, n_L)$, $\bar{\mathrm{M}}_1$ is $n_O \times n_O$ matrix of μ_{ij} $(i, j = 1, \ldots, n_O)$, and $\bar{\mathrm{M}}_2$ is the $n_O \times (n_L - n_O)$ matrix of μ_{ij} $(i = 1, \ldots, n_O,\ j = n_O + 1, \ldots, n_L)$.

Since we can choose $\bar{\mathrm{M}}_1$ not to be singular, L_1 can be expressed by:

$$\mathrm{L}_1 = \bar{\mathrm{M}}_1^{-1} \mathrm{Lo} - \bar{\mathrm{M}}_1^{-1} \bar{\mathrm{M}}_2 \mathrm{L}_2. \tag{2.14}$$

Let λ_X denote a Lagrange multiplier for $X = f(\mathrm{Lo})$, and λ_L denote a Lagrange multiplier for $\sum_{i=1}^{n_L} L_i = \sum_{j=1}^{n_O} Lo_j$, which is expressed as $\mathrm{L}'1 = \mathrm{Lo}'1$ in vector notation, where 1 is the vector of 1 and the dimension is determined according to the definition of multiplication. Then Lagrangian is written as follows:

$$\begin{aligned} \mathcal{L} &= \mathrm{L}'\mathrm{w} + \lambda_X (X - f(\mathrm{Lo})) + \lambda_L \left(\mathrm{L}'1 - \mathrm{Lo}'1\right), \\ &= \mathrm{Lo}'\bar{\mathrm{M}}_1^{-1\prime}\mathrm{w}_1 + \mathrm{L}_2{}' \left(\mathrm{w}_2 - \bar{\mathrm{M}}_2'\bar{\mathrm{M}}_1^{-1\prime}\mathrm{w}_1\right) + \lambda_X (X - f(\mathrm{Lo})) \\ &\quad + \lambda_L \left((\mathrm{Lo}'\bar{\mathrm{M}}_1^{-1\prime} - \mathrm{L}_2{}'\bar{\mathrm{M}}_2'\bar{\mathrm{M}}_1^{-1\prime}, \mathrm{L}_2{}')1 - \mathrm{Lo}'1\right). \end{aligned}$$

To derive the second equation, we use $\mathrm{L}'\mathrm{w} = \mathrm{L}_1{}'\mathrm{w}_1 + \mathrm{L}_2{}'\mathrm{w}_2$, and equation (2.14).

The first order conditions are:

$$\bar{M}_1^{-1'} w_1 - \lambda_X \nabla f + \lambda_L \left(\bar{M}_1^{-1'} 1 - 1 \right) = 0 \qquad (2.15)$$

$$X - f(Lo_1, Lo_2, \ldots, Lo_{n_O}) = 0, \qquad (2.16)$$

$$(Lo' \bar{M}_1^{-1'} - L_2' \bar{M}_2' \bar{M}_1^{-1'}, L_2) 1 - Lo' 1 = 0. \qquad (2.17)$$

The third term on the left hand side of the first equation (2.15) disappears by the definition of μ_{ij}. $\sum_{i=1}^{n_O} \mu_{ij} = 1$ means $\bar{M}_1' 1 = 1$, thus $1 = \bar{M}_1^{-1'} 1$.

Multiply Lo' to equation (2.15) by the left hand side, then it is clear that λ_X is equal to the inverse of the sum of output elasticity of Lo times average cost:

$$\lambda_X = \frac{L' w_1 + L_2' \bar{M}_2' w_1}{Lo' \nabla f(Lo)},$$

then

$$\lambda_X = \frac{C}{X} \frac{1}{\eta},$$

where η is $\sum_{j=1}^{n_O} \frac{\partial \ln f}{\partial \ln Lo_j}$, and C is defined as $L' w_1 + L_2' \bar{M}_2' w_1$.

Equation (2.15) is reduced to the next equation system.

$$\bar{M}_1^{-1'} w_1 - \frac{C}{X} \frac{1}{\eta} \nabla f = 0 \qquad (2.18)$$

This equation system can be solved for Lo, because it includes n_O equations and the variables are Lo_j, given w_j, μ_{ij} and X.

But labour demand by demographic category L can not be calculated by Lo. There are redundant degrees of freedom according to the equation $Lo = \bar{M}_1 L_1 + \bar{M}_2 L_2$. Since $L'w$ is divided into $Lo' \bar{M}_1^{-1'} w_1 + L_2' \left(w_2 - \bar{M}_2' \bar{M}_1^{-1'} w_1 \right)$, if $w_2 > \bar{M}_2' \bar{M}_1^{-1'} w_1$, then $L_2 = 0$. Therefore optimal labour cost $L'w$ is less than or equal to $Lo' \bar{M}_1^{-1'} w_1$.

Therefore we can determine the level of occupational labour demand Lo. But as we saw in the earlier paragraph, the level of labour demand classified with the demographic factor L is not determined by cost minimization without further assumptions.

In the case of $n_O > n_L$, labour demand classified with a demographic factor is determined by equation (2.12).

$$\begin{pmatrix} \mathrm{Lo}_1 \\ \mathrm{Lo}_2 \end{pmatrix} + \begin{pmatrix} \mathrm{M}_1 \\ \mathrm{M}_2 \end{pmatrix} \mathrm{L}, \tag{2.19}$$

where Lo_1 is the $n_L \times 1$ vector of Lo_j $(j = 1, \ldots, n_L)$, Lo_2 is the $(n_O - n_L) \times 1$ vector of Lo_j $(j = n_L + 1, \ldots, n_O)$, M_1 is the $n_L \times n_L$ matrix of μ_{ij} $(i, j = 1, \ldots, n_L)$, M_2 is the $(n_O - n_L) \times n_L$ matrix of μ_{ij} $(i = n_L + 1, \ldots, n_O, j = 1, \ldots, n_L)$, and L is the $n_L \times 1$ vector of L_j $(j = 1, \ldots, n_L)$. Under non singularity of M_1, labour demand by demographic category is determined by the following equation,

$$\mathrm{L} = \mathrm{M}_1{}^{-1}\mathrm{Lo}_1.$$

In order to satisfy consistency between occupational labour demand and labour demand categorised by a demographic factor, the next restrictions for Lo_j and μ_{ij} are required:

$$\mathrm{Lo}_2 = \mathrm{M}_2\mathrm{M}_1{}^{-1}\mathrm{Lo}_1.$$

Therefore production activity is restricted by the above equations. Using these restrictions, cost minimizing behavior by an enterprise can be described as the following constrained optimization:

$$\mathcal{L} = (\mathrm{M}_1{}^{-1}\mathrm{Lo}_1)'\mathrm{w} + \lambda_X(X - f(\mathrm{Lo}_1, \mathrm{M}_2\mathrm{M}_1{}^{-1}\mathrm{Lo}_1)),$$

where $\mathcal{L}$ is a Lagrangian, w is the vector of wages w_i, λ_X is a Lagrange multiplier, Lo_1, M_1 and M_2 are defined as before.

The first order conditions can be expressed as follows:

$$\begin{aligned} \mathrm{M}_1{}^{-1\prime}\mathrm{w} - \lambda_X\left(\nabla_{\mathrm{Lo}_1} f + \mathrm{M}_1{}^{-1\prime}\mathrm{M}_2{}'\nabla_{\mathrm{Lo}_2} f\right) &= 0 \\ f(\mathrm{Lo}_1, \mathrm{M}_2\mathrm{M}_1{}^{-1}\mathrm{Lo}_1) &= X, \end{aligned} \tag{2.20}$$

where $\nabla_{\mathrm{Lo}_1} f$ is a vector of partial derivatives $\frac{\partial f}{\partial \mathrm{Lo}_j}$ $(j = 1, \ldots, n_L)$, and $\nabla_{\mathrm{Lo}_2} f$ is a vector of partial derivatives $\frac{\partial f}{\partial \mathrm{Lo}_j}$ $(j = n_L + 1, \ldots, n_O)$.

Thus Lo_1 is derived as the functions of weighted average of wages and output level. Then Lo_2 is determined by $\mathrm{M}_2\mathrm{M}_1{}^{-1}\mathrm{Lo}_1$, and labour demand categorised by a demographic factor L is determined by $\mathrm{M}_1{}^{-1}\mathrm{Lo}_1$.

In this case, basically the same argument is established as in the case of $n_O = n_L$ using the relationship $\mathrm{L} = \mathrm{M}_1{}^{-1}\mathrm{Lo}_1$. The difference is the restriction on Lo_1 and Lo_2 in this case, which does not exist in the case of $n_O = n_L$. If production function is a semi factor substitutional type, demographic labour demand depends on output size, and the solution is not always a positive value.

An important implication of these illustrations is on the occupational opportunities and the skill distribution by demographic category. If there are a relatively wide variety of occupations compared to demographic categories, the skill distribution parameters mu_{ij} have an important role in determining labour demand categorised by occupation and hence labour demand categorised by demographic factor.

On the other hand, if a variety of occupations is scarce compared to demographic categories, the skill distribution parameters μ_{ij} do not have a critical rote in determining labour demand categorised by demographic factor, even if labour demand categorised by occupation is affected by the skill distribution.

According to this theoretical result, if production technology requires a lot of tasks and jobs relative to demographic classifications, a policy program of skill development in order to avoid misallocation of labour demand has meaning. But if production technology requires only a few kinds of skills, any policy concerning skill development is irrelevant to determine labour demand categorised by demographic factor.

In that situation, an enterprise's choice of labour by demographic category should be described by using optimization mechanisms with further assumptions than this paper presents. Obi [1978, 1996] and Obi and Miyauchi [1998] suggest that an enterprise has a choice of order (grades) among job applicants. He incorporates supply probability for each demographic category of labour and an enterprise's demand for labour. Although he did not intend to link occupational classification with demographic classification, the approach is highly suggestive in analyzing labour demand. As Obi considers, personnel management often employs applicants who do not have enough skill to meet the current techonological requirements even if personnel management has knowledge of the occupation requirements for existing technology and production levels. It is consistent with Obi's model that few skills are required for people fresh in the job market.

2.4.2 Formulation of the Labour Input Function

In the previous subsection, we investigated the characteristics of a linear relationship between labour demand by demographic category and by occupational category. We initially discussed the production function which is defined according to labour input categorised by occupation, which expresses the technological relationship between labour input and output more precisely than using labour input categorised by demographic factors in production functions. Given the distribution of a worker's skill and a variety of occupational categories, demograhically categorised labour demand is determined by labour input categorised by occupation and they share a linear relationship. But labour demand categorised by occupation does not always have a linear relationship with output level, hence labour demand categorised by demographic factor does not always have a positive value.

In this subsection, we derive labour demand by demographic category using the production function defined according to occupational category of labour. As we mentioned at the top of this section, the second problem we must face is zero level of labour input with positive output. We have already explained this possibility in the previous subsection, as coming from the nonhomothetic occupational labour input function and skill distribution parameters. In order to investigate nonhomothetic occupational labour input in detail, we introduce a semi factor substitutional production function.

If all categories of labour inputs are complementary to each other, the production function can be expressed as follows:

$$X = \min\left\{f_1(Lo_1), f_2(Lo_2), \ldots, f_{n_O}(Lo_{n_O}), g(\bar{K})\right\}, \tag{2.21}$$

where X is output level, f_i is the labour input function, g is the capital input function, Lo_i is each occupational type of labour, and $\bar{K}$ is the stock of capital.

If it is assumed further that the function f_i, $(i = 1, \ldots, n_O)$ is all through the origin,

$$0 = f_i(0), \quad (i = 1, \ldots, n_O),$$

meaning that all categories of labour are required for production activity, and that this property can be said to be an 'indispensable' complementary.

If it is assumed that the function f_i, $(i = 1, \ldots, n_O)$ is all homothetic,

$$\lambda f_i(Lo_i) = f_i(\lambda Lo_i), \ \lambda \geq 0 \ \ (i = 1, \ldots, n_O),$$

so it can be said that all categories of labour are perfect complements to each other. This production function is Leontief's input-coefficient.

But the latter assumption is quite restrictive in analyzing labour demand by occupational category, because labour input as a whole is not homothetic according to the previous investigations. Therefore we introduce a nonhomothetic relationship into the production function in formulating labour input by occupational category.

For given capital stock $\bar{K}$ we can define the semi factor substitutional production function as follows:

$$X = min\left\{f_1(Lo_1, \bar{K}), f_2(Lo_2, \bar{K}), \ldots, f_{n_O}(Lo_{n_O}, \bar{K})\right\}, \qquad (2.22)$$

where X is output level, and f_i is the semi factor substitutional function for each category of labour.

If it is assumed that $f_i(0, \bar{K}) = 0$, $(i = 1, \ldots, n_O)$, then all labour inputs by occupational category perfectly complement each other and are permitted to have substitutability for capital. But if the positive region $f_i(0, \bar{K}) = f_{i0} > 0$, (for some i) is permitted for some categories of labour, then that category of labour is not indispensable for given stock of capital $\bar{K}$ until the production level reaches f_{i0}. This relationship is observable because establishments often introduce outsourcing for some kinds of jobs and tasks, and often employ temporary workers from employment service companies.

Basically the above production function is not susbstitutable among categories of labour. But as Leontief [1951] notes, if there is perfect substitution between inputs Lo_1 and Lo_2, the observable input is one of them e.g. Lo_1 because of the cheaper cost of Lo_1. Moreover the relationship to output X is the same as the perfect complementary labour input coefficient $Lo_1 = \alpha X$. We can check from the data which type of labour input is not observed. If the relative wage among categories of labour is common to all enterprises, the reason why some types of labour input are not observed is from productivity differences of labour across enterprises.

Next we consider that an enterprise needs a specific occupational structure in order to carry out production activities. It is reasonable to assume that the size of the labour force has an effect on production level, and the production level is restricted by occupational structure. This is because an enterprise often decides to outsource its tasks which require specific occupational skills at some level of production.

So we can treat the occupational structure as a complementary input to total labour input or to capital stock:

$$X = \min\left\{fh(\frac{Lo_1}{L}, \frac{Lo_2}{L}, \ldots, \frac{Lo_{n_L}}{L}), f(L), g(\bar{K})\right\}, \tag{2.23}$$

where X is the output level, fh is a function of occupational structure, f is the total labour input function, L is the total labour input, $\bar{K}$ is the capital stock, and g is the capital input function.

Equation (2.23) can be interpreted as a modification of the labour aggregator function $f(Lo_1, Lo_2, \ldots, Lo_{n_O})$ which is homogeneous in degree one, and we can rewrite it as follows:

$$X = \min\left\{Lf(\frac{Lo_1}{L}, \frac{Lo_2}{L}, \ldots, \frac{Lo_{n_O}}{L}), g(\bar{K})\right\}.$$

In the above case, we allow substitutability of occupational structure to total labour input L, but there is no substitutability between them in equation (2.23).

If we further assume that each component of the occupational pattern of the labour force is complementary to each other, the production function can be expressed as follows:

$$X = \min\left\{fh_1(\frac{Lo_1}{L}), fh_2(\frac{Lo_2}{L}), \ldots, fh_{n_O}(\frac{Lo_{n_O}}{L}), f(L), g(\bar{K})\right\}, \tag{2.24}$$

where fh_i is the input function of the corresponding demographic type of labour force ratio $\frac{Lo_i}{L}$. O

Chapter 3

Labour Demand by Age and Gender in the Manufacturing Industries: Evidences from Linked Microdata in Japan

3.1 Introduction

This chapter attempts to investigate labour demand by age and gender in Japan, using microdata in which demographic structure of employment, labour conditions and production activities are paired with each other at the level of individual questionnaires. This paper has two purposes: to address the methodology of construction of data sets, and to address estimations of labour demand.

The labour demand function in Japan has been estimated by using time series data which are combined with aggregated data derived from different sources. Academic research on labour demand has been insufficient because of insufficient data, and labour demand has often been estimated simply to solve macroeconomic models. Our analysis is the first attempt to estimate labour demand by age and by gender in Japan using microdata which contain both demographic structure of employment and output information for the same establishment. While there are several investigations using microdata to estimate labour input function, they do not break down labour into subcategories because of insufficient information (Komiya [1962], Ozaki [1966,1970], Lau and Tamura [1972], Nakamura [1990]). These previous analyses suggest that there exists economy of scale at plant level, and the estimations support that the type of demand function is factor limitational rather than Cobb-Douglas or factor substitutional.

As far as the author knows, there does not exist in Japan microdata which include both production activities and demographic structure of employment. This is because there is a lack of sufficient information and coordination among surveys on production activities and on employment structure. We will cope with these difficulties in applying a minimum distance method to find pairs from the surveys, Census of Manufactures and Basic Survey on Wage Structure.

Even though we have a much more detailed data set than before, it still is insufficient to estimate wage elasticities since wages by age and gender are more correlated with wages themselves than with employment level.

But our analysis can show the dependency of employment structure on size of output and size of plant area as in our previous analysis (Hayami and Nakajima[1997], also refer to Chapter 3 of this book). These results suggest that there exists sustainable distribution of establishment size given the demographic labour force structure. And comparison of the intercept and the coefficient of the labour input function expresses relative flexibility of employment by categories. Davis and Haltiwanger [1992] suggest that gross job creation and destruction are the main causes of employment adjustment in the U. S., and if the same tendency also dominates the Japanese labour market, we will be able to observe a fixity of employment which is not affected by output fluctuation and a relatively high turn over rate for such employment with fixity.

Since there hasn't been such a data set in Japan before this attempt, we believe our investigation can accurately explore the Japanese demand for labour by demographic category. Unfortunately, unlike our previous analysis (Hayami and Nakajima [1997] and Chapter 3 of this book), each record of employment and production status we have constructed might not be exactly derived from the same establishment, due to a lack of information from questionnaires. So we have estimated data pairs assignable to the same establishment based on properties of each establishment.

Not every enterprise has all categories of labour, so this creates difficulties in estimation. That is, there is no data for some categories because not all establishments employ in labour every category. This might be due to the environment of the enterprise, i. e. production conditions or availability of labour supply. If the model permits such a zero employment level, one cannot use most of the flexible functional forms in cross-section data, such as logarithmic types of production functions including Translog production functions as well as cost functions and aggregator functions. Therefore we must extend the model to permit for a zero level of employment for each category, but not for all categories at the same time.

The following discussions are first of all explanations of how we obtained the data set. The difficulty remains in construction of such data, because the survey was not executed at the same sample base.

The formulation of labour demand or labour input function is examined. We use the factor limitation type of labour demand on an establishment base, and the formulation allows nonhomothetic production functions and does not assume perfect substitution among categories of labour or allowance of joint production and non-separability between capital and labour.

3.2 Data Construction

3.2.1 On the Data Sources

There are no published data based on samples which contain both productive activities and labour conditions by age and gender in Japan.

Statistics for production activities in the manufacturing industry are complied by the Ministry of International Trade and Industry (MITI). Pusblished every year, the Census of Manufactures is the most comprehensive statistics on establishments. It is divided into two censuses; a census for an establishment which employs more than or equal to 30 persons, and for an establishment which employs less than 30 persons. The census for an establishment, which employs more than or equal to 30 persons reports sales value of products, book value of capital, purchasing value of materials, number of employed persons by gender, gross area of plant and buildings sites and amount of water consumption. It does not include the establishment sorting code of the Establishment Census.

Thus, it is basically impossible to match an establishment record from the Census of Manufactures and its corresponding establishment record from the Establishment Census. We have to select the most plausible record from indirect information such as district, size of plant and industry classification code from over ten thousand possible candidates (See Table 3.1 and 3.2).

Statistics for labour based on age and gender are compiled by the Ministry of Labour every year, published as the Basic Survey on Wage Structure. As we mentioned in our previous paper (Hayami and Nakajima [1997]) and also in Chapter 3, the Basic Survey on Wage Structure is the most comprehensive survey on labour conditions in Japan; it reports mainly on regular worker's wages and hours worked by industry, occupation, education, age and gender.

The sampling in the Basic Survey on Wage Structure is based on the Establishment Census which is complied by the Statistics Bureau of the Management and Coordination Agency, every five years. Basic Survey on Wage Structure covers establishments which employ at least 10 regular workers. The questionnaire includes the same establishment identification number as in the Establishment Census, but for the manufacturing industry it offers no additional information.

Table 3.1 shows the year surveyed and the sampling base of the Establishment Census. And Table 3.2 shows the sample size of the Basic Survey on Wage Structure. The sample size used in the Basic Survey on Wage Structure is smaller than in the Establishment Census. But the reason is not straightforward, because of how employed workers are defined. Basic Survey on Wage Structure lists establishments which employ a population of at least 10 regular workers. Establishment Census lists establishments which employ at least 30 persons including non-regular workers, which is comparable to the Census of Manufactures; the 1991 Establishment Census includes 68,651 establishments which employed at least 30 persons, while the 1991 Census of Manufactures includes 62,170 establishments which employed at least 30 persons. The difference between both statistics is measured by the following formula:

$$d = \frac{2(\mathsf{EstCen91} - \mathsf{CenMan91})}{\mathsf{EstCen91} + \mathsf{CenMan91}} = 0.09908,$$

where $\mathsf{EstCen91} = 68,651$ denotes the number of establishments from the 1991 Establishment Census; $\mathsf{CenMan91} = 62,170$ denotes the number of establishments from the 1991 Census of Manufactures.

We will first compare the difference between the Establishment Census and the Basic Survey on Wage Structure, because the Basic Survey on Wage Structure is based on the Establishment Census and as in Table 3.1, it uses the same establishment identification code as that of the Establishment Census. The only difficulty in doing this however is the time period reported on in the Establishment Census on which the Basic Survey on Wage Structure is based. There is at least two year lags between the Basic Survey on Wage Structure and the Establishment Census. So we will try to match the 1992 version of the Basic Survey on Wage Structure with the 1991 version of the Establishment Census. Basic Survey on Wage Structure is based on the previous 1986 Establishment Census. If the 1991 Establishment Census did not change the establishment identification code, then a successful match can be expected between the 1992 Basic Survey on Wage Structure and the 1991 version of the Establishment Census.

We can generate over 9,000 establishment pairs from the two statistics in Table 3.3. Although the two statistics do not share precisely the same population, this is a high rate of successful matches. Because the Basic Survey on Wage Structure includes 22,506 establishments in 1992 and 16,355 establishments in 1993, the matching number divided by the total numbers of establishments from the Basic Survey on Wage Structure is 0.4213 in 1992 and 0.5716 in 1993.

Consistency of data for the number of employees should be evaluatedas we must employ the number of regular workers as one of the variables in making matches between the Census of Manufactures and the Basic Survey on Wage Structure. Establishment Census classifies the numbers of employees according to whether they are regular workers, part-time workers, owners of the establishment, or top executives

Table 3.1: Sampling base year of the statistics

Statistics	Surveyed year	Referenced sampling base of Establishment Census
Basic Survey on Wage Structure	1992	1986
	1993	1991
	1994	1991
Statistics	Surveyed year	Total reported establishments with at least 30 persons
Establishment Census	1991	68,651

Ministry of Labour, Basic Survey on Wage Structure.

Statistics Bureau of the Management and Coordination Agency, Establishment Census. From the original data, the authors selected establishments employing at least 30 people.

Table 3.2: Available data from the surveys

Basic Survey on Wage Structure,
Manufacturing Industries
Establishments employing at least 10 regular employees

Year	Total employees	Total establishments
1992	1,097,664	22,506
1993	888,851	16,355

Census of Manufactures
Establishments employing at least 30 regular employees

Year	Total establishments
1990	60,892
1991	62,170
1992	61,474
1993	59,711

Ministry of Labour, Basic Survey on Wage Structure.

Ministry of International Trade and Industry, Census of Manufactures.

Table 3.3: Sample size of the matched data between BWS and EC

	Number of establishments	Number of reported employees
BSWS 1992 and EC 1991	9,481	338,571
BSWS 1993 and EC 1991	9,349	355,047

BWS: Ministry of Labour, Basic Survey on Wage Structure.

EC: Statistics Bureau of the Management and Coordination Agency, Establishment Census. From the original data, the authors selected establishments employing at least 30 people.

and it classifies between them according to gender. The number of regular workers listed by gender in the Establishment Census is comparable to that in the Basic Survey on Wage Structure. Table 3.4–3.5 shows the distribution of establishments with a distance measure $\mathtt{d}$. $\mathtt{d}$ is defined as before, that is, it denotes the ratio of difference for regular employees described by the two statistics for the same establishment. If there is no time difference and no difference of definition, $\mathtt{d}$ is zero. But in this case there are possible sources for differences, mainly the time difference between the two statistics. In 1992, 80.03 per cent of total establishments have a difference within 30 per cent. In 1993, 75.89 per cent of total establishments have a difference within 30 per cent. A positive difference means a greater value in the Establishment Census than in the Basic Survey on Wage Structure. Therefore, the number of regular employees declined during 1991, 1992 and 1993.

The method of matching data from the Basic Survey on Wage Structure and the Establishment Census is exactly the same as the method used in our previous analysis (Hayami and Nakajima [1997]) and in Chapter 3 of. Both statistics have the same establishment identification number given the district sorting code. If you can sort records of the two statistics according to the identification number and the district sorting code, then matching can be executed sequentially.

But the Census of Manufactures does not include the same identification number or the minor district sorting code; it includes the city code, the major district sorting code and the number of regular workers which are the same as listed in the Basic Survey on Wage Structure. In the next subsection we will explain hot to generate matches from

Table 3.4: Distribution of the differences reported in numbers of regular workers between BWS and EC (1)

Number of Establishments
BWS 1992 and EC 1991

Difference of Numbers of Employees	Male	Female	Composition
$d < -0.3$	804	1,331	0.1126
$-0.3 \leq d < -0.2$	453	581	0.0545
$-0.2 \leq d < -0.1$	1,034	950	0.1046
$-0.1 \leq d < -0.05$	1,022	778	0.0949
$-0.05 \leq d < 0$	1,404	722	0.1121
$0 \leq d < 0.05$	1,997	1,864	0.2036
$0.05 \leq d < 0.1$	812	857	0.0880
$0.1 \leq d < 0.2$	869	971	0.0970
$0.2 \leq d < 0.3$	392	470	0.0455
$0.3 \leq d$	694	957	0.0871
Total	9,481	9,481	1.00

BWS: Ministry of Labour, Basic Survey on Wage Structure.

EC: Statistics Bureau of the Management and Coordination Agency, Establishment Census. From the original data, the authors selected establishments employing at least 30 persons.

d: $d = \frac{2(EstCen91 - BWS)}{EstCen91 + BWS}$,

where $EstCen91$ denotes the number of regular workers in an establishment reported by Establishment Census, and BWS denotes the number of regular workers in the same establishment reported by Basic Survey on Wage Structure.

Table 3.5: Distribution of the differences reported in numbers of regular workers between BWS and EC (2)

Number of Establishments
BWS 1993 and EC 1991

Difference of Numbers of Employees	Male	Female	Composition
$d < -0.3$	801	1,291	0.1119
$-0.3 \leq d < -0.2$	521	589	0.0594
$-0.2 \leq d < -0.1$	1,067	962	0.1085
$-0.1 \leq d < -0.05$	982	652	0.0874
$-0.05 \leq d < 0$	1,126	533	0.0887
$0 \leq d < 0.05$	1,528	1,289	0.1507
$0.05 \leq d < 0.1$	818	810	0.0871
$0.1 \leq d < 0.2$	990	1,145	0.1142
$0.2 \leq d < 0.3$	521	657	0.0630
$0.3 \leq d$	995	1,421	0.1292
Total	9,349	9,349	1.00

BWS: Ministry of Labour, Basic Survey on Wage Structure.

EC: Statistics Bureau of the Management and Coordination Agency, Establishment Census. The authors selected establishments employing at least 30 persons from the original data.

d: $d = \frac{2(EstCen91-BWS)}{EstCen91+BWS}$,

where $EstCen91$ denotes the number of regular workers in an establishment reported by Establishment Census, and BWS denotes the number of regular workers in the same establishment reported by Basic Survey on Wage Structure.

statistics which do not include enough complete information to allow for the identification of each record.

3.2.2 Matching Method in General

When survey establishment data are insufficient to allow for the identification of the same establishment reported in other surveys, we must estimate the most similar establishment by using variables reported in both surveys.

Let x denote the $(n_x \times 1)$ vector of an establishment identification code from one survey, and y denote the $(n_y \times 1)$ vector of an establishment identification code from another survey, where n_x is the number of establishments involved in x and n_y is the number of establishments involved in y. The purpose is to find a transformation matrix T $(n_y \times n_x)$ which relates the same establishment between the two surveys; $y = Tx$. In principle each element of the transformation matrix T takes zero or a value of one.

If we do not have enough information in order to determine all the elements of the transformation matrix, we must estimate the element t_{ij} of T using incomplete information such as number of employees, stock value of capital, where $i = 1, \ldots, n_x$, and $j = 1, \ldots, n_y$. Let Z_x denote a $(n_x \times m)$ matrix of these variables which characterise an establishment reported by the survey which includes the identification code x, and let Z_y denote a $(n_y \times m)$ matrix of side-information variables reported by the survey with the identification code y, where m is the number of kinds of side-information.

When matching between two surveys is perfect and the values of side-information include no error, the following relation is established by definition of T:

$$Z_y = TZ_x.$$

Because of the difference of the period surveyed, Z_x and Z_y for the same establishment do not necessarily assign the same value.

We should introduce the $m \times 1$ weighting vector w which denotes the relative importance of side-information variables, because some side-information may have greater variances (uncertainties) than those of others. We must determine the value of w with a priori information.

But once we determine w, we can write the relationship between Z_x and Z_y and we can introduce the squared distance S between the two matrices:

$$\begin{aligned} S &= (Z_y w - TZ_x w)'(Z_y w - TZ_x w) \\ &= w'(Z_y - TZ_x)'(Z_y - TZ_x)w \end{aligned}$$

The problem is to find a T which minimize S with constraints on the element of T. The value of each element of T takes zero or a value of one, and there is at most one element which takes one for each column and each row data. If all elements of row or column take a zero value, the establishment cannot be matched to its pair in the other survey. If n_x is greater than n_y, T has columns of all zero elements. This means some establishments in x do not have a corresponding establishment in the survey y.

In order to find the matrix T, first all elements of T are set to zero, and starting from the first row we can find the column of one which minimizes S. If we cannot find a further improvement on S, all values of the row are set to zero. Next starting from the first column we can find the row of one which minimizes S in order to avoid multiple assignment. More generally we can apply quadratic programming to this problem.

3.2.3 Specific Matching Method

In this research while we have only a few side-information variables, we have unambiguous information such as the city code of each establishment and an industry classification code which is assumed to be determined under the same rule. We apply the number of regular employees as a side-information variable to match the two surveys. And we permit a 30 per cent difference in the number to choose the pair, because Table 3.4 and 3.5 show there is still a discrepancy in the number of employees even for the same establishments.

The results of the matching are shown in Table 3.6. The results suggest that matching is not successful at high probabilities. Because the probabilities of matching between the Establishment Census and the Basic Survey on Wage Structure were very high in Table 3.3, the

Table 3.6: Sample size of the matched data

	Number of Establishments	Number of Reported Employees
BSWS 1992 and CM 1992	570	11,711
BSWS 1993 and CM 1993	260	5,045

BWS: Ministry of Labour, Basic Survey on Wage Structure.
CM: Ministry of International Trade and Industry, Census of Manufactures.

difference of coverage of an establishment between the surveys is not its cause. The cause is lack of sufficient information to find a pair from the two surveys. As we use the total number of employees only, an improvement could be achieved by using other information such as the ratio of male and female workers, or by permitting more than a 30 per cent difference in the number of employees.

But in this study we decided to concentrate on our next aim, that is an estimation of labour demand. Because the focus of this study is to estimate labour demand by age and gender, we must construct employment data from the Basic Survey on Wage Structure. The original employment data reported in the survey do not include the records of all employees; that is, the sampling is executed in each establishment. But at the same time, because it reports the total number of employees by gender, we can adjust the figures of each record into the figures of an establishment using its multiplier. Of course the adjustment does not imply a replication of the existing distribution of employees precisely.

3.3 Formulation of Labour Demand

Since we do not have long-term panel data on enterprises that enable us to elucidate the dynamic properties of labour demand more precisely, we have to rely on the static theory of labour. But as we reviewed in the previous paper (Hayami and Nakajima [1997]), the existing static theory of labour demand is designed to fit the model using time series data, hence the assumptions of getting inner solutions and homogeneous enterprises in the theory has difficulties when we use cross-section data. The difficulties are classified into three types as follows:

The first difficulty arises from the corner solution of labour demand. There are many null (zero) employees in categorised labour demand, such as a 60-year-old female worker.

The second difficulty stems from homogeneous enterprises, because one enterprise does not employ such kind of persons, but another enterprise does. Each enterprise has similar characteristics in the same industry and for the same size of employment.

We have to consider heterogeneity both in theory and in estimation. In theory, we used to assume that all enterprises had the same technology which is described by the production function. It can be shown that every categorised kind of labour is employed at each enterprise. But in reality such a case is rare; an enterprise does not always employ all categories of labour.

In estimation, we have to face the problem of truncated sample biases. This issue is well known by the facts of durable consumption goods or labour supply behaviors of households.

The third difficulty is the mechanism of the labour market. If the labour market mechanism works well, a single price is established for a single category of labour. That is, a 60-year-old female with 10 years experience and 12 years education has the same wage rate in every enterprise. In that case, one cannot estimate the wage elasticity of labour demand using cross-section data, because one category always has one wage. If one can estimate the wage elasticity of labour demand using cross-section data, there are three possibilities.

One is that the estimated labour demand function is not appropriate; it surrogates the quality differences of labour which cannot be traced by category. That is from aggregation of a different type of labour in an inadequate way.

The second possibility is that there are segmented labour markets for the same category of labour by region and other properties. In this case, the wage elasticity of labour demand is not a reaction of an enterprise's behavior but a compound effect of market imperfections.

The third possibility is that the estimated labour demand is not a labour demand but a misspecified response function of the monopolistic behaviour of an enterprise.

Therefore it is very difficult to estimate wage elasticity using cross-section data. Furthermore we must face the other difficulty in order to estimate labour demand by category of labour, which is the problem of missing observations.

3.3.1 Difficulties of Logarithmic Production Functions

It is very common to estimate the Translog production function, but there is difficulty because of its convenience: the logarithmic function cannot be defined for a zero level of input.

With the Translog function, we have to estimate share elasticity, which is the parameter of the Translog function. But the elasticity depends on the formulation of whether the Translog function is defined by price or by quantity. Furthermore, separability among aggregate inputs (K, L, Energy, Material) is often assumed in the Translog function to be much simpler. Under the separablitiy condition, the aggregator function of labour can be expressed independently from other economic variables like amount of production or amount of capital stock (services).

For example, a separable Translog aggregator function is assumed as follows,

$$\begin{gathered} f(X(X_1, \dots, X_{n_X}), L(L_1, \dots, L_{n_L}), K(K_1, \dots, K_{n_K}), \\ M(M_1, \dots, M_{n_M})) = 1. \end{gathered}$$

In this case, the aggregator function of labour is defined in Translog form as,

$$
\begin{aligned}
\ln L &= \ln L(L_1, L_2, \ldots, L_{n_L}) = \alpha + \sum_{i=1}^{n_L} \alpha_i \ln L_i \\
&\quad + \frac{1}{2} \sum_{i=1}^{n_L} \sum_{j=1}^{n_L} \alpha_{ij} \ln L_i \ln L_j, \\
\alpha_{ij} &= \alpha_{ji}, \quad (i, j = 1, \ldots, n) \\
\sum_{j=1}^{n_L} \alpha_{ij} &= 0, \quad (i = 1, \ldots, n) \\
\sum_{i=1}^{n_L} \alpha_i &= 1.
\end{aligned}
$$

When we assume this Translog aggregator function, the labour input elasticity of production is given as follows:

$$
\begin{aligned}
\frac{\partial \ln X}{\partial \ln L_j} &= \frac{\partial \ln X}{\partial \ln L} \frac{\partial \ln L}{\partial \ln L_j} \\
&= s_L s_j = \frac{\partial \ln X}{\partial \ln L} \left(\alpha_j + \sum_{i=1}^{n_L} \alpha_{ij} \ln L_i \right).
\end{aligned}
$$

If one labour input falls to zero, the labour input elasticity of production cannot be defined. Before the labour input L_i reaches zero, the cost share of labour input s_i becomes zero; this means that the price of the labour input w_i is zero. This is the property of the quantity Translog aggregator function.

When we define the Translog cost function (3.1), it can be shown that the share elasticity of each labour input $\frac{\partial s_i}{\partial \ln w_j} = \beta_{ij}$ is constant:

$$
\begin{aligned}
\ln C_L &= \sum_{i=1}^{n_L} \beta_i \ln w_i + \sum_{i=1}^{n_L} \sum_{j=1}^{n_L} \beta_{ij} \ln w_i \ln w_j \\
&\quad + \beta_X \ln X + \sum_{i=1}^{n_L} \beta_{iX} \ln X \ln w_i, \qquad (3.1)
\end{aligned}
$$

$$
s_i = \beta_i + \sum_{j=1}^{n_L} \beta_{ij} \ln w_j + \beta_{iX} \ln X \quad (i = 1, \ldots, n_L).
$$

In this case the functional form allows zero input of labour with a positive price (wage). But unfortunately this type of share function cannot be estimated by using cross-section data, which has only one level of wage for one category of labour because of the competitive labour market mechanism.[1] We cannot observe the wage elasticity of share function for employment. But if the labour market is not competitive, the share function is no longer valid.

Other types of production functions called factor limitational production function have also been investigated. Komiya [1962] distinguished between the substitution model (Cobb-Douglas type production function) and the limitational model, which is described by the input-output relationships as a log-linear function. For example, for the labour input $L = AX^{\beta_X} X_U{}^{\beta_X}$, X is the level of output and X_U is the number of production units at the same plant. Because this formulation assumes perfect substitutablity among the labour inputs, the aggregator function of labour is simply the average number of employees per production unit.

These formulations are an extension of the Leontief production function (Leontief [1951]). Among others, Ozaki [1966] and [1970] estimated extensively the factor limitational production functions in Japanese industry using plant-base data. Ozaki concluded that economies of scale for labour inputs in a wide range of industries exist:

$$\ln L = \alpha_L + \beta_L \ln X, \tag{3.2}$$

where L is the level of employment and X is the level of output, α_L and β_L are coefficients to be estimated.

The results are ascertained by Lau and Tamura [1972] in a more general functional formulation for the Japanese petrochemical processing industry and by Nakamura [1990] in comparison of more general functional forms for the Japanese manufacturing industry:

[1]In fact, we have tried to estimate this type of share function and cost function using a seemingly unrelated estimation. But the resulting moment matrix became singular. And we must use only positive wage data for positive employment levels, but for zero employment we have no wage data. This problem arises in a similar way as the truncated regression model, but in this case it is the truncated regression system (multiple simultaneous equations) that should be estimated. These issues will remain for future investigation.

$$
\begin{aligned}
\ln L &= \alpha_L + \beta_L \ln X + \gamma_L v \\
\frac{L}{X} &= \beta_{LL} X^{\beta_{XL}} \exp(\beta_{Lt}) + \sum_{j \neq L} \beta_{jL} \sqrt{\left(\frac{p_j}{w_L}\right)} X^{\beta_X} \exp(\beta_t t),
\end{aligned}
$$

where v is vintage of capital, t is time, X is the level of output, p_j is the price of input other than labour, w_L is the unit labour cost. α_L, β_L, β_{LL}, β_{XL}, β_{Lt}, β_{jL}, β_X, β_t and γ_L are coefficients to be estimated.

But because all of these analyses assume that any category of labour is a perfect substitute for another, they use summation of labour input i.e. $L = \sum_{i=1}^{n_L} L_i$. The reason why all the above estimations use only total labour input is simply because of the limitation of data, which are now available in this research.

This paper intends to examine demand for labour by demographic category, if all demographic categories of labour have the same role in production activities, the estimated parameters have almost the same value across the category. In that case, the issues on employment and unemployment by demographic category come either from the supply of labour or from changes in location of an enterprise through creation and extinction, as has been recently suggested by Davis and Haltiwanger [1992] and Bertin et al. [1996]. Then the issues on demand for labour relate only to the total amount of labour.

If we straightforwardly generalise the factor limitational type of production functions to estimate labour demand by category, we can get a nonhomothetic generalised Leontief cost function in Lau and Tamura [1972] and Nakamura [1990]. The above labour demand function is derived by the following Fuss class cost function, under the assumption of competitiveness in the labour market:

$$
\frac{C(p, X, t)}{X} = \sum_{i=1}^{n} \sum_{j=1}^{n} \sqrt{p_i p_j} h_{ij}(X, t), \tag{3.3}
$$

where p_i is the factor price, X is the output level, t is time, h_{ij} is the nonhomothetic function, and C is the cost function.

The development of production theory since the 1970s has not taken into consideration production technology which was first described by Chenery [1949, 1953] and by Ozaki [1966, 1970]. Since Lau and Tamura [1972] have said only a little about vintage of capital, they still seek a technological relationship between labour and output. Komiya [1962] was aware of the treatment of production units and plants, although he did not succeed in finding a stable relationship between labour and production activity. If attention has been paid to the technological relationship, the formulation of labour input ignores price effects; but if not, the labour input is derived from the cost function by dualism under competitive factor markets and the formulation ignores quantity effects. When the production function is based on the factor limitational type, it becomes

$$X = \min\{f(L_1, L_2, \ldots, L_{n_L}), K, M\},$$

where X is output level, f is labour aggregator function, K is stock of capital, and M is material (to be omitted).

In the next section, we will not assume this aggregation of labour inputs, and will introduce a factor limitational production function in order to investigate labour demand by age and by gender.

3.4 A Formulation of Labour Demand by Demographic Category

There are three points we should take into account to estimate labour demand function by age and gender using cross-sectional micro data.

First, labour demand defined by demographic category does not express a technological relationship with output level, because demographic category is not a good approximation to represent skill required in production activities, and it does not represent the type of jobs and tasks required. In order to construct labour demand from production functions, it is inadequate to formulate labour input categorised by demographic factors directly in production functions. Since occupational requirement is much more closely related to production activity than demographic factors, we should start with labour input categorised by occupation in order to formulate demand for labour categorised by demographic factors. Therefore we need bridge functions between occupational labour demand and demographical labour demand, which have not yet been well formulated.

Second, we can not always define all categorical labour demand for an establishment. Many establishments do not employ all categories of labour at the same time, thus we cannot estimate logarithmic functions using establishment data. But it is required that labour demand becomes zero, when output level is equal to zero. This means labour demand functions should not have a positive intercept. To avoid this difficulty, the existing analyses which are described in the previous section and our paper (Hayami and Nakajima [1997]) seem to have serious limitations in analyzing labour demand by demographic category, because they assume perfect substitutability among all demographic types of labour. If we assume perfect substitutability within types of labour, the problem of applying logarithmic functions to categorised labour disappears. Even if some categories of labour are not required for production, we can estimate labour demand for total labour input without any difficulty.

Third, data based on establishments sometimes include not only a single production process but also multiple production processes, hence the output data might include several kinds of products. Basically what we must take into account is the case of multiple production. If we should precisely take into account of all kinds of products, there are at least two difficulties; one is the lack of degree of freedom to estimate thousands of varieties of products as in the case of a pharmaceutical establishment, and another is the lack of information of product prices. In this paper we ignore this problem and this means that we accept the hypothesis that output has a linear aggregator function; $pX = \sum_{i=1}^{n} p_i X_i$, where X is an aggregate output, p is a general price index of output, p_i is a price of ith output, and X_i is the production amount of ith output, and n is the number of products.

In the next subsection we introduce the bridge matrix between occupational category and demographic category of labour. We shall cope with the first problem mentioned in this section.

3.4.1 Labour Demand for Occupational Category and Demographic Category

If labour inputs are classified by occupational category, it is reasonable by definition to assume that all categories of la

Chapter 4

Labour Demands by Age and Gender in the Commercial Industry: Evidences from Linked Microdata in Japan

4.1 Introduction

This chapter examines Japanese employment structure by age and gender using the linked employer-employee microdata.[1] The microdata linked with demographic categories of employees and characteristics of employer have not yet been constructed before, this is the first attempt using official Japanese statistics across the different administrations.

The need for the linked employer-employee data in Japan is growing especially because of changing situations in the labour market. Ageing population, growth of female participation, surge of deregu-

[1] This paper has been presented at the International Symposium on Employer-Employee Linked Data by Bureau of the Census, Bureau of Labor Statistics, Alfred P. Sloan Foundation, National Science Foundation and European Union, Washington DC, 21-22 May 1998. And it is based on the results of the project at the Economic Research Institute of the Economic Planning Agency, Government of Japan, when the authors were visiting researchers.

lation and long lasting recession in Japan should have considerable and complex effects on employment structure for macro and employment systems for micro. According to the Population Census in 1990, employment structure in Japan depends on three industries: manufacturing, commercial and service industry, each share of employee is 23.7%, 22.4%, and 22.5% respectively, and size of GDP for these industries is 24.5%, 12.7% and 16.8% respectively.

The share of manufacturing industry is gradually declining, and that of the service industry is increasing, employment in both sectors has not decreased, but the number of persons employed in commercial industry has decreased during 1985–1990. Commercial industry, the worst per capita GDP in these, is facing changing regulations, and also has both traditional sectors such as small family owned shops, and high tech sectors such as general trading company (sogo shosha) or franchise stores with computer network. According to the deregulation plan, the regulation for starting up the large shores (The Large Scale Retail Store's Law) has been reformed since 1980s, and finally will be abolished with five to ten years probation periods, although the new law with the similar effects but different purposes is proposed, and under consideration in Congress.[2]

Commercial industry has significant uncertainty of employment, extensive effects of deregulation and protection, thus our primary focus is on the issues of commercial industry, and the availability of data allows us to analyse the characteristics of commercial industry systematically. Fact findings on the effects of the Large Scale Retail Store's Law on the employment and the demographic structure are our main purposes using the linked data. And policy implications of the deregulation on retail industry will be discussed in concluding part.

The chapter consists of three parts: first of all, we explain the data sources and the matching procedure in constructing the employer-

[2] The other institutional arrangements for small businesses is an exemption of the consumption tax (the tax base is basically comparable to value added tax). The tax rate was raised by 2 per cent to 5 per cent from April 1997. The exemption which may bring benefit to small size companies which trades less than 30 million yen per year. In the linked data we employ, there are 39 establishments in retail industry, and 13 establishments in wholesale industry, which trade less than 30 million yen in 1991.

employee linked data. Secondly, the facts from the descriptive statistics will be given by using cross tabulation and by measuring gross job creation and destruction, as we follow the pioneering works by Davis and Haltiwanger [1992] and by Davis, Haltiwanger and Schuh [1996]. Thirdly, we try to estimate demographic structure of employment using censored regressions. And we will point out needs for estimating parameters under multivariate distribution with censored (and truncated) data. However the estimation technique has been recently developed,[3] but it should be beyond the scope of this paper.

4.2 Data Construction

4.2.1 On the Data Sources

In Japan there are no published data based on samples which contain both sales amount and employee's characteristics by age in the same survey. For example, the Establishment Census governed by Management and Coordination Agency (MCA) reports mainly number of persons employed by gender, the employer's characteristics included in the census is only industry classification and book value of capital funds.[4]

For another example, the Basic Survey on Wage Structure (BSWS) compiled by Ministry of Labour (MOL) is the most comprehensive survey on employee's labour conditions such as wages, bonuses, hours worked, tenure, job status and occupation as well as employee's characteristics such as age and education, also including employment status like part-time worker or general worker, and temporary worker or regular worker.[5] Unfortunately the BSWS does not include any em-

[3] Hajivassiliou and Ruud [1994] surveys the classical methods using Monte Carlo simulation. Gilks, Richardson and Spiegelhalter eds. [1996] reports general issues on Markov chain Monte Carlo (MCMC) method.

[4] Furthermore, the precise definition of establishment depends on the person who will answer questionnaire, in case whether an establishment sites inside its parent's company is recognised as one establishment or as a part of the company.

[5] The distinction of part and general depends on what they are called, that is, the part-time worker is an employee whose hours worked is determined less than a general worker by office regulation (agreement between union and employer). The distinction of temporary and regular worker depends on whether an employee has a termed contract or not. But, quite confusing, there is the other definition of regular worker in the same survey, which depends on actual days worked in

ployer's characteristics other than industry classification.[6] The BSWS is a sampling survey, its typical sample size is 71 thousands establishments and 1.55 million employees for the total sectors except for agriculture, forestry, fishery and public sectors, as reported in 1996. The BSWS sampling frame encompasses all private enterprises and state owned enterprises excluding public servants with 5 or more regular employees.[7] The BSWS has two stages of sampling: one is for establishment and the other is for employees within an establishment. The sampling probability for establishments varies across regions and size of establishment from 1/492 to 1 in wholesale and retail industries with 10 or more regular employees during 1992–1994, and the sampling probability for employees depends on the number of persons employed by establishment typically from 1/80 to 1.

Employer's production activities are surveyed by Ministry of International Trade and Industry (MITI). The Census of Manufactures is the most comprehensive survey on manufacturing activities every year. It reports sales figures for major commodities and other characteristics such as space area, water and electricity consumption for establishments with thirty and more employees.

The Census of Commerce is surveyed every three years. It is separated into "Wholesale and Retail Industries" and "General Eating and Drinking Places." The latter survey does not include further information than the Establishment Census, but the former survey contains sales figures and other employer's characteristics for wholesale and retail industries .

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the past two contiguous months before the survey. The latter definition of regular worker determines the sampling probability and the classification by firm size. It is the same definition as in the Establishment Census and the Census of Commerce.

[6] The industry classification is determined by the surveyor, it depends on the major sales commodities and activities. The classification changes occasionally, the most recent one was held in October 1993.

[7] The minimum size of establishments has changed to 5 or more regular employees for private enterprises and 10 or more regular employees in public enterprises from 1991. It used to be 10 or more regular employees for all enterprises. But the data we used contain establishments with 10 or more regular employees even after 1992, the data with less than 10 regular employees might be separated from those of 10 or more regular employees.

Table 4.1: Summary of the Data Sources

Census of Commerce 1991 (CC)

Retail Industry

Size of employment	Establishments		Employment		Regular Employees		Sales (10^{12}Yen)	
Total	1,591,223	(100%)	7,844,894	(100%)	4,666,624	(100%)	140.6	(100%)
5 or more regular	227,085	(14.3%)	3,988,005	(50.8%)	3,351,185	(71.8%)	92.3	(65.7%)
10 or more regular	95,569	(6.0%)	2,860,524	(36.5%)	2,515,307	(53.9%)	69.7	(49.6%)

Wholesale Industry

Size of employment	Establishments		Employment		Regular Employees		Sales (10^{12}Yen)	
Total	474,766	(100%)	5,025,623	(100%)	3,989,231	(100%)	573.2	(100%)
5 or more regular	193,581	(40.8%)	3,990,732	(79.4%)	3,505,748	(87.9%)	524.0	(91.4%)
10 or more regular	98,417	(20.7%)	3,195,737	(63.6%)	2,880,831	(72.2%)	462.2	(80.6%)

Basic Survey on Wage Structure (BSWS)

Retail, Wholesale Industries and Drinking-Eating Places

	Sample size for		Sampling frame
	Employees	Establishments	based on
1992	157,268	5,657	Establishment Census 1986
1993	157,383	6,179	Establishment Census 1991
1994	156,933	6,329	Establishment Census 1991

Manufacturing Industry

	BSWS		Census of Manufactures	Establishment Census
	Establishments with 10 or more regular employees		The numbers of establishments with 30 or more employees	The numbers of establishments with 30 or more employees
	Sample size for Employees	Sample size for Establishments		
1991	—	—	62,170	68,651
1992	1,097,664	22,506	61,474	Not surveyed
1993	888,851	16,355	59,711	Not surveyed

Notes for Table 4.1:

The Census of Commerce (CC) is governed by the Ministry of International Trade and Industry (MITI) every three years. In 1991, the CC has the same sorting code for establishments as the Establishment Census 1991 governed by the Management and Coordination Agency.

Figures inside () denotes per cent to the total number.

Regular employees are: (1) employed persons without any specified period by contract, (2) employed persons under contract for more than one month, (3) those who work at least monthly 18 days previous two months to the surveillance under the contract for less than one month or daily contract.

Sales are the sales revenue from the primary activities, that is, and do not include side products.

The Basic Survey on Wage Structure (BSWS) is annually governed by the Ministry of Labour (MOL).

The sampling frame of the BSWS is the previous Establishment Census, and the industry classification has been changed in 1993. Because of this change in the classification, it is difficult to compare number of employees or establishments between different sectors in the industry.

The panel of the BSWS can be constructed for the years of the same sampling frame.

But new establishments (probably over thousand) are added to the BSWS every year because of dropped establishments in order to keep the surveillance error constant.

The Census of Manufactures (CM) is governed by the MITI every year, but it does not include the same sorting code for establishments as the Establishment Census (EC). The CM is separated into two parts; for establishments with 30 or more employees, and for establishments with less than 30 employees which contains fewer information.

There is a significant difference of the number of establishments between the CM and the EC, even if both are census and surveyed in the same year.

4.2.2 Matching Procedure

The BSWS is based on the previous Establishment Census, commences two years after a census year, and includes the same sorting code of the Establishment Census. Therefore it is not difficult to link between the two surveys if both have the sorting code of the Establishment Census. The Census of Commerce includes the sorting code, then the matching procedure for commercial industry is straightforward. But the success rates of matching are not perfect: 63.8 per cent ($= 3,613/5,657$) in 1992, 84.3 per cent ($= 5,208/6,179$) in 1993 and 76.8 per cent ($= 4,861/6,329$) in 1994. The reason is not clear possible cause are differences of the industry classification, difference of the year surveyed, and there are newly added establishments into the BSWS.

On the contrary, the Census of Manufactures is not based on the same sorting code as in the Establishment Census. Therefore we apply the following estimation procedure, sort according to the district code and the full digit industry code, and then seek the nearest employment size of establishment within these common codes. The size of employment is the only common indicators between the Census of Manufactures and the Establishment Census. As Table 4.2 shows, the rate of matching between the Establishment Census and the BSWS is relatively high; 42 per cent ($= 9,481/22,506$) in 1992 and 57 per cent ($= 9,349/16,335$) in 1993, but the rate of matching for the Census of Manufacturing is very low, this requires further investigations for manufacturing industry.

Table 4.2: Summary of the Matching Procedure

Retail Industry

	Sample size for matched establishment	Sample size for employees	Estimated number of employees using the matched establishments
BSWS 1992 and CC 1991	2,345 (2.45%)	55,405 (1.94%)	1,637,280 (57.24%)
BSWS 1993 and CC 1991	4,131 (4.32%)	109,918 (3.84%)	2,092,940 (73.17%)
BSWS 1994 and CC 1991	3,877 (4.06%)	103,950 (3.63%)	1,938,680 (67.78%)

Wholesale Industry

	Sample size for matched establishment	Sample size for employees	Estimated number of employees using the matched establishments
BSWS 1992 and CC 1991	1,268 (1.29%)	30,007 (0.94%)	1,812,940 (56.7%)
BSWS 1993 and CC 1991	1,077 (1.09%)	25,934 (0.81%)	2,969,550 (92.9%)
BSWS 1994 and CC 1991	984 (1.00%)	23,396 (0.73%)	2,728,690 (85.4%)

Manufacturing Industry

	Sample size for matched establishment	Sample size for employees	
BSWS 1992 and EC 1991	9,481 (15.4%)	338,571	
BSWS 1993 and EC 1991	9,349 (15.7%)	355,047	
BSWS 1992 and CM 1992	570 (0.93%)	11,711	
BSWS 1993 and CM 1993	260 (0.44%)	5,045	

Notes for Table 4.2:
BSWS: Ministry of Labour, Basic Survey on Wage Structure, each year.

CC: Ministry of International Trade and Industry, Census of Commerce, 1991.

EC: Statistical Bureau of Management and Coordination Agency, Establishment Census, 1991.

CM: Ministry of International Trade and Industry, Census of Manufactures, each year.

Sample size for matched establishment denotes the number of establishments which are found in the both surveys shown in the left column.

Sample size for employees denotes the number of records for employees which the BSWS surveyed, the figure is different from the number of employed persons because of sampling within establishment. Its sampling probability varies from 1 to 1/80 depending upon size of establishment.

Estimated number of employees using the matched establishments denotes estimation of the total number of employee in each industry using the sampling weights (the reciprocals of the sampling probabilities) given in the BSWS. In Table 4.1 the population value is given by the Census of Commerce 1991.

The possible causes of the estimation errors are from the following three sources:

(1) There are a lot of dropped data of which an appropriate candidate can not be found in the other survey. Nevertheless we still use the original sampling weights to calculate the number of employees.

(2) There are time differences between the CC and the BSWS.

(3) The BSWS does not intend to be sampled to obtain the precise volume of employment, its purpose is mainly on wage and other labour conditions.

Figures in () are the ratio to the population value from the CC 1991 for commercial industry and from the CM for manufacturing industry.

The Census of Commerce covers all retailers and wholesalers in Japan, but the BSWS, and, therefore, the linked data are sample surveys for the establishments with 10 or more regular employees.[8] The coverage for the establishments with 10 or more regular employees is 36.5 per cent of all employment in retail industry and 63.6 per cent of all the employment in wholesale industry as shown in Table 4.1. The sampling probability of the matched establishments to the total of establishments with 10 or more regular employees is between 2.45 per cent and 4.32 per cent for retail industry, and between 1.0 per cent and 1.29 per cent for wholesale industry. The sampling probability of the matched employees to the total employees employed by establishments with 10 or more regular employees is between 1.94 and 3.84 per cent in retail industry, between 0.73 per cent and 0.94 per cent in wholesale industry.

[8] As we mentioned in the footnote 7, the BSWS is a survey for the establishments 5 or more regular employees, but the data is separated into the establishments with less than 10 regular employees. We focus on the establishments with 10 or more regular employees.

The sampling probability for commercial industry comes from two factors; the sampling probability of the BSWS and the probability of successful matching. The BSWS files the sampling weight which reproduces the total number of employment, estimated amounts of employment using the weight are given in Table 4.2.

4.3 Basic Facts from Descriptive Statistics

This section lays out elementary facts, using the linked data, about the wage and other differences of employees and the gross job creation/destruction under different types of employers . First of all we carried out the cross tabulations in more than 600 cases. As a result, there are statistically significant wage differences between male and female employees controlling characteristics of employees and types of employers in detail as possible. The wage rate for female employee is lower at least 30 per cent than that for male employee even at the entrance of labour market in Japan. After entering the labour market, there is significant tenure differences between gender, the tenure of female employee is significantly shorter than that of male in their 30s or older generation, these tendency is observed in every classification of employers and employees. The proportion of part-time worker in the female labour force is higher than that of the male worker, but the difference of hours worked between genders is not commonly observed; in several categories of employer and employees, the female worker works longer than male, even if the female's part-time ratio is higher than the male's. We can hardly conclude that the female employee in Japan chooses positively her labour condition; it suggests that the possible explanation for the differences should rely on the analysis of the labour demand factor.

Secondly, we try to find the gender differences in employer's employment policy, and its possible causes. Following Davis and Haltiwanger [1990], we obtained the gross job creation and destruction indicators for categories of employees and types of employers. The results suggests that a high rate of gross job creation exists with high rate of gross job destruction at the same time in Japanese commercial industry. In comparing the part-time worker with the general worker, both the rate of gross job creation and the rate of gross job destruction for male part-time worker are significantly higher than that of the male general worker. On the contrary, the rate of gross job creation and destruction for female part-time worker is not so different from that of general female worker; the rate of gross job creation for female part-time worker is higher than that for general female worker. But the rate of gross job destruction for the female part-time worker is lower than that of the general female worker, especially in larger establishments.

4.3.1 The Cross Tabulation Results

Table 4.3 shows the summary of the cross tabulation results, especially the tabulations across the two official statistics; the BSWS and the Census of Commerce (CC). We have obtained the cross tabulations in calculating mean, standard deviation and frequency in each cell classified as 10 (Variables of employee) × 10 (Demographic categories of employees) × 3 (Observation periods) × 2 (Simple average/weighted average) × 6 (Characteristics of retail establishment) or 4 (Characteristics of wholesale establishment).

The variables of employee are: (1) the ratio of temporary workers in the total employment for each category, (2) the ratio of part-time workers in the total employee of each category, (3) the year of education, (4) the year of tenure (employment duration in the current company), (5) monthly actual hours worked, (6) monthly overtime hours worked (7) monthly regular (agreements by wage negotiation) payment, (8) hourly wage rate, (9) bonus, (10) monthly overtime payment.

The demographic categories of employees are gender (female/male) times generations of which there are five categories such as those in their 20s or less, 30s, 40s, 50s and 60s or more.

The characteristics in retail establishments are: (1) annual sales in retail activity, (2) annual sales other than in retail activity, (3) degree of specialisation (annual sales other than retail activity divided by the total sales), (4) the age of establishment, (5) sales space area and (6) ratio of space area trading imported goods. The characteristics in wholesale establishments are: (1) annual sales in wholesale activity, (2) annual sales other than in wholesale activity, (3) degree of specialisation (annual sales other than wholesale activity divided

Table 4.3: Summary of the Cross Tabulation Results: 1993

	Retail		Wholesale	
	Male	Female	Male	Female
Average hourly wage rate (1,000Yen)	2.70	1.31	4.10	2.17
Standard deviation of hourly wage rate	1.30	0.64	2.14	1.22
Sample size	44,254	65,436	17,068	8,820
Wage difference by sales size	1.52	1.44	2.12	2.15
Wage difference by degree of specialisation	1.25	?1.03	0.97	0.82
Wage difference by age of establishment	1.35	1.44	1.05	?0.99
Wage difference by size of sales area	1.38	1.30	—	—
Average years of education	11.96	12.09	11.97	12.36
Standard deviation of years of education	0.56	0.58	0.51	0.57
Sample size	41,808	33,452	16,967	7,461
Education difference by sales size	1.02	1.03	1.02	1.04
Education difference by degree of specialisation	0.98	1.01	1.01	?1.00
Education difference by age of establishment	0.99	1.003	?1.00	?1.00
Education difference by size of sales area	1.02	1.03	—	—
Average years of tenure	12.98	6.67	15.11	7.13
Standard deviation of years of tenure	5.57	5.48	5.20	4.90
Sample size	40,112	56,665	16,039	7,612
Difference of tenure by sales size	1.58	1.30	1.50	1.37
Tenure difference by degree of specialisation	1.13	1.12	0.67	0.75
Tenure difference by age of establishment	2.04	2.03	2.06	2.35
Tenure difference by size of sales area	1.31	1.36	—	—

by the total sales), (4) the age of establishment.

Notes for Table 4.3:

The figures are obtained from the linked data of the BSWS 1993 and the CC 1991.

?: The difference is not statistically significant, otherwise all the differences are statistically significant at 1%.

Average hourly wage rate is the total monthly wages and salary including both bonus (divided by 12) and over time payments divided by monthly actual hours worked (including over time, excluding lunch time and paid holiday).

Wage difference is ratio of the hourly wage rate; the ratio between the right tail and the left tail of distribution by type establishment. Education difference is ratio of years of education; the ratio between the right tail and the left tail. Tenure difference is ratio of years of tenure; the ratio between the right tail and the left tail.

The difference in comparing the size of sales amount is between establishments with sales 15 billion yen or more (right tail) and establishments with sales less than 0.5 billion yen (left tail).

The difference in comparing the degree of specialisation is between establishments with more than 40% of the total revenues which are not retail or wholesale activity and establishments with less than 0.05% of the total revenues are not retail or wholesale activity.

The difference in comparing the age of establishment is between establishments which exists before 1945 and the establishments established after 1988.

The difference in comparing the sales space area of establishment is between establishments with positive sales area less than 250m^2 and establishments with sales area 10,000m^2 or more.

The coverage of the reference categories are shown in Table 4.

The summary of the cross tabulations is shown in Table 4.3, which exhibits statistically significant differences in hourly wage rate, tenure and education by sales size, by size of sales space area and by gender. In retail industry, the gender differences of hourly wage rate are larger than any other differences among the establishments characteristics shown in Table 4.3. On the contrary in wholesale industry, the sales size differences of hourly wage rate are larger than the gender difference. We found that in retail industry male wage rate even in the smallest size of establishment group (size in terms of sales amount) is higher than female wage rate of the largest establishment group. On the other hand, in wholesale industry male wage rates in smaller establishments are lower than the female wage rate in larger establishments.

Wage difference by degree of specification is significant for both gender in wholesale industry but the difference for female in retail industry is not significant, the difference for male has opposite directions between retail and wholesale industry: the product diversification has positive effect on hourly wage in retail industry and has negative effect in wholesale industry. The age of establishment has positive large (35

Table 4.4: Composition of employment and establishment in comparing the difference in 1993

	The numerator		The denominator	
Annual Sales	15 billion yen or more		Less than 0.5 billion yen	
	employment	establishment	employment	establishment
Retail	36%	6.0%	5.0%	26%
Wholesale	56%	9.4%	1.8%	13%
Specialisation	40% or more		Less than 0.05%	
	employment	establishment	employment	establishment
Retail	0.4%	1.7%	82%	73%
Wholesale	2.0%	2.4%	57%	83%
Age of Establishment	Before 1945		After 1988	
	employment	establishment	employment	establishment
Retail	16%	5%	16%	21%
Wholesale	25%	13%	11%	14%
Sales Area	10,000m^2 or more		Less than 250m^2	
	employment	establishment	employment	establishment
Retail	43%	10%	3%	13%

Note: The ratio is to the total number of employment and to the total number of establishment in each industry.

The left column is the numerator of the figures in Table 4.3.

The right column is the denominator of the figures in Table 4.3.

per cent for male and 44 per cent for female) effects on wage rate in retail industry, but the effect is not large nor significant in wholesale.

The size of sales area which is by definition available only for retail industry has significant positive effect on hourly wages, which are attributed partially to education difference and to tenure difference.

The education differences among the establishment characteristics in Table 4.3 are not large or significant compared to wage rate or to tenure differences especially for wholesale industry. For both industry, female has higher education, and the difference is statistically significant at the level of one per cent. In retail industry, the establishment with large annual sales and with large space area employs workers with longer education and longer tenure than the establishment with small size. And the degree of product specification has opposite effects on years of education between female and male. The retail establishment with wide product variety employs male workers with two per cent shorter education but employs female workers with 1 per cent longer education than the establishment with specificity. The age of establishment has similar effect on education in smaller size than the effect of degree of specialisation.

The tenure differences are all statistically significant, and every difference by type of establishment has the similar effects for both gender: establishment with large amount of sales size, with large space area and with old history (this is rather obvious) has positive effect on tenure in both industries. The degree of specialisation has opposite effects on tenure between the two industries: product diversification has positive on tenure in retail, but negative (minus 33 per cent for male, minus 25 per cent for female) in wholesale. It is said that worker reallocation within one company is a typical employment adjustment in Japan, hence it is easy to assume that product diversification has a positive effect on tenure. But at least in wholesale product diversification does not mean stable employment.[9]

We should look more closely at the wage differences by gender and

[9] Higuchi and Shimpo [1997] reports the gross job creation and destruction in Japan using the Employment Trends Survey. They find relatively small size of the gross job growth rate in Japan, although they suggest that the gross job creation and destruction in retail industry have higher than the other industries. The gross creation rate is about 4 per cent and the gross destruction rate is about 6 per cent in retail industry 1996.

age, in order to complement our later analysis on the demographic composition of employment using labour input function. The hourly wage differences by gender are significant for employees in their 30s and 40s, mainly because the tenure of female workers remains at 8 years but male worker has tenure of longer than 10 years for those in their 30s and longer than 20 years for those in their 40s. The short tenure for female employees is related to high proportion of female part-time workers. But tenure and proportion of part-time workers for those in their 20s are not so different in both genders. Table 4.5 shows that an hourly wage rate difference between gender is from 1.29 to 1.68 depending on sales size of establishment, it means that male employees in their 20s receive the hourly wage rate as high as 1.29–1.68 times those of female. These differences are statistically significant at 1 per cent level. On the other hand, education of females in their 20s is significantly higher than that of male employees in their 20s, except for the establishment with sales figures of 0.5–1.0 billion yen. Tenure of female employees in their 20s is longer than that of male employees for large size establishment. However, tenure of female workers is shorter than that of male for small size establishment with less annual sales than 2 billion yen. The proportion of part-time female workers in their 20s is higher than those of male workers on average, but in establishments with annual sales from 8 to 15 billion yen, this difference is not statistically significant and there is even a higher part-time proportion for male employees.

In wholesale industry, on average, education of female employees in their 20s is 3.1 per cent longer than that of male employees in the same generation. As a result, tenure of male employees in their 20s is 1.9 per cent longer than that of female employees in their 20s, and the proportion of part-time female workers is 1.5 per cent. At the same time there is large wage difference of 66.9 per cent.

All those facts suggest that there is a significant wage difference between the genders of at least 30 per cent, even if all the available conditions of employees and of establishments remain common to both genders. Furthermore the existence of a wage difference is commonly observed for establishments in both retail and wholesale industry; i. e. the difference is not a special phenomenon for specific establishments, but a common characteristics for every establishment.

On the labour supply side there is an possibility that female employees choose a part-time job for its shorter hours rather than higher wage rate. Hours worked for female employees in retail industry are actually shorter than those of male employees for all generations. But the gender difference for hours worked in the 20s is less than five hours per month. Furthermore in wholesale industry, hours worked for females in their 20s in the largest establishment groups are 0.7 hours longer than that of male employees. Average hours worked for females in small sales size establishments are 8 hours longer than those for male employed in large establishments in the wholesale industry. Therefore the explanation for the supply side of labour should not be considered without regards to the labour demand side.

Table 4.5: The wage, education and tenure differences by gender in the age of 20s (1)

Retail

Hourly wage rate

Sales (billion yen)	–0.5	0.5–1	1–2	2–3	3–4	4–6	6–8	8–10	10–15	15–	Total
Female in their 20s	1.176	1.246	1.227	1.199	1.224	1.224	1.297	1.311	1.363	1.563	1.4
Male in their 20s	1.709	2.028	1.995	2.018	1.949	1.912	1.86	1.826	1.752	2.436	2.057
Difference: female= 1	1.45	1.63	1.63	1.68	1.59	1.56	1.43	1.39	1.29	1.56	1 .47

Education

Sales (billion yen)	–0.5	0.5–1	1–2	2–3	3–4	4–6	6–8	8–10	10–15	15–	Total
Female in their 20s	12.18	12.13	12.14	12.13	12.08	12.12	12.11	12.14	12.17	12.22	12.18
Male in their 20s	12.04	12.17	12.16	12.15	12.1	12.06	12.06	12.06	12.05	12.04	12.07
Difference: female= 1	0.989	s1.003	?1.002	?1.002	?1.002	0.995	0.996	0.993	0.990	0.985	0.991

Tenure

Sales (billion yen)	–0.5	0.5–1	1–2	2–3	3–4	4–6	6–8	8–10	10–15	15–	Total
Female in their 20s	2.851	2.944	3.546	3.682	3.615	3.531	3.481	3.422	3.411	3.757	3.595
Male in their 20s	3.276	3.561	3.753	3.64	3.711	3.612	3.319	3.103	3.24	3.725	3.553
Difference: female= 1	1.149	1.210	1.058	?0.989	?1.027	?1.023	?0.953	0.907	?0.950	?0.991	?0.988

Ratio of part-time worker

Sales (billion yen)	–0.5	0.5–1	1–2	2–3	3–4	4–6	6–8	8–10	10–15	15–	Total
Female in their 20s	0.334	0.163	0.211	0.186	0.179	0.173	0.172	?0.179	?0.150	0.055	0.126
Male in their 20s	0.218	0.064	0.057	0.065	0.101	0.116	0.152	?0.175	?0.168	0.034	0.097
Total Female	0.490	0.488	0.544	0.538	0.573	0.564	0.550	0.524	0.478	0.220	0.423
Total Male	0.107	0.039	0.035	0.047	0.060	0.060	0.080	0.097	0.085	0.014	0.046

Table 4.5: The wage, education and tenure differences by gender in the age of 20s (2)

Wholesale

Hourly wage rate

Sales (billion yen)	–0.5	0.5–1	1–2	2–4	4–6	6–8	8–10	10–25	25–50	50–	Total
Female in their 20s	1.305	1.333	1.22	1.367	1.356	1.579	1.731	1.785	1.789	2.351	2.039
Male in their 20s	1.93	1.799	1.867	2.155	2.05	2.246	2.621	2.8	3.118	4.122	3.403
Difference: female= 1	1.479	1.350	1.530	1.576	1.512	1.422	1.514	1.569	1.743	1.753	1.669

Education

Sales (billion yen)	–0.5	0.5–1	1–2	2–4	4–6	6–8	8–10	10–25	25–50	50–	Total
Female in their 20s	12.18	12.29	12.1	12.17	12.25	12.4	12.43	12.48	12.46	12.5	12.45
Male in their 20s	12.01	12.01	12.06	12.09	12.11	12.22	12.15	12.13	12.06	12.03	12.06
Difference: female= 1	0.986	0.977	0.997	?0.993	0.989	0.985	0.977	0.972	0.968	0.962	0.969

Tenure

Sales (billion yen)	–0.5	0.5–1	1–2	2–4	4–6	6–8	8–10	10–25	25–50	50–	Total
Female in their 20s	2.796	3.128	3.298	3.483	3.744	3.128	3.041	3.433	3.1	3.53	3.438
Male in their 20s	3.806	4.13	3.747	3.272	4.033	3.626	3.137	3.239	3.461	3.556	3.504
Difference: female= 1	1.361	1.320	?1.136	0.939	1.077	1.159	1.032	0.943	1.116	1.007	1.019

Ratio of part-time worker

Sales (billion yen)	–0.5	0.5–1	1–2	2–4	4–6	6–8	8–10	10–25	25–50	50–	Total
Female in their 20s	0.048	0.042	0.073	0.070	0.017	?0.053	0.008	?0.021	?0.017	?0	0.015
Male in their 20s	0.004	0.010	0.008	0.014	0.005	?0	0.007	?0.008	?0.015	?0	0.005
Female	0.196	0.279	0.204	0.219	0.103	0.300	0.171	0.099	0.104	0.037	0.091
Male	0.01	0.015	0.009	0.011	0.003	0.002	0.011	0.006	0.008	0	0.003

Notes for Tables 4.5:

? denotes that the difference between male and female is statistically insignificant at least 10% level.

s denotes that the difference between male and female is statistically significant at 5% level.

Otherwise: Statistically significant at 1% level.

4.3.2 The Gross Job Creation and Destruction

In this part, we have tried to obtain the same rate of the gross job creation and destruction as Davis and Haltiwanger [1990] and Davis, Haltiwanger and Schu [1997]. But there are at least two major limitations in our linked data set. Because of these limitations the results we obtained are not simply comparable to the other results.

The first and most important limitation is the sample size of our linked data. Although the BSWS is the most comprehensive official survey on employee's labour condition in Japan, the sample size is small as shown in Table 4.1 and 4.2. The BSWS has added the new establishments almost every year to keep the accuracy of the survey. If the coverage is large enough, the additional data of establishments reflect precisely the characteristics of the newly born establishments such as the number of employment. And the dropped establishments do not always mean that the establishments cease operating. Otherwise, our results suggest that the rate of gross job creation and destruction is over 40 per cent on average, but such a high rate of gross job creation and destruction is contradictory to the observation of tenure and also to the observation of the rate of start-up and shutdown for establishment by the Establishment Census and the other sources.

Figures 4.1–4.3 present the distribution of the gross rate. There is extremely high frequency at the rate of -2.0 (Disappear) and 2.0 Newly added. Because of these high rates of exit from and entry into the sample, we gave up including these tail-end data in the following calculation for the gross job creation (POS) and the gross job destruction (NEG). That is the difference between our results and the other results. Apart from the extreme frequency at the tail-end of the distribution, each shape resembles the other including the results of the US manufacturing given by Davis and Haltiwanger [1990].

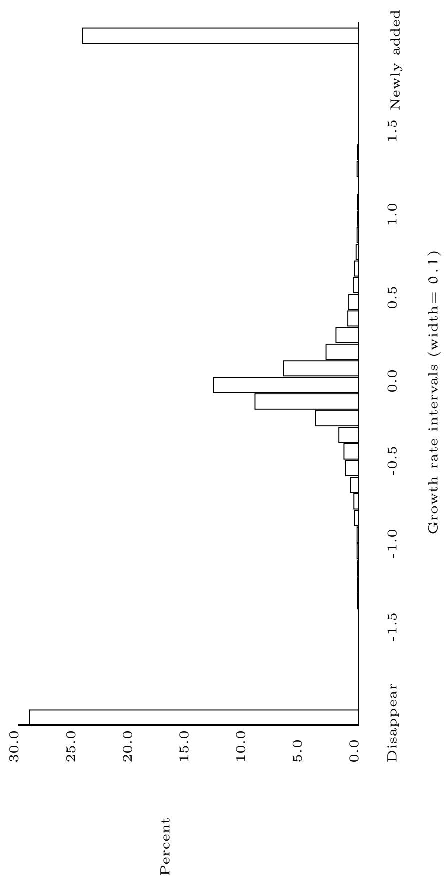


Figure 4.1: Unweighted growth rate distribution of the total employment: Retail industry

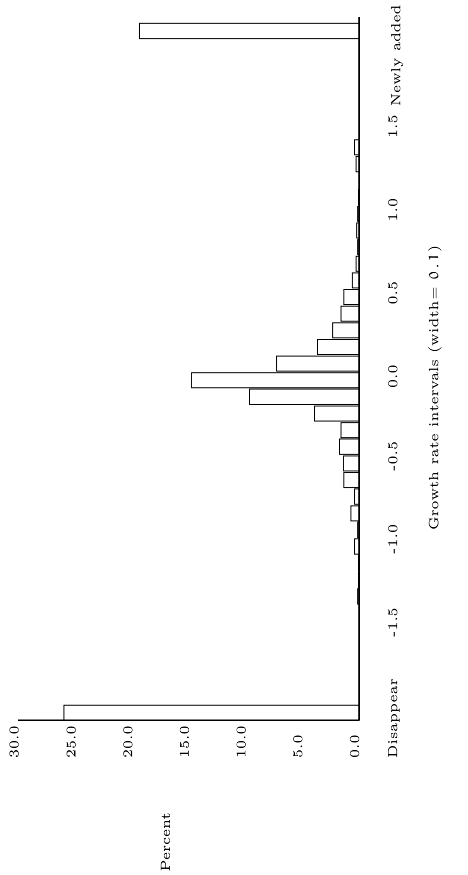


Figure 4.2: Weighted growth rate distribution of the total employment: Retail industry

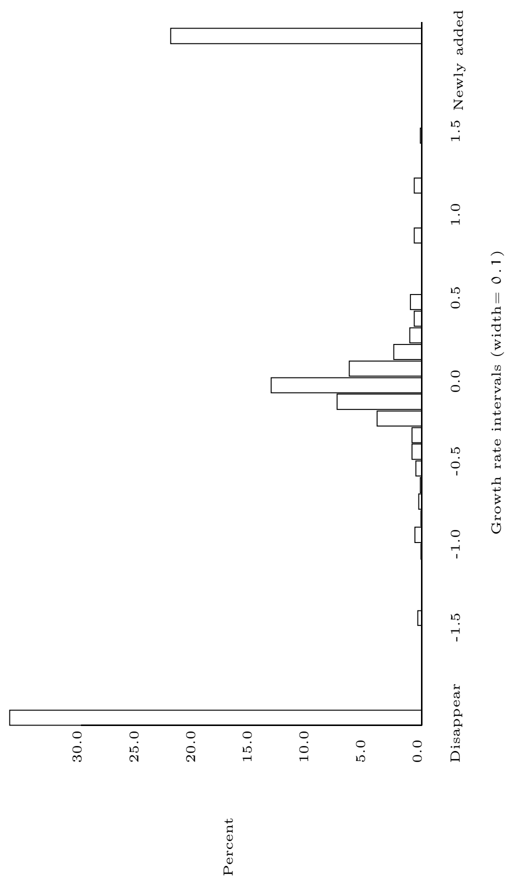


Figure 4.3: Weighted growth rate distribution of the total employment: Wholesale industry

Notes for Tables 4.6 and 4.7

POS: The rate of gross job creation defined by $\mathsf{POS}_s = \sum_{e \in E_s, g_e > 0} w_{es} g_{es}$, where w_{es} is the employment weight for the eth establishment in sector s and g_{es} is defined by $g_{es} = \frac{L_{es,t} - L_{es,(t-1)}}{\frac{L_{es,t} + L_{es,(t-1)}}{2}}$, where $L_{es,t}$ denotes the number of employment of the eth establishment in sector s at time t.

NEG:The rate of gross job destruction defined by $\mathsf{NEG}_s = \sum_{e \in E_s, g_e < 0} w_{es} |g_{es}|$.

NET: The net employment growth rate defined by $\mathsf{NET} = \mathsf{POS} - \mathsf{NEG}$.

SUM: The upper bounds on the worker reallocation rate required to accommodate job reallocation.

MAX: The lower bounds on the worker reallocation rate required to accommodate job reallocation.

Share: The group share of the total employment.

Tenure: The average tenure of employees in terms of years.

Multiple denotes that the establishment is a branch or a head office of the other establishment.

A single denotes that the establishment is operated by individual or has no other branch or head office.

See Davis and Haltiwanger [1990].

Table 4.6: Net and gross rates by size : Retail industry 1993–1994 (1)

Male total

Persons	POS	NEG	NET	SUM	MAX	Share	Tenure
-99	0.1091	0.1072	0.0019	0.2163	0.1722	0.6338	8.554
100-249	0.095	0.1185	-0.0235	0.2134	0.1753	0.1488	10.59
250-499	0.0574	0.0922	-0.0347	0.1496	0.1186	0.0935	11.15
500-999	0.0436	0.075	-0.0314	0.1186	0.0955	0.0545	14.21
1000–	0.0542	0.0496	0.0046	0.1038	0.0818	0.0694	16.34
Total	0.0948	0.1017	-0.0069	0.1965	0.1572	1	9.947

Male general job

Persons	POS	NEG	NET	SUM	MAX	Share	Tenure
-99	0.0956	0.0913	0.0043	0.1869	0.1495	0.6225	9.444
100-249	0.092	0.1089	-0.0169	0.2009	0.1652	0.1529	11.18
250-499	0.0577	0.0779	-0.0202	0.1357	0.1065	0.0923	12.29
500-999	0.0513	0.0774	-0.0261	0.1287	0.0999	0.0578	14.67
1000–	0.0566	0.0424	0.0142	0.099	0.0784	0.0745	16.68
Total	0.0861	0.0883	-0.0022	0.1744	0.1398	1	10.81

Male part-time job

Persons	POS	NEG	NET	SUM	MAX	Share	Tenure
-99	0.2755	0.2977	-0.0222	0.5732	0.4753	0.7802	1.335
100-249	0.4317	0.5978	-0.1662	1.03	0.7899	0.0977	2.863
250-499	0.3436	0.5023	-0.1587	0.8459	0.6875	0.0904	1.659
500-999	0.719	0.4473	0.2717	1.166	1.055	0.0167	2.678
1000–	0.2419	0.3814	-0.1395	0.6233	0.5674	0.0151	1.847
Total	0.3038	0.3493	-0.0455	0.6531	0.5363	1	1.543

Table 4.6: Net and gross rates by size : Retail industry 1993–1994 (2)

Female total

Persons	POS	NEG	NET	SUM	MAX	Share	Tenure
-99	0.1449	0.154	-0.0091	0.2989	0.2454	0.5164	4.575
100-249	0.1377	0.1241	0.0136	0.2618	0.2073	0.2101	5.031
250-499	0.1032	0.1561	-0.0529	0.2594	0.2037	0.1334	4.873
500-999	0.07	0.1396	-0.0696	0.2095	0.1681	0.0706	5.462
1000–	0.0775	0.0827	-0.0052	0.1602	0.1028	0.0695	7.608
Total	0.1279	0.142	-0.0142	0.2699	0.2164	1	4.984

Female general job

Persons	POS	NEG	NET	SUM	MAX	Share	Tenure
-99	0.1739	0.1715	0.0025	0.3454	0.2687	0.4514	6.22
100-249	0.1577	0.206	-0.0483	0.3638	0.2776	0.1893	5.691
250-499	0.1245	0.1316	-0.0071	0.2562	0.2049	0.1391	6.345
500-999	0.0614	0.1166	-0.0552	0.178	0.1375	0.0991	6.6
1000–	0.0798	0.0772	0.0025	0.157	0.0985	0.1211	8.341
Total	0.1414	0.1556	-0.0142	0.2971	0.2279	1	6.432

Female part-time

Persons	POS	NEG	NET	SUM	MAX	Share	Tenure
-99	0.1567	0.1647	-0.008	0.3213	0.2601	0.5955	4.007
100-249	0.2404	0.1422	0.0982	0.3826	0.2919	0.2209	5.605
250-499	0.207	0.1647	0.0423	0.3717	0.2738	0.1141	4.831
500-999	0.2185	0.1613	0.0572	0.3798	0.2994	0.0421	4.804
1000–	0.1972	0.1386	0.0586	0.3358	0.2441	0.0275	6.171
Total	0.1846	0.1589	0.0258	0.3435	0.2699	1	4.547

Table 4.7: Net and gross rates by ownership type: Retail industry 1993–1994

Male total	POS	NEG	NET	SUM	MAX	Share	Tenure
Multiple	0.0971	0.0985	-0.0014	0.1955	0.154	0.866	10.26
A single	0.0802	0.1228	-0.0426	0.2029	0.1782	0.134	7.931
Total	0.0948	0.1017	-0.0069	0.1965	0.1572	1	9.947

Male general job	POS	NEG	NET	SUM	MAX	Share	Tenure
Multiple	0.0902	0.0891	0.0011	0.1793	0.143	0.8815	10.97
A single	0.0556	0.0823	-0.0267	0.138	0.1155	0.1185	9.662
Total	0.0861	0.0883	-0.0022	0.1744	0.1398	1	10.81

Male part-time job	POS	NEG	NET	SUM	MAX	Share	Tenure
Multiple	0.3606	0.4066	-0.0459	0.7672	0.6222	0.7116	1.74
A single	0.1635	0.2079	-0.0444	0.3714	0.3242	0.2884	1.059
Total	0.3038	0.3493	-0.0455	0.6531	0.5363	1	1.543

Female total	POS	NEG	NET	SUM	MAX	Share	Tenure
Multiple	0.1311	0.1442	-0.0131	0.2752	0.2169	0.8636	5.059
A single	0.1075	0.1286	-0.0211	0.2361	0.2138	0.1364	4.508
Total	0.1279	0.142	-0.0142	0.2699	0.2164	1	4.984

Female general job	POS	NEG	NET	SUM	MAX	Share	Tenure
Multiple	0.1422	0.1596	-0.0174	0.3018	0.2246	0.8655	6.428
A single	0.1366	0.1302	0.0063	0.2668	0.2492	0.1345	6.459
Total	0.1414	0.1556	-0.0142	0.2971	0.2279	1	6.432

Female part-time	POS	NEG	NET	SUM	MAX	Share	Tenure
Multiple	0.1946	0.1666	0.028	0.3611	0.279	0.8574	4.733
A single	0.1249	0.1125	0.0124	0.2375	0.2154	0.1426	3.432
Total	0.1846	0.1589	0.0258	0.3435	0.2699	1	4.547

Table 4.8: Net and gross rates by size of sales area: Retail industry 1993–4

	Total						
Sales Area	POS	NEG	NET	SUM	MAX	Share	Tenure
–100m^2	0.0887	0.1101	-0.0214	0.1987	0.1101	0.3042	7.754
100-500	0.1297	0.1494	-0.0197	0.2791	0.1494	0.1818	4.757
500-1000	0.1779	0.0805	0.0974	0.2584	0.1779	0.0633	5.852
1000-1500	0.1223	0.0954	0.0269	0.2177	0.1223	0.0638	6.055
1500-2000	0.097	0.1369	-0.0398	0.2339	0.1369	0.0159	6.043
2000-3000	0.1508	0.1195	0.0312	0.2703	0.1508	0.0326	7.019
3000-4000	0.1102	0.0801	0.0301	0.1903	0.1102	0.0186	7.152
4000-5000	0.0785	0.1275	-0.049	0.2059	0.1275	0.0261	6.165
5000–	0.0731	0.1026	-0.0295	0.1757	0.1026	0.2937	8.244
Total	0.1016	0.1128	-0.0112	0.2145	0.1223	1	7.02

Notes: The notation is the same as in Tables 4.6 and 4.7.

The Large Scale Retail Store's Law has regulation boundaries at 500m^2 and 3000m^2, which was 1500m^2 until 1991.

The rate of gross job creation for total employment is 10.2 per cent and the rate of gross job destruction for the total employment is 11.3 per cent. This presents a higher result than that of the previous study given by Higuchi and Shimpo [1997], where they reported the rate as 4.0 per cent for job creation and 5.0 per cent for job destruction in retail industry 1994. However our results neglect job creation from newly entered establishments and job destruction by shutdown or exclusion from the sample of the BSWS.[10]

The most comprehensive data on start-up and shutdown of establishment are the Establishment Census. It reports that the rate of

[10]Higuchi and Shimpo based on the Employment Trend Survey which is more specialised to survey on employment than the BSWS. Unfortunately they do not report the coverage of the Employment Trend Survey or the sample size of the survey; they just mention that the survey is based on the Establishment Census and new establishments are added into the sampling frame as the BSWS. The BSWS includes more information on labour conditions than any other labour statistics, but the reported number of employed persons is designed as the weight in calculating wages and salaries. The Labour Force Survey (the special issue) reports reasons for unemployment, and it shows that in 1994 29.5 per cent of the total number of job redundancies are due to employer's reasons such as shutdown, layoff and other employment reduction.

Table 4.9: Net and gross rates by size of sales area: Retail industry 1993–4

Male total

Sales area	POS	NEG	NET	SUM	MAX	Share	Tenure
–100m^2	0.0875	0.0858	0.0017	0.1733	0.0875	0.4707	9.633
100-500	0.1409	0.1736	-0.0328	0.3145	0.1736	0.1431	6.538
500-1000	0.1568	0.1096	0.0472	0.2665	0.1568	0.0448	8.184
1000-1500	0.1524	0.0616	0.0908	0.214	0.1524	0.0455	8.542
1500-2000	0.0949	0.1124	-0.0175	0.2073	0.1124	0.0122	8.39
2000-3000	0.0924	0.1792	-0.0868	0.2715	0.1792	0.0251	10.59
3000-4000	0.0733	0.0879	-0.0146	0.1612	0.0879	0.0129	10.62
4000-5000	0.0658	0.1321	-0.0663	0.1979	0.1321	0.0182	8.94
5000–	0.061	0.0851	-0.0241	0.1461	0.0851	0.2276	13.42
Total	0.0948	0.1017	-0.0069	0.1965	0.1087	1	9.947

Male general job

Sales area	POS	NEG	NET	SUM	MAX	Share	Tenure
–100m^2	0.0824	0.0772	0.0052	0.1596	0.0824	0.4866	10.16
100-500	0.127	0.1352	-0.0082	0.2623	0.1352	0.1205	8.266
500-1000	0.0949	0.1175	-0.0226	0.2123	0.1175	0.0425	9.276
1000-1500	0.1435	0.0511	0.0924	0.1946	0.1435	0.0458	9.195
1500-2000	0.0766	0.0984	-0.0218	0.175	0.0984	0.0125	8.842
2000-3000	0.0925	0.1742	-0.0816	0.2667	0.1742	0.0263	11
3000-4000	0.0739	0.0877	-0.0138	0.1616	0.0877	0.0135	11.03
4000-5000	0.0797	0.1003	-0.0206	0.18	0.1003	0.0174	10.08
5000–	0.0609	0.0783	-0.0174	0.1392	0.0783	0.2349	14.2
Total	0.0861	0.0883	-0.0022	0.1744	0.0951	1	10.81

Male part-time job

Sales area	POS	NEG	NET	SUM	MAX	Share	Tenure
–100m^2	0.2365	0.252	-0.0155	0.4885	0.252	0.3265	1.58
100-500	0.2135	0.3206	-0.107	0.5341	0.3206	0.3744	1.112
500-1000	0.5223	0.3492	0.1731	0.8715	0.5223	0.0723	1.623
1000-1500	0.595	0.4391	0.1559	1.034	0.595	0.0404	1.914
1500-2000	0.4858	0.5842	-0.0984	1.07	0.5842	0.0094	2.532
2000-3000	0.39	0.4923	-0.1023	0.8823	0.4923	0.0118	2.662
3000-4000	0.5345	0.8327	-0.2982	1.367	0.8327	0.0077	3.609
4000-5000	0.3711	0.5619	-0.1907	0.933	0.5619	0.0218	2.102
5000–	0.4677	0.5455	-0.0778	1.013	0.5455	0.1355	2.121
Total	0.3038	0.3493	-0.0455	0.6531	0.3681	1	1.543

Notes: The notation is the same as in Tables 4.6 and 4.7.

The Large Scale Retail Store's Law has regulation boundaries at 500m^2 and 3000m^2, which was 1500m^2 until 1991.

Table 4.10: Net and gross rates by size of sales area: Retail industry 1993–4

Female total

Sales area	POS	NEG	NET	SUM	MAX	Share	Tenure
–100m^2	0.1262	0.1877	-0.0615	0.3139	0.1877	0.1883	4.486
100-500	0.1471	0.1606	-0.0134	0.3077	0.1606	0.2088	3.908
500-1000	0.2074	0.0895	0.1179	0.2969	0.2074	0.0762	4.898
1000-1500	0.1327	0.1323	0.0004	0.265	0.1327	0.0765	5.026
1500-2000	0.1187	0.1688	-0.0502	0.2875	0.1688	0.0184	4.957
2000-3000	0.1872	0.1015	0.0857	0.2887	0.1872	0.0378	5.372
3000-4000	0.1351	0.0871	0.0479	0.2222	0.1351	0.0226	5.774
4000-5000	0.0962	0.1382	-0.042	0.2344	0.1382	0.0316	5.055
5000–	0.0943	0.1263	-0.032	0.2207	0.1263	0.3398	5.831
Total	0.1279	0.142	-0.0142	0.2699	0.1554	1	4.984

Female general job

Sales area	POS	NEG	NET	SUM	MAX	Share	Tenure
–100m^2	0.1487	0.1602	-0.0115	0.309	0.1602	0.2115	5.76
100-500	0.2056	0.1436	0.0619	0.3492	0.2056	0.1654	5.919
500-1000	0.2238	0.3314	-0.1076	0.5552	0.3314	0.0499	6.632
1000-1500	0.1717	0.1994	-0.0277	0.3711	0.1994	0.0443	6.64
1500-2000	0.1492	0.1515	-0.0023	0.3007	0.1515	0.0149	6.321
2000-3000	0.1307	0.1451	-0.0144	0.2758	0.1451	0.0338	6.924
3000-4000	0.1242	0.1341	-0.01	0.2583	0.1341	0.0234	7.119
4000-5000	0.1496	0.2942	-0.1446	0.4438	0.2942	0.0272	5.685
5000–	0.1015	0.1264	-0.0249	0.2279	0.1264	0.4296	6.89
Total	0.1414	0.1556	-0.0142	0.2971	0.1659	1	6.432

Female part-time job

Sales area	POS	NEG	NET	SUM	MAX	Share	Tenure
–100m^2	0.1633	0.1597	0.0036	0.323	0.1633	0.179	3.618
100-500	0.1353	0.1725	-0.0371	0.3078	0.1725	0.2524	3.23
500-1000	0.2436	0.1275	0.116	0.3711	0.2436	0.0982	4.935
1000-1500	0.1681	0.1281	0.04	0.2962	0.1681	0.0997	5.459
1500-2000	0.1846	0.1953	-0.0107	0.3799	0.1953	0.0197	5.351
2000-3000	0.1323	0.1116	0.0206	0.2439	0.1323	0.0403	5.273
3000-4000	0.2323	0.1523	0.08	0.3847	0.2323	0.0216	5.577
4000-5000	0.2193	0.148	0.0713	0.3674	0.2193	0.0344	5.671
5000–	0.2318	0.1755	0.0562	0.4073	0.2318	0.2546	5.584
Total	0.1846	0.1589	0.0258	0.3435	0.1942	1	4.547

The notation is the same as in Tables 4.6 and 4.7.

The Large Scale Retail Store's Law has regulation boundaries at 500m^2 and 3000m^2, which was 1500m^2 until 1991.

Table 4.11: Net and gross rates by size : Wholesale industry 1993–4 (1)

Male total

Persons	POS	NEG	NET	SUM	MAX	Share	Tenure
-99	0.0715	0.0978	-0.0263	0.1693	0.1322	0.6166	11.58
100-249	0.2539	0.1825	0.0714	0.4363	0.4082	0.13	13.51
250-499	0.0665	0.1255	-0.0589	0.192	0.1835	0.0368	13
500-999	0.0657	0.0413	0.0244	0.107	0.0894	0.1688	12.86
1000–	0.0215	0.0918	-0.0703	0.1132	0.1117	0.0478	15.44
Total	0.0917	0.1	-0.0083	0.1917	0.1618	1	12.29

Male general job

Persons	POS	NEG	NET	SUM	MAX	Share	Tenure
-99	0.068	0.0932	-0.0252	0.1612	0.1259	0.6155	11.73
100-249	0.25	0.1937	0.0563	0.4437	0.4133	0.1292	13.78
250-499	0.0759	0.1267	-0.0508	0.2026	0.1952	0.0368	13.17
500-999	0.0589	0.0849	-0.026	0.1438	0.117	0.1703	12.92
1000–	0.0199	0.0925	-0.0726	0.1124	0.1106	0.0483	15.49
Total	0.0879	0.106	-0.018	0.1939	0.1633	1	12.43

Male part-time job

Persons	POS	NEG	NET	SUM	MAX	Share	Tenure
-99	0.4541	0.571	-0.1169	1.025	0.9147	0.8597	2.758
100-249	0.2129	0.1552	0.0576	0.3681	0.3681	0.1321	1.676
250-499	0	0	0	0	0	0.0035	0
500-999	0.1481	1.852	-1.704	2	2	0.0047	3.395
1000–	0	0	0	0	0	0	0
Total	0.4192	0.5201	-0.101	0.9393	0.8444	1	2.608

The notation is the same as in Tables 4.6 and 4.7.

Table 4.11: Net and gross rates by size : Wholesale industry 1993–4 (2)

Female total

Persons	POS	NEG	NET	SUM	MAX	Share	Tenure
-99	0.1145	0.1448	-0.0303	0.2593	0.201	0.5333	5.061
100-249	0.2425	0.0892	0.1533	0.3317	0.3046	0.1447	5.046
250-499	0.252	0.0578	0.1943	0.3098	0.3018	0.0511	3.678
500-999	0.0659	0.0604	0.0055	0.1263	0.1222	0.2282	4.261
1000–	0.0154	0.0588	-0.0434	0.0742	0.068	0.0427	6.966
Total	0.1247	0.1094	0.0154	0.2341	0.1975	1	4.887

Female general job

Persons	POS	NEG	NET	SUM	MAX	Share	Tenure
-99	0.1054	0.14	-0.0346	0.2455	0.1999	0.5531	5.443
100-249	0.2758	0.091	0.1849	0.3668	0.3246	0.142	5.82
250-499	0.5281	0.1121	0.416	0.6402	0.6346	0.0395	4.868
500-999	0.0346	0.1579	-0.1233	0.1924	0.1619	0.2135	4.432
1000–	0.0248	0.0657	-0.0408	0.0905	0.0728	0.052	6.949
Total	0.127	0.1319	-0.0049	0.2589	0.22	1	5.337

Female part-time job

Persons	POS	NEG	NET	SUM	MAX	Share	Tenure
-99	0.2925	0.3011	-0.0086	0.5936	0.5206	0.4961	4.01
100-249	0.3296	0.23	0.0996	0.5597	0.5226	0.1593	3.034
250-499	0.2546	0.6712	-0.4165	0.9258	0.9184	0.0711	3.07
500-999	0.368	0.1462	0.2218	0.5142	0.4741	0.2625	5.145
1000–	0.1538	0.0769	0.0769	0.2308	0.2308	0.011	7.635
Total	0.314	0.273	0.0411	0.587	0.5338	1	4.125

The notation is the same as in Tables 4.6 and 4.7.

Table 4.12: Net and gross rates by ownership type : Wholesale industry 1993–4

Male total

	POS	NEG	NET	SUM	MAX	Share	Tenure
Multiple	0.0948	0.1063	-0.0115	0.2011	0.1697	0.8408	12.61
A single	0.0752	0.0668	0.0083	0.142	0.1198	0.1592	10.56
Total	0.0917	0.1	-0.0083	0.1917	0.1618	1	12.29

Male general job

	POS	NEG	NET	SUM	MAX	Share	Tenure
Multiple	0.0905	0.1137	-0.0233	0.2042	0.1717	0.8445	12.72
A single	0.074	0.0637	0.0103	0.1377	0.1177	0.1555	10.88
Total	0.0879	0.106	-0.018	0.1939	0.1633	1	12.43

Male part-time job

	POS	NEG	NET	SUM	MAX	Share	Tenure
Multiple	0.5079	0.6285	-0.1206	1.136	1.044	0.5079	2.531
A single	0.3276	0.4083	-0.0807	0.7359	0.6383	0.4921	2.688
Total	0.4192	0.5201	-0.101	0.9393	0.8444	1	2.608

Female total

	POS	NEG	NET	SUM	MAX	Share	Tenure
Multiple	0.1323	0.1079	0.0243	0.2402	0.2036	0.8404	4.821
A single	0.085	0.1168	-0.0318	0.2018	0.1656	0.1596	5.235
Total	0.1247	0.1094	0.0154	0.2341	0.1975	1	4.887

Female general job

	POS	NEG	NET	SUM	MAX	Share	Tenure
Multiple	0.1343	0.1339	0.0004	0.2682	0.2281	0.8604	5.206
A single	0.0818	0.1196	-0.0377	0.2014	0.1701	0.1396	6.141
Total	0.127	0.1319	-0.0049	0.2589	0.22	1	5.337

Female part-time job

	POS	NEG	NET	SUM	MAX	Share	Tenure
Multiple	0.3518	0.2897	0.0621	0.6415	0.5865	0.7457	4.25
A single	0.2034	0.224	-0.0206	0.4273	0.3793	0.2543	3.759
Total	0.314	0.273	0.0411	0.587	0.5338	1	4.125

The notation is the same as in Tables 4.6 and 4.7.

shutdown and the rate of start-up establishment to the total number of establishments is about 5 per cent for both. The rates are less than half of those in the United States. Therefore we decided to exclude disappeared establishments from the sample and also to exclude newly added establishments into the sample in calculation of the gross rate.

The tabulations are executed by establishment size in terms of number of persons employed, by 3 digit industry classification, by age of establishment, by type of ownership, by region, and by size of sales area (for retail industry). Each tabulation table is divided by gender and by employment status. The employment status represents whether employee is a general worker or a part-time worker. The definition of part-time worker is a person who works shorter hours than a person who works under office regulations.[11] We can interpret the employment status as job opportunity, although it represents employee's working status. The gross job creation for male part-time worker implies the gross creation of male part-time job opportunity and the gross job destruction for female general worker implies the gross destruction of female general job opportunity. The concept of job creation and job destruction has reality in the manufacturing industry, but it is not so apparent in commercial industry, especially in Japan. This is because the job is not so related to special skill or to occupation of employee in commercial industry as in the manufacturing industry. Job creation is rather related to general opportunity of employment in commercial industry.[12]

Table 4.6–4.7 results show clear differences of the rate of gross job creation and destruction between gender and employment status. The rate of gross job creation and destruction for a male general job is decreasing in proportion to the size of both commercial industries,

[11]There is one more distinction of the employment status, which categorises employees into regular workers or temporary workers. For details see footnote 5.

[12]For example the plant in manufacturing industry has machines where operating staff are required to have skill to operate them. If the machine becomes obsolete, accordingly, the operator's skill become out of date. In commercial industry, location of establishment rather than machine tool is one of the important factors which determines further growth opportunity for employment. For example, the wholesale establishment in Japan strongly concentrates in big city such as Tokyo or Osaka (each area occupies around 30 per cent of the total employment) and the retail store often locates near stations. If the location as a whole becomes out of fashion, shops have to leave and set up alternative locations.

except for the smallest establishments with less than 100 persons. This is the same for a female general job in the retail industry. But in the wholesale industry, the rate of gross job creation and destruction for a female general job is highest in the middle sized establishment. For part-time jobs, there is no such clear relationship between the gross rate and the size of establishment. Because the sample covers mostly large scale establishments and their general worker, the resulting rate of job creation and destruction will be smaller than that of our results.

The result classified by ownership type in retail industry shows in Table 4.7: both male general and female general jobs in multiple establishments have larger rate of job creation and destruction than that of a single establishment, net job growth rate for male general job is positive in multiple establishment and negative in a single establishment, and that for female general job is negative in multiple and positive in a single establishments. The rate of gross job creation and destruction for part-time jobs in both genders is larger in multiple establishments than in single establishments. The net growth of male part-time jobs is negative in both ownership types, and the net growth of female part-time jobs is positive in both ownership types in the retail industry. In the wholesale industry, Table 4.12 shows that magnitude of the gross rate has the same directions as in retail industry, but the net growth rate for male general job is negative in multiple establishments and positive in single establishments, the net growth rate for female general jobs is positive in multiple and negative in a single establishments. The net growth rate of male part-time jobs is negative in both cases; the net growth rate of female is positive in multiples and negative in a single establishments in the wholesale industry.

The data on sales space area are available for retail industry, Table 4.9–4.10 show the results. We paid special attention to sales space areas for retail stores, because there is a strict regulation on start-up of large scale shops, which is called the Large Scale Retail Store's Law. This law restricts start-up of all shops with sales areas of over 500m^2.

The first type of store with a sales space area of over 3000m^2 is required to be scrutinised considerably longer than that of the second type of store with sales a area of from 500m^2 to 3000m^2. The supervisors are the Minister of International Trade and Industry and the governor of the local government. They say that there are additional local government regulations for shops with space areas of less than 500m^2. The supervisors consider that the effects of start-up of large scale shops on the business activity of the smaller shops in the surrounding region. And the authority regulates the opening days and hours of the large scale shop as well as the sales space area.

The law has been considerably amended from 1991, especially concerning of the border of the sales space area between the first type shop and the second type shop which is increased from 1500m^2 to 3000m^2. The amended law was put in force from 31 January 1992.

The law itself is going to be abolished now in consideration of Congress, but the alternative law will supercede. The new law is going to restrict start-up of the shop with a sales space area over 1000m^2. The lower limit of restrictions of space area is larger than that of the previous law, and the new law does not intend to protect business activity of large scale shops, but to regulate availability of parking spaces, noise and other environmental conditions of shops. The regulator of the law is going to the local government.

The net growth rates in Table 4.9–4.10 are consistently negative for establishments with sales areas of $1500\text{–}2000\text{m}^2$. In particular, the net growth rate of female part-time job is negative for establishments with $1500\text{–}2000\text{m}^2$. The observation period 1993–1994 is one year after the reform of the Large Scale Store's Law, when the establishments were still in adjustment process.

The rate of gross job creation and destruction of establishments with sales areas of less than 1500m^2 is relatively higher than in other categories of establishments; this is the common characteristics for small size establishments.[13]

But the gross creation rate of the total employees in the establishments with sales areas of more than 2000m^2 is also higher than that of the establishments with sales areas of $1500\text{–}2000\text{m}^2$. The net job growth rate for female general workers is positive in establishments with sales areas of $100\text{–}500\text{m}^2$, while at the same time, the rate for female part-time workers is negative in the same establishment. In the other categories of establishments, the net growth rate for female

[13] The exception is the smallest categories of establishments with sales areas of less than 100m^2, establishments with no sales area such as head office included in these categories. This head office effect can disturb the general tendency.

general jobs is of negative.

The male part-time job in establishments with sales areas of 500–1000m^2 increases over 15 per cent, and at the same time the female part-time job also increases. This suggests that there is significant re-employment of elderly male workers in this category of establishments. The result of the cross tabulation shows that the proportion of male part-time workers in their 60s is 15.5 per cent in this category of establishment. This ratio is relatively smaller than 40 per cent which is a typical proportion of male part-time workers in their 60s in the other categories of establishments with sales areas of more than 1000m^2.

These findings suggests: first of all, the employment policy in the retail industry reduces the general job for both genders and also reduces the part-time job for the male. The exception is for shops with sales area of 500–1000^2 which are affected by the regulation change. Secondly the employment policy in the retail industry increases the part-time job for the female, except for shops with sales areas of 1500–2000m^2 and of less than 500^2 which are also affected by the regulation change. We will investigate the static effect of the regulation more closely in the next section.

4.4 Estimating Labour Input Functions

There are a few previous studies on labour demand function using micro data in Japan. None of them pays attention to demographic components of labour demand, hence the specification is not different from that of time series analyses, such as log linear form ([13] and [21]) or share functions derived by flexible functional form ([14] and [16]) using logarithm or inverse of square root. These analyses all emphasised the importance of non-homothetic relation between labour and production, because their analyses focused on manufacturing industry, especially heavy industry, and quite naturally it reflects the period the papers were written in.

Our problem is that we have to give up taking logarithms of number of persons employed because there is much zero employment for some of the demographic categories of labour, such as female workers in their 60s. It means that all the demographic categories of labour are not always employed in every establishment. There is not only no information on labour conditions for such categories of employment, but also no information on job applicants for such categories of employment. Thus estimation of labour demand by demographic category brings censored data problem into labour demand analysis.

In this paper we employ the conventional Tobit estimation of a single equation to each categories of labour, rather than develop the system of the equation with 10 dimension normal distribution. As we mentioned earlier in this paper, this simplification reduces the efficiency of the estimator because the single equation estimation discards information of correlation between the equations.

We should point out one more qualification on the estimation of labour demand: we neglect wage rate effects. We have tried to incorporate wage rate into the equations of truncated regression which uses the data for employed persons only. But the rate of convergence is extremely slow in this situation, and after 200 iterations we cannot find the solution. The reason is multicollinearity which is caused by the very high correlation between the wage rates of each demographic category.

Our focus on this section is to reveal the relationship between employment structure and the characteristics of establishment such as sales areas and annual sales size. The estimated equation is a static model because of lack of enough longitudinal data.

4.4.1 Formulation of labour input functions

We have estimated basically five types of equation according to formulation of the dependent variable. First, the dependent variable is the number of persons employed L_i $(i = 1 \ldots m)$ or the sum of the working hours for each employee $Lh_i = \sum_j^{n_i} Lh_{ji}$ $(i = 1 \ldots m)$, where m denotes the number of demographic category $(m = 10)$, and n_i denotes the number of person employed in ith demographic category.

For each demographic category, we apply the same type of equations as follows:

$$
\begin{aligned}
L_{ij} &= \alpha_{0i} + \alpha_{1i}X_j + \alpha_{2i}X_j^2 + \alpha_{3i}OX_j + \alpha_{4i}OX_j^2 \\
&\quad +\alpha_{5i}YR_j + \alpha_{6i}YR_j^2 + \alpha_{7i}S_j + \alpha_{8_j}S_j^2 + e_j \\
&\quad \text{ if } L{*}_{ij} > 0 \qquad\qquad (4.1) \\
L_{ij} &= 0 \quad \text{if } L\,{*}_{ij} \leq 0 \\
&\quad (i = 1, \ldots, m), \quad (j = 1, \ldots, n)
\end{aligned}
$$

where i denotes the i demographic category, m denotes the number of the demographic category in this case $m = 10$, that is, five generations for each gender, j denotes the jth establishment, n denotes the number of establishments, that is, the sample size of this estimation, e_j denotes error with normal distribution with mean zero and variance σ_i^2, and $L{*}_{ij} \sim N[\mu_i, \sigma_i^2]$. The parameters to be estimated are α_{ki} and σ_i where $(k = 0, \ldots, 8)$, and $(i = 1, \ldots, m)$. The independent variables are defined as follows:

X_j the annual sales value from commercial activity in terms of billion yen.

OX_j the annual revenue from non commercial activity in terms of billion yen.

YR_j the age of establishment in terms of the number of years.

S_j the sales space area of establishment in terms of 100m^2, this is only for retail industry.

These equations are for the number of employed persons.

The next equations are for the hours worked for each demographic category:

$$
\begin{aligned}
Lh_{ij} &= \alpha_{0i} + \alpha_{1i}X_j + \alpha_{2i}X_j^2 + \alpha_{3i}OX_j + \alpha_{4i}OX_j^2 \\
&\quad +\alpha_{5i}YR_j + \alpha_{6i}YR_j^2 + \alpha_{7i}S_j + \alpha_{8_j}S_j^2 + e_j \\
&\quad \text{ if } Lh{*}_{ij} > 0 \qquad\qquad (4.2) \\
Lh_{ij} &= 0 \quad \text{if } Lh\,{*}_{ij} \leq 0 \\
&\quad (i = 1, \ldots, m), \quad (j = 1, \ldots, n)
\end{aligned}
$$

where the notations are the same as the previous equation. But obviously the parameters shall take different values from the previous equations.

We have also estimated the following equations which are labour coefficients for each demographic categories:

$$
\begin{aligned}
\frac{L_{ij}}{X_j} &= \beta_{0i} + \beta_{1i}\ln X_j + \beta_{2i}(\ln X_j)^2 + \beta_{3i}\frac{OX_j}{OX_j + X_j} \\
&\quad + \beta_{4i}\left(\frac{OX_j}{OX_j + X_j}\right)^2 + \beta_{5i}YR_j + \beta_{6i}YR_j^2 + \beta_{7i}\ln S_j \\
&\quad + \beta_{8_j}(\ln S_j)^2 + e_j \quad \text{if } \frac{L*_{ij}}{X_j} > 0 \qquad (4.3) \\
\frac{L_{ij}}{X_j} &= 0 \quad \text{if } \frac{L*_{ij}}{X_j} \leq 0 \\
&\quad (i = 1, \ldots, m), \quad (j = 1, \ldots, n)
\end{aligned}
$$

where i denotes the i demographic category, m denotes the number of the demographic category in this case $m = 10$, that is, five generations for each gender, j denotes the jth establishment, n denotes the number of establishments, that is, the sample size of this estimation, e_j denotes error with normal distribution with mean zero and variance σ_i^2, and $\frac{L*_{ij}}{X_j} \sim N[\mu_i, \sigma_i^2]$. The parameters to be estimated are β_{ki} and σ_i where $(k = 0, \ldots, 8)$, and $(i = 1, \ldots, m)$ The independent variables are the same definition as the previous equations. The variables $\frac{OX_j}{OX_j + X_j}$ denotes the degree of specialisation. This type of equation explains variation of the inverse of labour productivity by characteristics of the establishment.

The same equations for labour input (sum of hours worked) are as follows:

$$
\begin{aligned}
\frac{Lh_{ij}}{X_j} &= \beta_{0i} + \beta_{1i}\ln X_j + \beta_{2i}(\ln X_j)^2 + \beta_{3i}\frac{OX_j}{OX_j + X_j} \\
&\quad + \beta_{4i}\left(\frac{OX_j}{OX_j + X_j}\right)^2 + \beta_{5i}YR_j + \beta_{6i}YR_j^2 + \beta_{7i}\ln S_j \\
&\quad + \beta_{8_j}(\ln S_j)^2 + e_j \quad \text{if } \frac{Lh*_{ij}}{X_j} > 0 \qquad (4.4) \\
\frac{Lh_{ij}}{X_j} &= 0 \quad \text{if } \frac{Lh*_{ij}}{X_j} \leq 0 \\
&\quad (i = 1, \ldots, m), \quad (j = 1, \ldots, n)
\end{aligned}
$$

The notation of the equation is the same as the previous equations.

Finally, we formulate the share function as follows:

$$\begin{aligned}
\frac{whL_{ij}}{C_j} &= \gamma_{0i} + \gamma_{1i}\ln X_j + \gamma_{2i}(\ln X_j)^2 + \gamma_{3i}\frac{OX_j}{OX_j + X_j} \\
&\quad + \gamma_{4i}\left(\frac{OX_j}{OX_j + X_j}\right)^2 + \gamma_{5i}YR_j + \gamma_{6i}YR_j^2 + \gamma_{7i}\ln S_j \\
&\quad + \gamma_{8_j}(\ln S_j)^2 + e_j \quad \text{if } \frac{whL*_{ij}}{C_j} > 0 \qquad (4.5) \\
\frac{whL_{ij}}{C_j} &= 0 \quad \text{if } \frac{whL*_{ij}}{C_j} \leq 0 \\
&\quad (i = 1, \dots, m), \quad (j = 1, \dots, n)
\end{aligned}$$

where C_j denotes the total labour cost, that is $C_j = \sum_{i=1}^{m} whL_{ij}$, whL_{ij} is the labour cost of the ith category of labour employed by the jth establishment. The other notation is the same as the previous equations.

We have estimated the above equations for each industry and for each year, the total estimated number of equations are at least 10 (demographic category) times 2 (industries) times 3 (years) times 5 (types of equations). We also have estimated the first type of equations for manufacturing industry. The estimation procedure is the maximum likelihood for censored distribution, called by the Tobit regression model.

4.4.2 The estimated results of labour input functions

Table 4.13–4.14 shows the summary of the estimated equations. The results on the dependent variables of L and Lh have basically the same sign of the estimated parameters, hence the results on L/X and Lh/X have the same as well.

The results on the number of employees and labour inputs (L and Lh) in the retail industry are summarised as follows:

1 Output activity (measured by X) has positive significant first order effects on male employment (man L and man-hour Lh) and negative significant second order effects (measured by X^2) on male employment. This means that increment of demand for male labour is decreasing as sales size of shops grows.

2 The same effect of output activity on female employment is observed.

3 Output activity other than retail activity (measured as OX) has positive significant first order effects on male employment, but it does not have clear effect on female employment.

4 Age of establishment has positive effects (in first order) on male employment in their 40s and 50s, but negative effects on female employment in their 20s, 30s and 40s. But the second order effects are not so significant or consistent as the first order effects.

5 Sales space area has positive first order effects on female employment for all generations and negative second order effects on female employment except for employment in their 20s. Sales space area does not have consistent effects on male labour demand.

The results on the labour coefficients (L/X and Lh/X) in the retail industry are summarised as follows:

1 Output activity (measures by lnX) has negative significant first order effects on the labour coefficients L/X, Lh/X of male and female employees in all generations. This means that labour productivity (the inverse of labour coefficient) for both gender is increasing as sales size of shops grows at first order. But the second order effects of output activity have positive significant effects on the labour coefficients of all generations and genders except for employees in their 60s. This implies that diminishing increase of labour productivity is observed as output activity grows. These results are consistent as the model for L and Lh.

2 There is no significant effects of degree of specialisation (measured by OX/(OX+X) on labour productivity, possible exceptions are male employees in their 50s. It is plausible from causal observations that male employees in their 50s start their second career in a different field from their previous jobs.

3 Age of establishment has positive first order effects on the labour coefficients of male employees in their 20s and 60s, and negative

second order effects on every generation and gender except for male employees in their 50s and 60s. This means that labour productivity is high in young establishments or in old establishment.

4 Sales space area has positive first order effects on the labour coefficients of female employees under the age of 60, negative second order effects on the labour coefficients of female employees under the age of 60. This means that labour productivity of female employees except for their 60s is high in small scale establishments or in large scale establishment.

The results on the labour's share by demographic category (whL/C) in the retail industry are summarised as follows:

1 Output activity has positive significant first order effects on the labour's shares for male employees in their 20s and 30s, and negative significant first order effects on the shares for female employees in their 30s, 40s, 50s and 60s. It suggests that the establishment distributes more for young male workers than female workers as output increases.

2 Age of establishment has positive significant first order effects on the labour's shares for male employees in their 40s and 50s and female employees in their 50s, negative first order effects on the shares for female employees in their 20s and 30s. The old establishment distributes more for employees in their 40s and 50s rather than young female employees.

3 Sales space area has significant positive first order effects on the labour's share of female employees in their 20s, 30s and 40s. But it does not have significant or consistent effects on the labour's share for male employees. It suggests that the shop with large sales space areas distributes more for female employees than male employees.

The results on the number of employees and labour inputs (L and Lh) in the wholesale industry are summarised as follows:

1 Output has positive significant first order effects and negative significant second order effects on the number of employees and

labour inputs for both genders under the age of 60. This effect is the same as that of the retail industry.

2 Other characteristics of establishments have no significant effects on employment in the wholesale industry.

The results on the labour coefficients (L/X and Lh/X) in the wholesale industry are summarised as follows:

1 Output has negative first order effects and positive second order effects on the labour coefficients for both genders under the age of 50. This effect is the same as that of the retail industry.

2 Other characteristics of establishment have no significant effects on the labour coefficients in the wholesale industry.

The results on the labour's share by demographic category (whL/C) in the wholesale industry are summarised as follows:

1 Output activity has positive significant first order effects on the labour's shares for male in their 40s and 50s, for female in their 20s, and negative significant first order effects on the labour's shares for females in their 40s and 50s. This implies that the establishment in the wholesale industry distributes more male employees in their middle age and young female employees than female employees in their middle age, as output grows.

2 Other characteristics of establishments have no significant effects on the labour's shares of the wholesale industry.

Table 4.13: The summary of the estimated parameters: Retail industry 1992–1994 (1)

The dependent variables: L and Lh

Independent	Variables	Male					Female				
		20s	30s	40s	50s	60s	20s	30s	40s	50s	60s
α_1	X	+	+	+	+	+?	+	+	+	+?	−?
α_2	X^2	−	−	−	−	−?	−	−?	−	−?	?
α_3	OX	+	+	+	+	+?	+	−?	−	−	−?
α_4	OX^2	−	−	−?	−	+?	−	+?	+	+?	+
α_5	YR	?	+	+	+	+?	−?	−	−?	+?	+?
α_6	YR^2	−?	−?	−?	+?	+?	?	+	+?	−?	?
α_7	S	+−	+	+−	−?	−?	+	+	+	+	+?
α_8	S^2	?	+−	+?	+	+?	+?	−?	−	−	−?

+ denotes that the parameter has positive significant values at 5 per cent level for all the observation periods and models.

− denotes that the parameter has negative significant values at 5 per cent level for all the observation periods and models.

? denotes that the parameter has insignificant values at 5 per cent level for all the observation periods and models.

+? or −? denotes that the parameter has a significant or an insignificant value at 5 per cent level depending on the observation period or model.

−?+ denotes that parameters have significant positive, significant negative and insignificant value depending on the observation period or model.

Table 4.13: The summary of the estimated parameters: Retail industry 1992–1994 (2)

The dependent variables: L/X and Lh/X

	Independent Variables	Male					Female				
		20s	30s	40s	50s	60s	20s	30s	40s	50s	60s
β_1	$\ln X$	−	−	−	−	−	−	−	−	−	−
β_2	$(\ln X)^2$	+	+	+	+?	−?	+	+	+	+	−?
β_3	$OX/(OX+X)$	?	?	?	?+	?	?	?	−?	−?	?
β_4	$[OX/(OX+X)]^2$	?	?	?	−?	?	?	?	?	?	?
β_5	YR	+?	+?	+	+	+?	+?	+?	+?	+	+
β_6	YR^2	−?	−?	−	?	−?	−?	−?	−?	−	−?
β_7	$\ln S$	+−	+?	+?	+?	−?	+	+?	+?	+?	−?
β_8	$(\ln S)^2$	−?	−?	−?	+?	+?	−?	−?	−?	+−	+

+ denotes that the parameter has positive significant values at 5 per cent level for all the observation periods and models.

− denotes that the parameter has negative significant values at 5 per cent level for all the observation periods and models.

? denotes that the parameter has insignificant values at 5 per cent level for all the observation periods and models.

+? or −? denotes that the parameter has a significant or an insignificant value at 5 per cent level depending on the observation period or model.

−?+ denotes that parameters have significant positive, significant negative and insignificant value depending on the observation period or model.

Table 4.13: The summary of the estimated parameters: Retail industry 1992–1994 (3)

The dependent variable: whL/C

		Male					Female				
Independent Variables		20s	30s	40s	50s	60s	20s	30s	40s	50s	60s
γ_1	$\ln X$	+	+	? −+	+?	−?	+?	−	−	−	−
γ_2	$(\ln X)^2$	+?	−?+	?	+?	−?	?	+−?	+−	−?	−?
γ_3	$OX/(OX+X)$	?	?	+?	+?	?	?	−?	−	−?	?
γ_4	$[OX/(OX+X)]^2$	?+	?	−?	−?	?	?	+?	+?	+?	?
γ_5	YR	+−	?	+	+	+?	−	−	+?	+	+?
γ_6	YR^2	+	?	−	?	−?	+?	+?	?	−	−?
γ_7	$\ln S$	−?	+?	?	−?	−?	+?	+	+	?	−?
γ_8	$(\ln S)^2$	−?	−?	?	+?	?	+?	?	?	?	+?

+ denotes that the parameter has positive significant values at 5 per cent level for all the observation periods and models.

− denotes that the parameter has negative significant values at 5 per cent level for all the observation periods and models.

? denotes that the parameter has insignificant values at 5 per cent level for all the observation periods and models.

+? or −? denotes that the parameter has a significant or an insignificant value at 5 per cent level depending on the observation period or model.

−?+ denotes that parameters have significant positive, significant negative and insignificant value depending on the observation period or model.

Table 4.14: The summary of the estimated parameters: Wholesale industry 1992–1994 (1)

The dependent variables: L and Lh

		Male					Female				
Independent Variables		20s	30s	40s	50s	60s	20s	30s	40s	50s	60s
α_1	X	+	+	+	+	?	+	+	+	+?	−?
α_2	X^2	−	−	−	−	?	−	−	−?	−?	?
α_3	OX	?	?	−?	+?	+?	?	−?	?	?	?
α_4	OX^2	?	?	?	−?	−?	?	−?	?	?	?
α_5	YR	?	?	−?	?	?	−?	?	?	+?	?
α_6	YR^2	+?	?	+?	+?	+?	+?	?	?	?	?

+ denotes that the parameter has positive significant values at 5 per cent level for all the observation periods and models.

− denotes that the parameter has negative significant values at 5 per cent level for all the observation periods and models.

? denotes that the parameter has insignificant values at 5 per cent level for all the observation periods and models.

+? or −? denotes that the parameter has a significant or an insignificant value at 5 per cent level depending on the observation period or model.

Table 4.14: The summary of the estimated parameters: Wholesale industry 1992–1994 (2)

The dependent variables: L/X and Lh/X

		Male					Female				
Independent Variables		20s	30s	40s	50s	60s	20s	30s	40s	50s	60s
β_1	$\ln X$	−	−	−	−?	−?	−	−	−	−	−?
β_2	$(\ln X)^2$	+	+	+	+?	−?	+	+	+	+	+?
β_3	$OX/(OX+X)$	?	?	?	?	?	?	?	?	−?	?
β_4	$[OX/(OX+X)]^2$	?	?	?	?	?	?	?	?	−?	?
β_5	YR	?	?	?	?	+?	?	?	?	+?	+?
β_6	YR^2	?	?	?	?	?	?	?	?	?	−?

+ denotes that the parameter has positive significant values at 5 per cent level for all the observation periods and models.

− denotes that the parameter has negative significant values at 5 per cent level for all the observation periods and models.

? denotes that the parameter has insignificant values at 5 per cent level for all the observation periods and models.

+? or −? denotes that the parameter has a significant or an insignificant value at 5 per cent level depending on the observation period or model.

Table 4.14: The summary of the estimated parameters: Wholesale industry 1992–1994 (3)

The dependent variable: whL/C

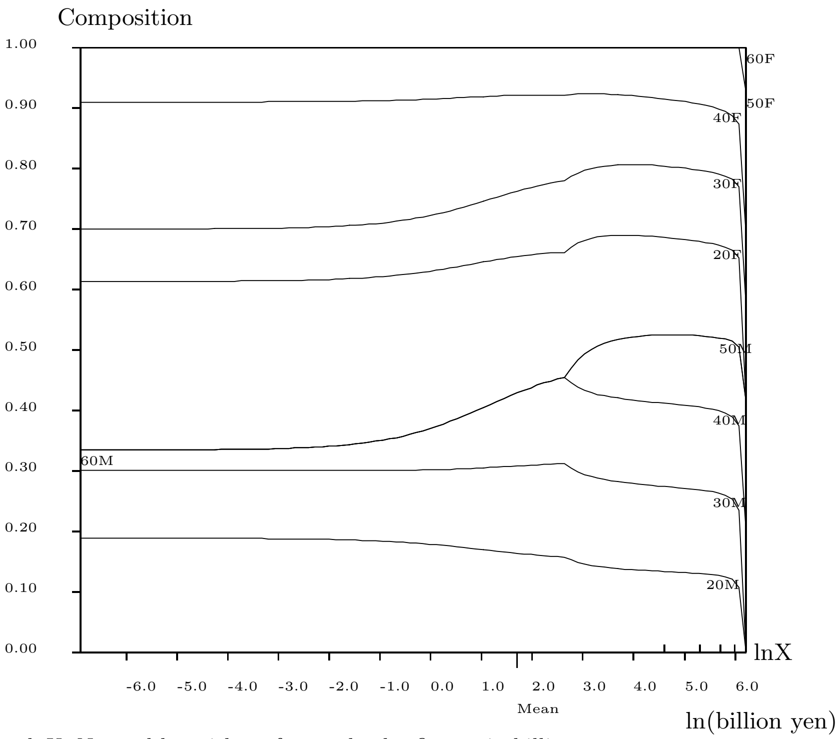
Independent Variables		Male					Female				
		20s	30s	40s	50s	60s	20s	30s	40s	50s	60s
γ_1	$\ln X$	−?	+?	+	+	−?	+	−?	−	−	−?
γ_2	$(\ln X)^2$	+?	−?	−?	−?	−?	−?	+?	+?	+?	?
γ_3	$OX/(OX+X)$	?	?	+?	+?	?	?	?	?	−?	?
γ_4	$[OX/(OX+X)]^2$	?	?	?	−?	?	?	?	?	?	?
γ_5	YR	−?	−?	?	+?	+?	?	?	?	+?	?
γ_6	YR^2	?	?	?	?	?	?	?	?	−?	?

+ denotes that the parameter has positive significant values at 5 per cent level for all the observation periods and models.

− denotes that the parameter has negative significant values at 5 per cent level for all the observation periods and models.

? denotes that the parameter has insignificant values at 5 per cent level for all the observation periods and models.

+? or −? denotes that the parameter has a significant or an insignificant value at 5 per cent level depending on the observation period or model.



lnX: Natural logarithm of annual sales figures in billion yen.

20M: Male employees in their 20s, 20F: Female employees in their 20s.

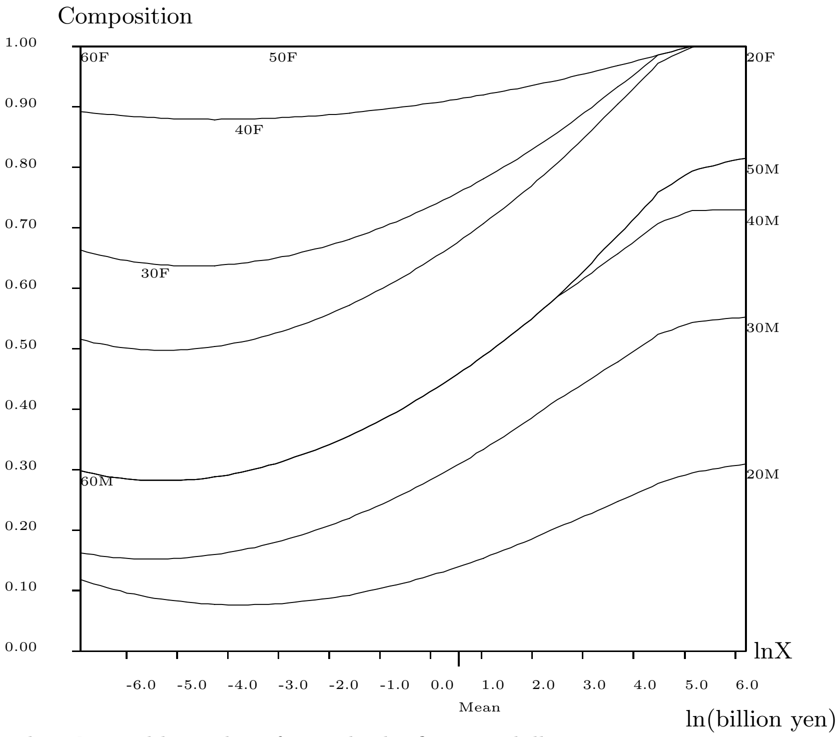
30M: Male employees in their 30s, 30F: Female employees in their 30s.

40M: Male employees in their 40s, 40F: Female employees in their 40s.

50M: Male employees in their 50s, 50F: Female employees in their 50s.

60M: Male employees in their 60s, 60F: Female employees in their 60s.

Figure 4.4: L Model: Retail Industry in 1993



lnX: Natural logarithm of annual sales figures in billion yen.

20M: Male employees in their 20s, 20F: Female employees in their 20s.

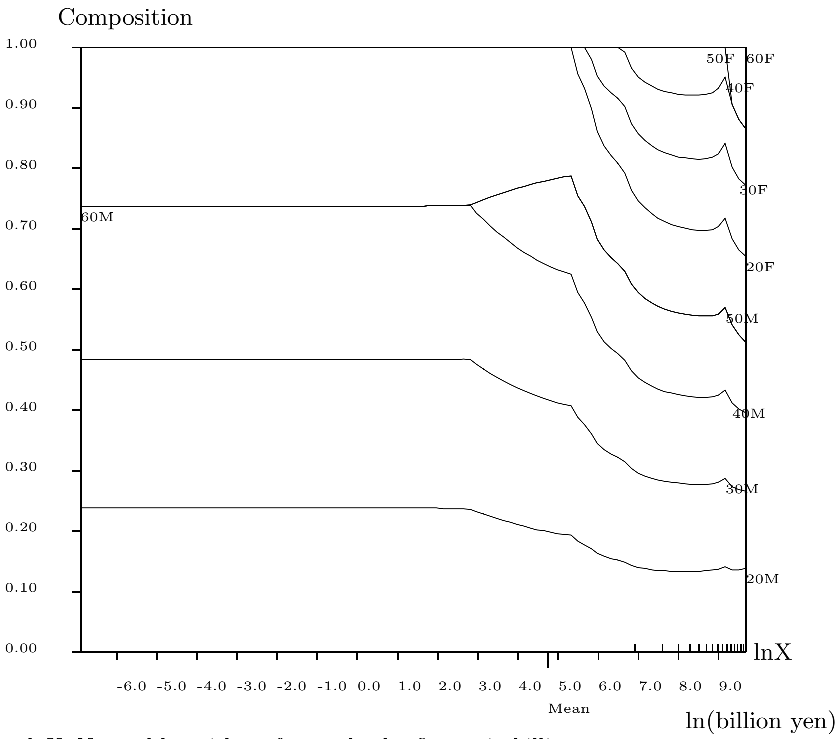
30M: Male employees in their 30s, 30F: Female employees in their 30s.

40M: Male employees in their 40s, 40F: Female employees in their 40s.

50M: Male employees in their 50s, 50F: Female employees in their 50s.

60M: Male employees in their 60s, 60F: Female employees in their 60s.

Figure 4.5: whL/C Model: Retail Industry in 1993



lnX: Natural logarithm of annual sales figures in billion yen.

20M: Male employees in their 20s, 20F: Female employees in their 20s.

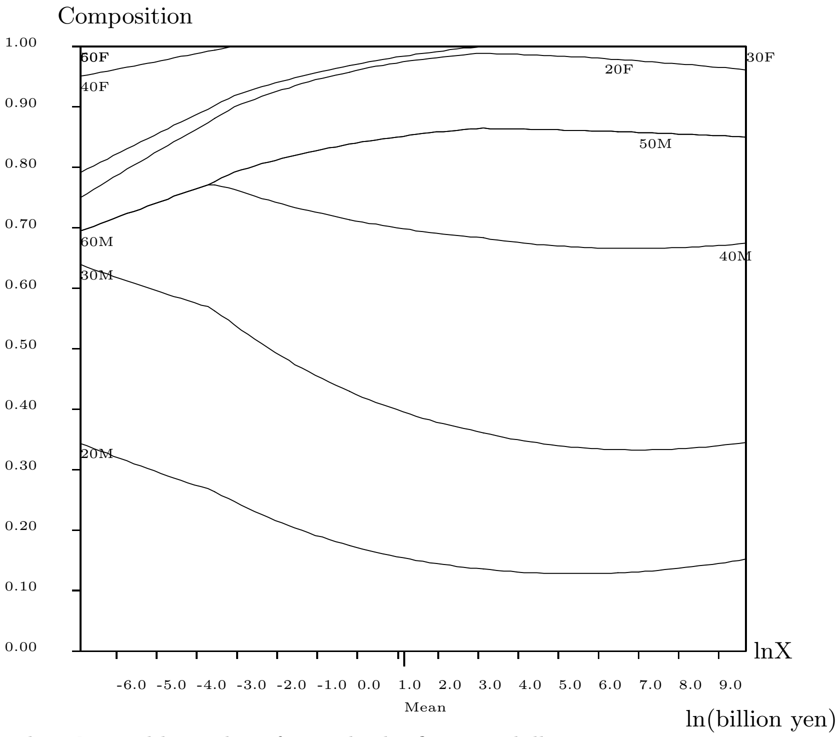
30M: Male employees in their 30s, 30F: Female employees in their 30s.

40M: Male employees in their 40s, 40F: Female employees in their 40s.

50M: Male employees in their 50s, 50F: Female employees in their 50s.

60M: Male employees in their 60s, 60F: Female employees in their 60s.

Figure 4.6: L Model: Wholesale Industry in 1993



lnX: Natural logarithm of annual sales figures in billion yen.

20M: Male employees in their 20s, 20F: Female employees in their 20s.

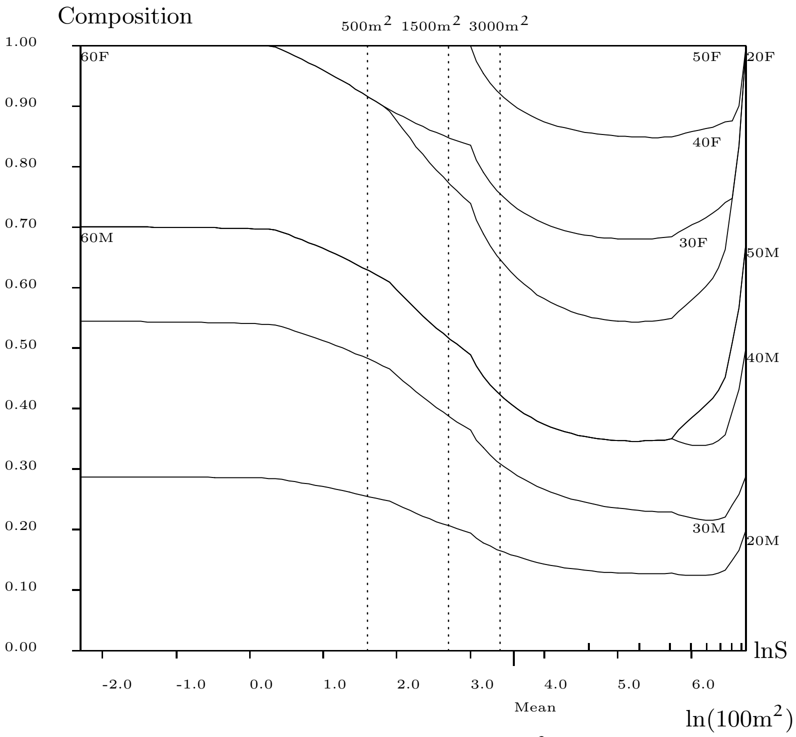
30M: Male employees in their 30s, 30F: Female employees in their 30s.

40M: Male employees in their 40s, 40F: Female employees in their 40s.

50M: Male employees in their 50s, 50F: Female employees in their 50s.

60M: Male employees in their 60s, 60F: Female employees in their 60s.

Figure 4.7: whL/C Model: Wholesale Industry in 1993



lnS: Natural logarithm of sales spacee area in 100m^2.

20M: Male employees in their 20s, 20F: Female employees in their 20s.

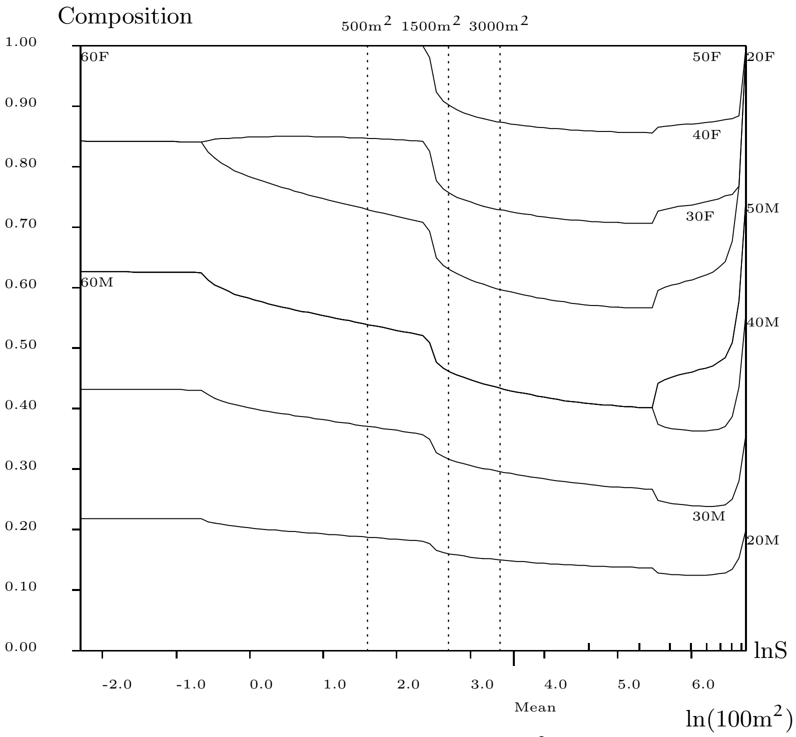
30M: Male employees in their 30s, 30F: Female employees in their 30s.

40M: Male employees in their 40s, 40F: Female employees in their 40s.

50M: Male employees in their 50s, 50F: Female employees in their 50s.

60M: Male employees in their 60s, 60F: Female employees in their 60s.

Figure 4.8: L Model: Retail Industry in 1993



lnS: Natural logarithm of sales spacee area in 100m^2.

20M: Male employees in their 20s, 20F: Female employees in their 20s.

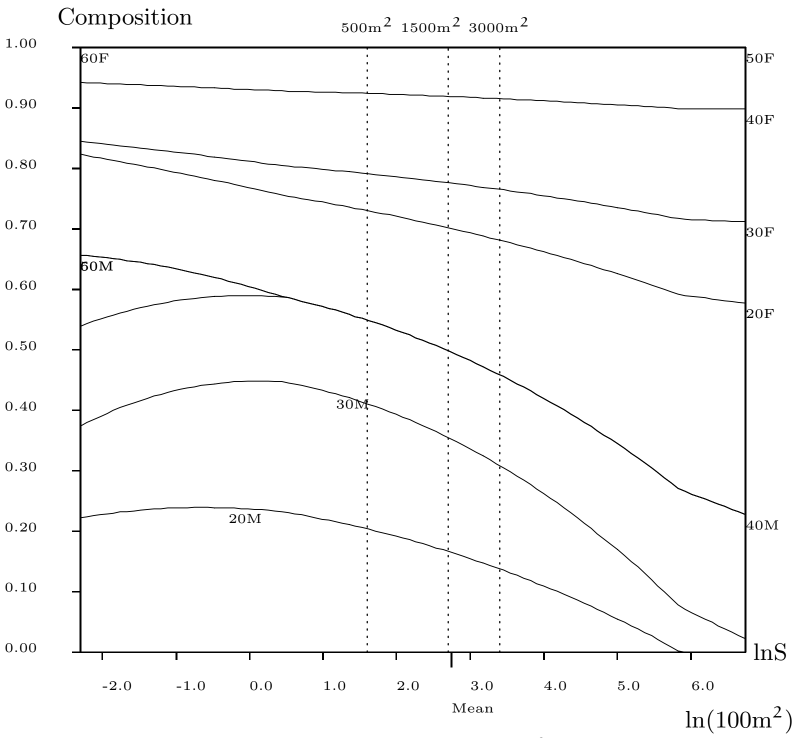
30M: Male employees in their 30s, 30F: Female employees in their 30s.

40M: Male employees in their 40s, 40F: Female employees in their 40s.

50M: Male employees in their 50s, 50F: Female employees in their 50s.

60M: Male employees in their 60s, 60F: Female employees in their 60s.

Figure 4.9: Lh Model: Retail Industry in 1993



lnS: Natural logarithm of sales spacee area in $100m^2$.

20M: Male employees in their 20s, 20F: Female employees in their 20s.

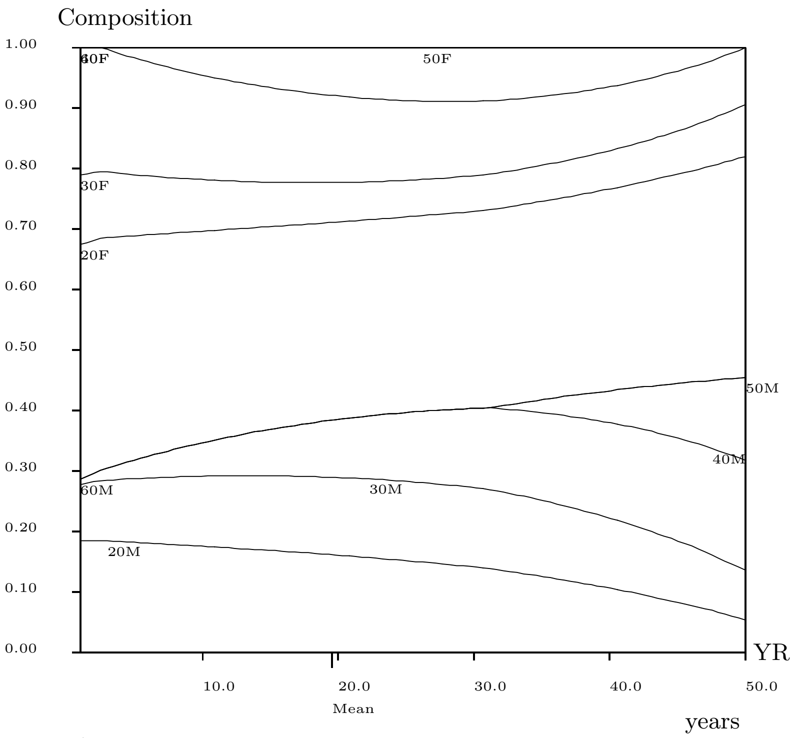
30M: Male employees in their 30s, 30F: Female employees in their 30s.

40M: Male employees in their 40s, 40F: Female employees in their 40s.

50M: Male employees in their 50s, 50F: Female employees in their 50s.

60M: Male employees in their 60s, 60F: Female employees in their 60s.

Figure 4.10: whL/C Model: Retail Industry in 1993



YR: Age of establishments.

20M: Male employees in their 20s, 20F: Female employees in their 20s.

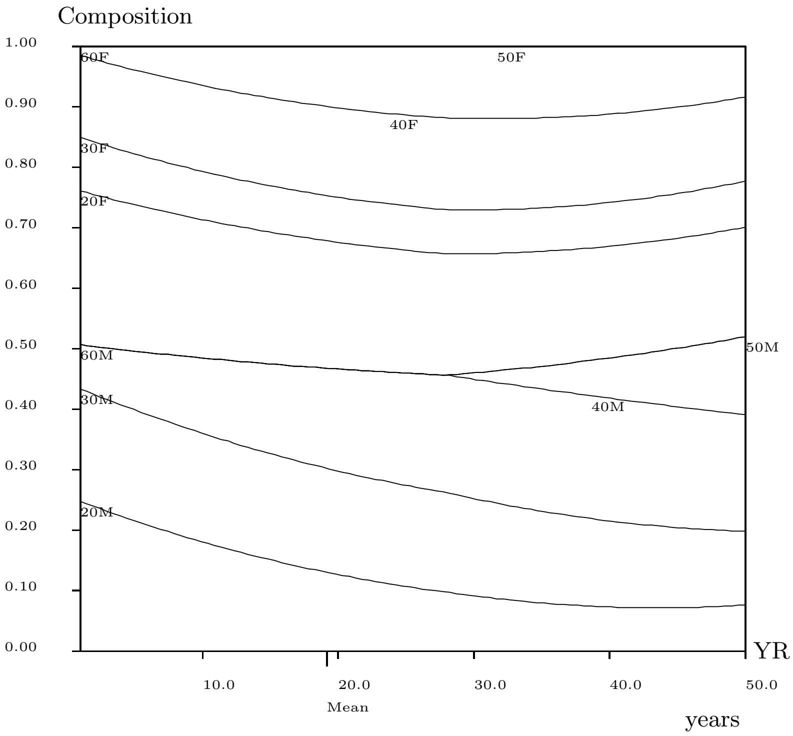
30M: Male employees in their 30s, 30F: Female employees in their 30s.

40M: Male employees in their 40s, 40F: Female employees in their 40s.

50M: Male employees in their 50s, 50F: Female employees in their 50s.

60M: Male employees in their 60s, 60F: Female employees in their 60s.

Figure 4.11: L Model: Retail Industry in 1993



YR: Age of establishments.

20M: Male employees in their 20s, 20F: Female employees in their 20s.

30M: Male employees in their 30s, 30F: Female employees in their 30s.

40M: Male employees in their 40s, 40F: Female employees in their 40s.

50M: Male employees in their 50s, 50F: Female employees in their 50s.

60M: Male employees in their 60s, 60F: Female employees in their 60s.

Figure 4.12: whL/C Model: Retail Industry in 1993

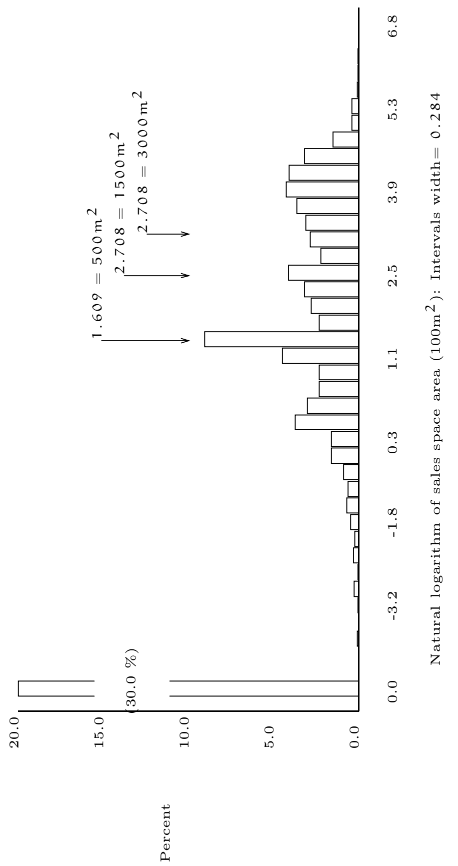


Figure 4.13: Sales space area distribution of weighted number establishments: Retail 1991

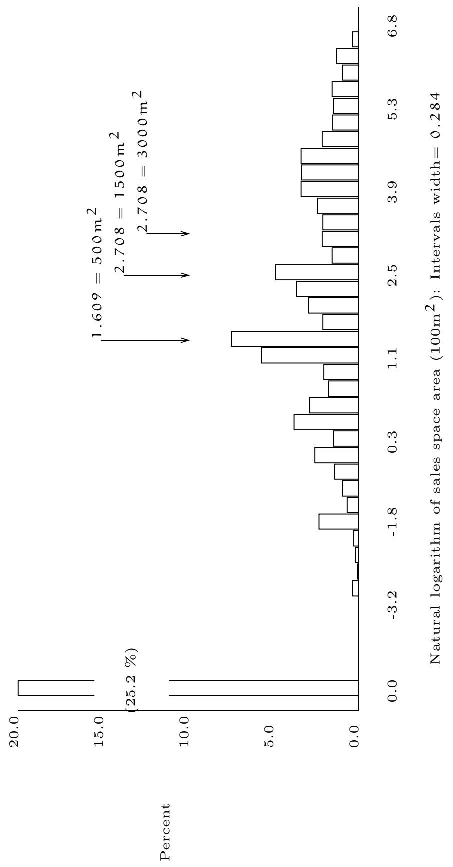


Figure 4.14: Sales space area distribution of weighted number of employees: Retail 1993

Though the estimated equations have insignificant parameters, this summary presents that qualitative effects are consistent and stable even based on the different equations. On the other hand, quantitative effects show the employment policy of establishment in detail, especially in retail industry which has the regulation on sales space area. The simulation results are illustrated in order to lay out quantitative effects, and we substitute the sample average value into the independent variables except for the variable which we would like to analyse.

Figures 4.4–4.5 show that the demographic composition of employment and the share of compensation by demographic category for various size of output activity in retail industry. Figure 4.4 presents that elderly male employment increases as output activity increases keeping the other conditions at average level. Mean in the figure denotes the point of the average size of output activity. Figure 4.5 presents that the share of compensation in younger male employment prevails as the size of output activity grows. These two figures show that the compensation of elderly male and elderly female employment decreases as size of output increase keeping the other conditions at average level.

Figures 4.6–4.7 are the same figures in the wholesale industry as the previous. It shows that female employment in the wholesale industry other than those in their 20s increases as output grows. At the same time, Figure 4.7 shows that the compensation share of female in their 20s is relatively constant, but the share of other generation almost disappears in large scale establishment. On the contrary the share of male in their middle age grows as output grows.

The last simulation we present is the effect of sales space area on employment composition and share of compensation by demographic category. The results are shown in Figures 4.8–4.10. Figures 4.8 and 4.9 show that female employment increases from space area 2.7 (=ln15 means 1,500m^2, X axis is measured by natural logarithm of 100m^2) where the regulation boundary used to be set. In Figures 4.8, female employees in their 30s are employed just above the level of the regulation boundary at 1.6 (=ln5 means 500m^2). The establishment within these sales space areas employs female employees and decrease male employment. As Figure 4.10 shows, the compensation share of each demographic category does not change as rapidly as the composition of employment changes. This means that the establishment with a large space area above the regulation boundary employs female labour at a lower wage than the establishment with a small space area below the regulation boundary, given the size of output at the average level.

In the retail industry, establishments with space areas larger than 40,000m^2 (6 in the scale of Figure 4.8) start to employ more male labour as space area increases; the second order effect of sales space area on employment structure is dominant for lager scale, hence this nonlinearity is observed.

The demographic composition of employment does not change as rapidly in varying the other establishment's characteristics like age of establishment in Figures 4.11–4.12.

Hayami and Nakajima [1997b] presents the result of manufacturing industry; it depends on the data with small sample size (248 or 550 as in Table 4.2). Estimations in the manufacturing industry show that the percentage of young male workers increases in output of the establishment. As far as these estimations show, the percentage of male workers under the age of 40 increases as area of the establishment; furthermore the trend is more straightforward than in the retail industry.

Finally the actual distribution of establishments and employment are shown in Figures 4.13–4.14. There is a sharp peak at 1.6 which means the first boundary of the regulation and second peak is at 2.7 which means the second boundary of the regulation. The shops are concentrated below the first boundary, and the second boundary, hence employment is also concentrated at those points.

4.5 Concluding Remarks

At the Japanese department store which has the largest sales space area in most cities, you will be impressed that young ladies are sitting at the reception desk and young elevator ladies welcome you with smile. At many smaller shops there are few young female employees. This stylised scenery used to be so common. In 1990s part-time employees increase in the retail industry with large sales area as shown in Table 4.10, and the part-time employees were often the former full-time employees of the large scale store, hence the clear distinction is going to disappear.

The mechanism behind the circumstance as the discussion of the last section suggests, is that the entry regulation of sales space areas in the retail industry limits female employment opportunity. Because the establishments above the boundary of the regulation employ more female employees than those below the boundary without entry regulation, but at the same time the number of establishments above the boundary is restricted artificially at low level as the gaps show in Figure 4.13.

This entry regulation has the consequence of low wage job opportunity for female employees even in large scale establishments, as suggested in section 4.3. The store with a large sales space area can enjoy strong competitiveness around its location, since there are only small size shops and no other competitors with large sales area. The simulation shows that the store with large sales area employs more female labour at a lower wage than those with small sales areea. Thus it can be interpreted that the competitiveness of the large store is strong enough to supply job opportunity with low wages. The policy intended to protect the small scale shops in fact protects the large scale shops:

As the result of recent deregulation and long lasting recession, the large scale store,[14] especially the department store, has decreased its sales figures even in nominal terms.[15] The regulation policy on starting up shops with large sales space area is still under consideration, and it brings further uncertainty for the operation of existing large stores.

Then what is the possible consequence of abolition of the regulation of the Large Scale Store's Law? As in the wholesale industry, the wage difference between establishment size may be widened, or female

[14] The large scale store is defined in official statistics as follows: the establishment with more than 50 employees and with sales area larger than 3,000m^2 in a city designed by ordinance or with sales area larger than 1,500m^2 in the other region. The large scale store is divided into department store and supermarket store.

[15] Department store sales figures peaked at 12.1 trillion (10^{12}) yen in 1991, and it decreased to 11.0 trillion yen in 1994, whereas supermarket sales reached 10.0 trillion in 1991 and 10.7 trillion in 1994.

employment may increase in sales amount, not in sales space area. But in both the wholesale and the retail industry, the employer depends on more female part-time jobs with high education, and at the higher rate of gross job creation and destruction than male full-time jobs.

Appendix

Table 4.15: Employment Structure in Japan

	(mil.)	Composition		Persons
Manufacturing	(14)	23.7 %	Decrease	+
Commercial	(13)	22.4 %	Decrease	−
Service	(13)	22.5 %	Increase	+

Source: Population Census, 1985 and 1990

Table 4.16: Sample Size for the Linked Data

Sample Size Establishments		
Retail	Wholesale	Manufacturing
4,000	1,000	260~570
Sapling Probability Establishments		
Retail	Wholesale	Manufacturing
4%	1%	0.4 ~ 0.9 %
Sample Size Employees		
Retail	Wholesale	Manufacturing
109,900	25,900	5,000~11,000
Sapling Probability Employees		
Retail	Wholesale	Manufacturing
2~4%	0.7~0.9%	~0.1%

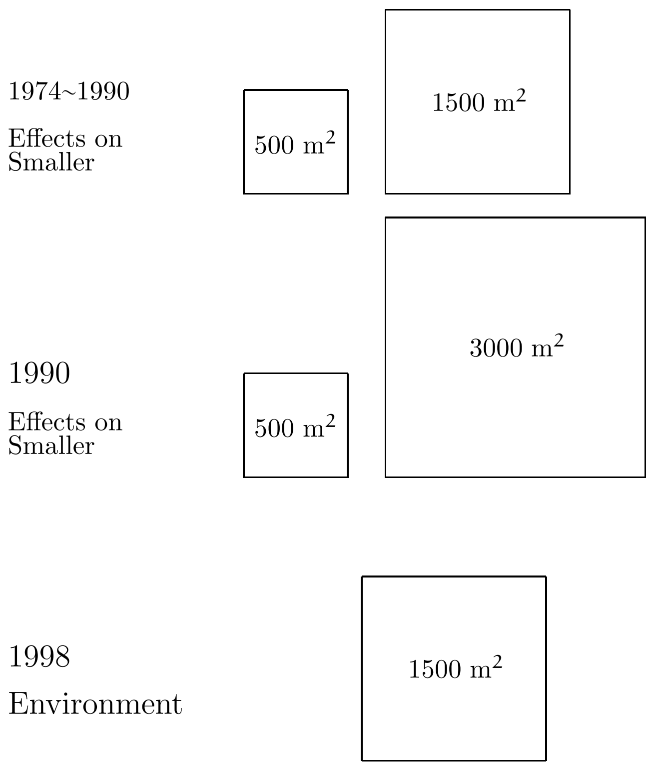


Figure 4.15: Deregulation on Retail Industry: the Large Scale Retail Store's Law

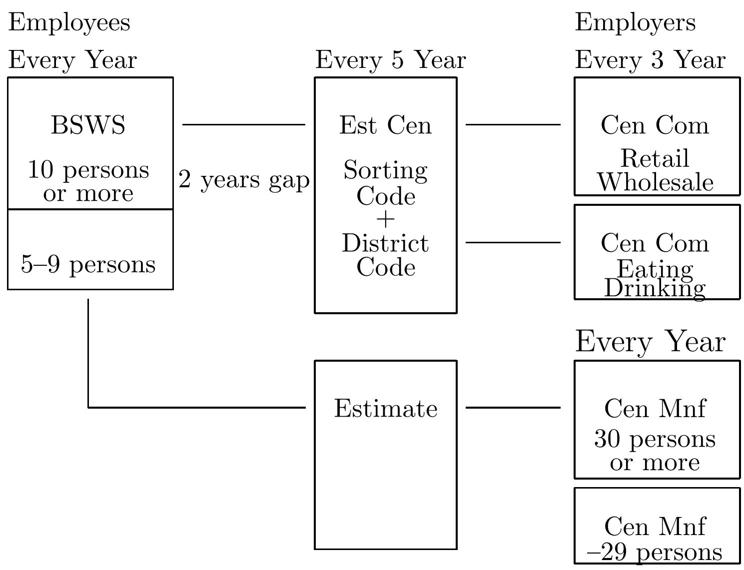


Figure 4.16: Data Construction

Table 4.17: Descriptive Statistics of Manufacturing Industry in 1992

Var	Unit	Mean	Std. Dev.	Minimum	Maximum	C.V.
TL	person	133	345	30	5748	2.59
X	million yen	55.61	331.56	0.48	6022.49	5.96
S	m^2	11344	70420	130	1434675	6.21
LX	ln(million)	6.79	1.54	3.86	13.31	0.23
AGE20M	person	11	67	0	1433	6.08
AGE30M	person	9	39	0	790	4.13
AGE40M	person	10	41	0	692	4.08
AGE50M	person	9	41	0	593	4.59
AGE60M	person	2	9	0	166	4.55
AGE20F	person	20	61	0	687	3.07
AGE30F	person	21	60	0	814	2.83
AGE40F	person	38	90	0	1245	2.35
AGE50F	person	24	56	0	1006	2.29
AGE60F	person	2	7	0	70	2.87
R20M	ratio	0.07	0.11	0.00	0.60	1.47
R30M	ratio	0.09	0.11	0.00	0.82	1.25
R40M	ratio	0.10	0.13	0.00	1.00	1.24
R50M	ratio	0.10	0.15	0.00	1.00	1.40
R60M	ratio	0.04	0.08	0.00	0.90	2.27
R20F	ratio	0.08	0.12	0.00	0.85	1.48
R30F	ratio	0.10	0.12	0.00	1.00	1.21
R40F	ratio	0.20	0.16	0.00	0.80	0.80
R50F	ratio	0.17	0.16	0.00	0.80	0.91
R60F	ratio	0.03	0.06	0.00	0.43	1.87

Sample size $N = 550$

X: Main output (amount traded) of each establishment.

S: Space area of plant in an establishment.

LX: Natural log of X

TL: Total employment

AGE: Employment by age and gender

R: Ratio of each category of labor to total employment

M: M stands for Male.

F: F stands for Female.

Table 4.18: Descriptive Statistics of Manufacturing Industry in 1993

Var	Unit	Mean	Std. Dev.	Minimum	Maximum	C.V.
TL	person	209	544	30	4641	2.60
X	million yen	132.30	666.21	0.62	7433.03	5.04
S	m^2	20469	74643	224	638656	3.65
LX	ln(million)	6.99	1.79	4.12	13.52	0.26
AGE20M	person	25	128	0	1375	5.06
AGE30M	person	20	102	0	977	5.10
AGE40M	person	20	113	0	1493	5.68
AGE50M	person	16	74	0	697	4.67
AGE60M	person	2	9	0	78	3.94
AGE20F	person	28	154	0	1891	5.42
AGE30F	person	13	39	0	498	2.92
AGE40F	person	28	69	0	858	2.50
AGE50F	person	18	39	0	315	2.18
AGE60F	person	2	6	0	78	3.45
R20M	ratio	0.09	0.13	0.00	0.63	1.42
R30M	ratio	0.09	0.11	0.00	0.45	1.27
R40M	ratio	0.11	0.14	0.00	0.80	1.22
R50M	ratio	0.10	0.12	0.00	0.52	1.26
R60M	ratio	0.05	0.10	0.00	0.60	2.18
R20F	ratio	0.09	0.13	0.00	0.77	1.54
R30F	ratio	0.10	0.11	0.00	0.47	1.19
R40F	ratio	0.20	0.18	0.00	0.73	0.87
R50F	ratio	0.15	0.16	0.00	0.68	1.05
R60F	ratio	0.03	0.05	0.00	0.29	1.86

Sample size N = 248

X: Main output (amount traded) of each establishment.

S: Space area of plant in an establishment.

LX: Natural log of X

TL: Total employment

AGE: Employment by age and by sex

R: Ratio of each category of labor to total employment

M: M stands for Male.

F: F stands for Female.

Table 4.19: Descriptive Statistics of Retail Industry in 1992

Var	Unit	Mean	Std. Dev.	Minimum	Maximum	C.V.
X	million yen	34.24	129.79	0.01	4230.31	3.79
OX	million yen	0.56	3.94	0.00	269.37	7.06
S	m^2	2479	5303	0	84586	2.14
LX	ln(million)	6.99	1.47	-4.61	12.96	0.21
LOX*)	ln(million)	3.39	1.87	-4.61	10.20	0.55
AGE20M	person	58	262	0	5734	4.54
AGE30M	person	50	215	0	5483	4.31
AGE40M	person	55	360	0	11810	6.60
AGE50M	person	23	142	0	3637	6.23
AGE60M	person	2	15	0	353	6.45
AGE20F	person	146	847	0	19470	5.81
AGE30F	person	40	201	0	5062	5.06
AGE40F	person	55	256	0	5483	4.62
AGE50F	person	32	210	0	6715	6.53
AGE60F	person	2	10	0	152	4.93
R20M	ratio	0.18	0.17	0.00	0.94	0.90
R30M	ratio	0.13	0.11	0.00	0.70	0.80
R40M	ratio	0.10	0.10	0.00	0.60	0.92
R50M	ratio	0.04	0.07	0.00	0.50	1.50
R60M	ratio	0.01	0.03	0.00	0.43	2.84
R20F	ratio	0.19	0.15	0.00	0.92	0.78
R30F	ratio	0.09	0.09	0.00	0.60	1.11
R40F	ratio	0.15	0.14	0.00	0.80	1.00
R50F	ratio	0.08	0.10	0.00	0.60	1.26
R60F	ratio	0.01	0.04	0.00	0.56	3.12

*) The values are applied to positive output only (Sample size $N = 829$).

Sample size $N = 2,108$

X: Main output (amount traded) of each establishment in 1991.

OX: Subsidiary output (amount traded) of each establishment in 1991.

S: Shopping space area of an establishment in 1991.

LX: Natural log of X

LOX:Natural log of OX

TL: Total employment

AGE: Employment by age and gender

R: Ratio of each category of labour to total employment

M: M stands for Male.

F: F stands for Female.

Table 4.20: Descriptive Statistics of Retail Industry in 1993

Var	Unit	Mean	Std. Dev.	Minimum	Maximum	C.V.
X	million yen	34.24	129.79	0.01	4230.31	3.79
OX	million yen	0.56	3.94	0.00	269.37	7.06
S	m^2	2479	5303	0	84586	2.14
LX	ln(million)	7.39	1.47	-4.61	12.96	0.20
LOX*)	ln(million)	3.39	1.87	-4.61	10.20	0.55
AGE20M	person	63	222	0	6188	3.52
AGE30M	person	50	205	0	6083	4.12
AGE40M	person	51	294	0	13469	5.83
AGE50M	person	21	140	0	4780	6.71
AGE60M	person	3	16	0	434	5.18
AGE20F	person	159	685	0	21291	4.31
AGE30F	person	45	146	0	3476	3.24
AGE40F	person	75	211	0	6606	2.81
AGE50F	person	47	158	0	5138	3.35
AGE60F	person	3	14	0	287	4.32
R20M	ratio	0.18	0.16	0.00	0.90	0.91
R30M	ratio	0.12	0.10	0.00	0.70	0.82
R40M	ratio	0.10	0.09	0.00	0.67	0.95
R50M	ratio	0.04	0.07	0.00	0.63	1.63
R60M	ratio	0.01	0.03	0.00	0.40	2.81
R20F	ratio	0.21	0.15	0.00	1.00	0.70
R30F	ratio	0.09	0.09	0.00	0.66	1.00
R40F	ratio	0.16	0.14	0.00	0.80	0.88
R50F	ratio	0.09	0.10	0.00	0.71	1.09
R60F	ratio	0.01	0.04	0.00	1.00	3.08

*) The values are applied to positive output only (Sample size $N = 1,494$).

Sample size $N = 4,098$.

X: Main output (amount traded) of each establishment in 1991.

OX: Subsidiary output (amount traded) of each establishment in 1991.

S: Shopping space area of a establishment in 1991.

LX: Natural log of X

LOX:Natural log of OX

TL: Total employment

AGE: Employment by age and gender

R: Ratio of each category of labour to total employment

M: M stands for Male.

F: F stands for Female.

Table 4.21: Descriptive Statistics of Retail Industry in 1994

Var	Unit	Mean	Std. Dev.	Minimum	Maximum	C.V.
X	million yen	34.24	129.79	0.01	4230.31	3.79
OX	million yen	0.56	3.94	0.00	269.37	7.06
S	m^2	2479	5303	0	84586	2.14
LX	ln(million)	7.39	1.47	-4.61	12.96	0.20
LOX*)	ln(million)	3.39	1.87	-4.61	10.20	0.55
AGE20M	person	62	215	0	5854	3.49
AGE30M	person	52	221	0	6245	4.24
AGE40M	person	52	310	0	13450	5.92
AGE50M	person	24	164	0	4610	6.87
AGE60M	person	3	17	0	403	5.63
AGE20F	person	161	671	0	16393	4.16
AGE30F	person	51	199	0	7025	3.88
AGE40F	person	80	236	0	6245	2.96
AGE50F	person	55	185	0	6725	3.39
AGE60F	person	3	14	0	341	4.14
R20M	ratio	0.17	0.16	0.00	0.92	0.93
R30M	ratio	0.11	0.10	0.00	0.55	0.84
R40M	ratio	0.09	0.09	0.00	0.71	0.97
R50M	ratio	0.04	0.07	0.00	0.67	1.64
R60M	ratio	0.01	0.03	0.00	0.27	2.75
R20F	ratio	0.21	0.15	0.00	0.90	0.71
R30F	ratio	0.09	0.08	0.00	0.67	0.98
R40F	ratio	0.16	0.14	0.00	0.70	0.87
R50F	ratio	0.10	0.11	0.00	0.64	1.07
R60F	ratio	0.01	0.04	0.00	0.64	2.87

*) The values are applied to positive output only (Sample size $N = 1,392$).

Sample size $N = 3,836$.

X: Main output (amount traded) of each establishment in 1991.

OX: Subsidiary output (amount traded) of each establishment in 1991.

S: Shopping space area of an establishment in 1991.

LX: Natural log of X

LOX:Natural log of OX

TL: Total employment

AGE: Employment by age and gender

R: Ratio of each category of labour to total employment

M: M stands for Male.

F: F stands for Female.

Table 4.22: Descriptive Statistics of Wholesale Industry in 1992

Var	Unit	Mean	Std. Dev.	Minimum	Maximum	C.V.
X	million yen	476.59	5641.34	0.01	155523.42	11.84
OX	million yen	2.89	33.93	0.00	1098.89	11.73
LX	ln(million)	7.78	1.72	-4.61	16.56	0.22
LOX*)	ln(million)	4.12	2.29	-3.51	11.61	0.56
AGE20M	person	66	318	0	9462	4.80
AGE30M	person	67	338	0	10054	5.05
AGE40M	person	69	269	0	6505	3.92
AGE50M	person	36	173	0	4926	4.77
AGE60M	person	3	39	0	1343	11.51
AGE20F	person	86	441	0	10645	5.13
AGE30F	person	23	161	0	3792	7.07
AGE40F	person	24	178	0	4108	7.37
AGE50F	person	10	81	0	2239	8.44
AGE60F	person	1	14	0	448	12.76
R20M	ratio	0.18	0.13	0.00	0.78	0.74
R30M	ratio	0.19	0.11	0.00	0.73	0.59
R40M	ratio	0.19	0.12	0.00	0.82	0.61
R50M	ratio	0.10	0.10	0.00	0.63	0.96
R60M	ratio	0.02	0.04	0.00	0.42	2.36
R20F	ratio	0.17	0.13	0.00	0.78	0.77
R30F	ratio	0.05	0.06	0.00	0.40	1.26
R40F	ratio	0.07	0.09	0.00	0.60	1.37
R50F	ratio	0.03	0.07	0.00	0.59	1.95
R60F	ratio	0.01	0.03	0.00	0.35	3.95

*) The values are applied to positive output only (Sample size $N = 313$).

Sample size $N = 1,230$

X: Main output (amount traded) of each establishment in 1991.

OX: Subsidiary output (amount traded) of each establishment in 1991.

LX: Natural log of X

LOX:Natural log of OX

TL: Total employment

AGE: Employment by age and gender

R: Ratio of each category of labour to total employment

M: M stands for Male.

F: F stands for Female.

Table 4.23: Descriptive Statistics of Wholesale Industry in 1993

Var	Unit	Mean	Std. Dev.	Minimum	Maximum	C.V.
X	million yen	476.59	5641.34	0.01	155523.42	11.84
OX	million yen	2.89	33.93	0.00	1098.89	11.73
LX	ln(million)	7.78	1.72	-4.61	16.56	0.22
LOX*)	ln(million)	4.12	2.29	-3.51	11.61	0.56
AGE20M	person	140	697	0	11642	4.99
AGE30M	person	146	781	0	11861	5.34
AGE40M	person	161	834	0	13011	5.20
AGE50M	person	95	571	0	10392	6.01
AGE60M	person	3	17	0	305	5.34
AGE20F	person	176	827	0	13011	4.69
AGE30F	person	44	237	0	4109	5.34
AGE40F	person	36	183	0	3704	5.14
AGE50F	person	14	70	0	1058	4.80
AGE60F	person	1	9	0	236	8.14
R20M	ratio	0.18	0.13	0.00	0.77	0.75
R30M	ratio	0.18	0.11	0.00	0.56	0.59
R40M	ratio	0.18	0.11	0.00	0.58	0.61
R50M	ratio	0.10	0.10	0.00	0.56	0.97
R60M	ratio	0.02	0.04	0.00	0.50	2.34
R20F	ratio	0.17	0.13	0.00	0.89	0.75
R30F	ratio	0.05	0.06	0.00	0.49	1.30
R40F	ratio	0.07	0.09	0.00	0.73	1.37
R50F	ratio	0.04	0.07	0.00	0.62	1.92
R60F	ratio	0.01	0.03	0.00	0.31	3.92

*) The values are applied to positive output only (Sample size $N = 291$).
Sample size $N = 1,078$.

X: Main output (amount traded) of each establishment in 1991.

OX: Subsidiary output (amount traded) of each establishment in 1991.

LX: Natural log of X

LOX:Natural log of OX

TL: Total employment

AGE: Employment by age and gender

R: Ratio of each category of labour to total employment

M: M stands for Male.
F: F stands for Female.

Table 4.24: Descriptive Statistics of Wholesale Industry in 1994

Var	Unit	Mean	Std. Dev.	Minimum	Maximum	C.V.
X	million yen	476.59	5641.34	0.01	155523.42	11.84
OX	million yen	2.89	33.93	0.00	1098.89	11.73
LX	ln(million)	7.78	1.72	-4.61	16.56	0.22
LOX*)	ln(million)	4.12	2.29	-3.51	11.61	0.56
AGE20M	person	138	826	0	16216	5.98
AGE30M	person	140	843	0	17199	6.03
AGE40M	person	154	867	0	13759	5.61
AGE50M	person	83	479	0	8522	5.76
AGE60M	person	2	16	0	434	6.37
AGE20F	person	174	882	0	15681	5.05
AGE30F	person	41	202	0	3505	4.95
AGE40F	person	32	166	0	2769	5.16
AGE50F	person	14	77	0	1661	5.34
AGE60F	person	1	8	0	167	8.39
R20M	ratio	0.18	0.13	0.00	0.75	0.73
R30M	ratio	0.18	0.11	0.00	0.80	0.61
R40M	ratio	0.18	0.11	0.00	0.58	0.60
R50M	ratio	0.10	0.10	0.00	0.58	0.94
R60M	ratio	0.02	0.05	0.00	0.40	2.48
R20F	ratio	0.17	0.13	0.00	0.95	0.77
R30F	ratio	0.05	0.07	0.00	0.47	1.31
R40F	ratio	0.06	0.08	0.00	0.53	1.34
R50F	ratio	0.04	0.07	0.00	0.62	1.76
R60F	ratio	0.01	0.03	0.00	0.35	3.95

*) The values are applied to positive output only (Sample size $N = 232$).
Sample size $N = 974$

X: Main output (amount traded) of each establishment in 1991.

XO: Subsidiary output (amount traded) of each establishment in 1991.

LX: Natural log of X

LXO:Natural log of XO

TL: Total employment

AGE: Employment by age and gender

R: Ratio of each category of labour to total employment

M: M stands for Male.

F: F stands for Female.

Table 4.25: Regression results of Age Model(1) for the manufacturing industry in 1992

Male

Age	20s	30s	40s	50s	60s
Intercept	0.918	3.735	3.764	2.885	1.517
	(0.75)	(4.60)	(5.56)	(3.56)	(4.20)
X	1.849e-05	1.03e-05	1.153e-05	1.122e-05	6.694e-07
	(51.23)	(43.10)	(57.88)	(47.00)	(6.30)
Adj-R^2	0.83	0.77	0.86	0.80	0.07
Sample Size	550	550	550	550	550

Female

Age	20s	30s	40s	50s	60s
Intercept	17.84	21.5	39.045	24.3	2.247
	(6.90)	(8.14)	(9.87)	(9.96)	(8.15)
X	4.259e-06	4.949e-07	-2.518e-07	1.094e-07	-8.432e-08
	(5.60)	(0.64)	(-0.22)	(0.15)	(-1.04)
Adj-R^2	0.05	0.00	0.00	0.00	0.00
Sample Size	550	550	550	550	550

Table 4.26: Regression results of Age Model(2) for the manufacturing industry in 1992

Male

Age	20s	30s	40s	50s	60s
Intercept	4.686	5.288	3.311	1.639	1.352
	(4.27)	(6.63)	(4.76)	(2.02)	(3.63)
X	6.906e-06	5.527e-06	1.292e-05	1.505e-05	1.177e-06
	(7.61)	(8.37)	(22.44)	(22.39)	(3.82)
X^2	2.404e-13	9.905e-14	-2.89e-14	-7.953e-14	-1.054e-14
	(13.59)	(7.70)	(-2.57)	(-6.07)	(-1.76)
Adj-R^2	0.87	0.79	0.86	0.81	0.07
Sample Size	550	550	550	550	550

Female

Age	20s	30s	40s	50s	60s
Intercept	18.49	22.22	38	24.44	2.34
	(6.92)	(8.14)	(9.29)	(9.69)	(8.21)
X	2.248e-06	-1.701e-06	2.962e-06	-3.317e-07	-3.683e-07
	(1.02)	(-0.75)	(0.88)	(-0.16)	(-1.56)
X^2	4.174e-14	4.557e-14	-6.668e-14	9.153e-15	5.893e-15
	(0.97)	(1.03)	(-1.01)	(0.23)	(1.28)
Adj-R^2	0.05	0.00	0.00	0.00	0.00
Sample Size	550	550	550	550	550

Table 4.27: Regression results of Age Model(3) for the manufacturing industry in 1992

Male

Age	20s	30s	40s	50s	60s
Intercept	3.776	4.759	3.327	1.925	1.329
	(4.42)	(6.89)	(4.77)	(2.46)	(3.56)
X	1.933e-05	1.275e-05	1.27e-05	1.113e-05	1.495e-06
	(20.08)	(16.37)	(16.15)	(12.60)	(3.55)
X^2	1.437e-13	4.286e-14	-2.714e-14	-4.909e-14	-1.301e-14
	(9.80)	(3.61)	(-2.27)	(-3.65)	(-2.03)
S	-0.0004329	-0.0002517	7.911e-06	0.0001364	-1.106e-05
	(-18.98)	(-13.64)	(0.43)	(6.51)	(-1.11)
Adj-R^2	0.92	0.85	0.86	0.83	0.07
Sample Size	550	550	550	550	550

Female

Age	20s	30s	40s	50s	60s
Intercept	18.17	22.11	37.78	24.35	2.349
	(6.81)	(8.08)	(9.22)	(9.63)	(8.23)
X	6.612e-06	-1.683e-07	5.98e-06	9.732e-07	-4.929e-07
	(2.20)	(-0.06)	(1.29)	(0.34)	(-1.53)
X^2	7.811e-15	3.365e-14	-9.016e-14	-9.923e-16	6.863e-15
	(0.17)	(0.72)	(-1.28)	(-0.02)	(1.40)
S	-0.000152	-5.339e-05	-0.0001052	-4.545e-05	4.342e-06
	(-2.13)	(-0.73)	(-0.96)	(-0.67)	(0.57)
Adj-R^2	0.06	0.00	0.00	0.00	0.00
Sample Size	550	550	550	550	550

Table 4.28: Regression results of Age Model(4) for the manufacturing industry in 1992

Male

Age	20s	30s	40s	50s	60s
Intercept	-4.0242	-0.5881	-2.109	-4.197	0.4927
	(-4.48)	(-0.77)	(-2.73)	(-4.84)	(1.07)
X	4.694e-06	2.719e-06	2.495e-06	-3.566e-07	-7.403e-08
	(3.64)	(2.47)	(2.25)	(-0.29)	(-0.11)
X^2	2.895e-13	1.428e-13	7.443e-14	6.531e-14	2.611e-15
	(18.19)	(10.52)	(5.44)	(4.25)	(0.32)
TL	0.1285	0.0881	0.08956	0.1009	0.01377
	(14.67)	(11.79)	(11.89)	(11.92)	(3.07)
S	-0.0006885	-0.000427	-0.0001702	-6.428e-05	-3.845e-05
	(-26.45)	(-19.23)	(-7.61)	(-2.56)	(-2.89)
Adj-R^2	0.94	0.88	0.89	0.86	0.08
Sample Size	550	550	550	550	550

Female

Age	20s	30s	40s	50s	60s
Intercept	-0.667	4.634	6.603	7.775	2.036
	(-0.22)	(1.47)	(1.45)	(2.68)	(5.75)
X	-2.874e-05	-3.296e-05	-5.253e-05	-3.013e-05	-1.08e-06
	(-6.63)	(-7.28)	(-8.02)	(-7.23)	(-2.13)
X^2	3.598e-13	3.602e-13	4.924e-13	3.087e-13	1.271e-14
	(6.72)	(6.44)	(6.09)	(6.00)	(2.03)
TL	0.3104	0.2879	0.5137	0.2731	0.005154
	(10.53)	(9.35)	(11.54)	(9.64)	(1.49)
S	-0.0007693	-0.000626	-0.001127	-0.0005886	-5.909e-06
	(-8.79)	(-6.85)	(-8.52)	(-6.99)	(-0.58)
Adj-R^2	0.22	0.13	0.19	0.14	0.00
Sample Size	550	550	550	550	550

Table 4.29: Regression results of Age Model(5) for the manufacturing industry in 1992

Male

Age	20s	30s	40s	50s	60s
Intercept	-3.738	-0.09464	-2.414	-5.0133	0.5416
	(-4.16)	(-0.13)	(-3.14)	(-6.15)	(1.17)
X	4.062e-06	1.629e-06	3.17e-06	1.446e-06	-1.822e-07
	(3.13)	(1.50)	(2.85)	(1.22)	(-0.27)
X^2	2.951e-13	1.524e-13	6.849e-14	4.945e-14	3.563e-15
	(18.52)	(11.48)	(5.02)	(3.42)	(0.43)
TL	0.1245	0.08108	0.09391	0.1125	0.01308
	(14.11)	(11.03)	(12.44)	(14.04)	(2.88)
S	-0.0006823	-0.0004162	-0.0001769	-8.205e-05	-3.739e-05
	(-26.29)	(-19.25)	(-7.96)	(-3.48)	(-2.80)
$\bar{K}$	1.493e-06	2.575e-06	-1.595e-06	-4.257e-06	2.556e-07
	(2.86)	(5.92)	(-3.57)	(-8.98)	(0.95)
Adj-R^2	0.94	0.88	0.89	0.88	0.08
Sample Size	550	550	550	550	550

Female

Age	20s	30s	40s	50s	60s
Intercept	-0.997	3.971	5.381	7.153	2.0239
	(-0.33)	(1.25)	(1.18)	(2.45)	(5.68)
X	-2.801e-05	-3.149e-05	-4.983e-05	-2.876e-05	-1.053e-06
	(-6.36)	(-6.87)	(-7.53)	(-6.81)	(-2.04)
X^2	3.534e-13	3.473e-13	4.687e-13	2.966e-13	1.247e-14
	(6.55)	(6.18)	(5.78)	(5.73)	(1.97)
TL	0.3151	0.2973	0.5311	0.2819	0.005326
	(10.55)	(9.56)	(11.82)	(9.84)	(1.52)
S	-0.0007765	-0.0006404	-0.001153	-0.0006021	-6.172e-06
	(-8.84)	(-7.00)	(-8.73)	(-7.14)	(-0.60)
$\bar{K}$	-1.722e-06	-3.461e-06	-6.373e-06	-3.244e-06	-6.315e-08
	(-0.97)	(-1.88)	(-2.40)	(-1.91)	(-0.31)
Adj-R^2	0.22	0.14	0.20	0.14	0.00
Sample Size	550	550	550	550	550

Table 4.30: Regression results of Ratio Model(1) for the manufacturing industry in 1992

Male

Age	20s	30s	40s	50s	60s
Intercept	-0.2129	-0.2179	-0.2413	-0.2996	-0.06855
	(-6.65)	(-6.42)	(-6.39)	(-7.04)	(-2.59)
lnX	0.02518	0.02712	0.03018	0.03532	0.009241
	(9.05)	(9.21)	(9.20)	(9.56)	(4.02)
Adj-R^2	0.13	0.13	0.13	0.14	0.03
Sample Size	550	550	550	550	550

Female

Age	20s	30s	40s	50s	60s
Intercept	0.1838	0.3904	0.748	0.6217	0.09646
	(4.79)	(10.23)	(15.98)	(13.71)	(5.26)
lnX	-0.008894	-0.0251	-0.04766	-0.03967	-0.005701
	(-2.67)	(-7.57)	(-11.72)	(-10.08)	(-3.58)
Adj-R^2	0.01	0.09	0.20	0.15	0.02
Sample Size	550	550	550	550	550

Table 4.31: Regression results of Ratio Model(2) for the manufacturing industry in 1992

Male

Age	20s	30s	40s	50s	60s
Intercept	-0.112	-0.4162	-0.5141	-0.8439	-0.548
	(-0.65)	(-2.28)	(-2.53)	(-3.71)	(-3.89)
lnX	0.008093	0.06067	0.07633	0.1274	0.09036
	(0.28)	(1.99)	(2.25)	(3.35)	(3.84)
$(\ln X)^2$	0.0007087	-0.001392	-0.001915	-0.00382	-0.003365
	(0.60)	(-1.11)	(-1.37)	(-2.43)	(-3.46)
Adj-R^2	0.13	0.13	0.13	0.15	0.05
Sample Size	550	550	550	550	550

Female

Age	20s	30s	40s	50s	60s
Intercept	0.3851	0.6217	1.432	0.9769	0.01821
	(1.87)	(3.03)	(5.73)	(4.01)	(0.19)
lnX	-0.04295	-0.06424	-0.1634	-0.09978	0.007538
	(-1.25)	(-1.88)	(-3.91)	(-2.45)	(0.46)
$(\ln X)^2$	0.001413	0.001624	0.004802	0.002493	-0.0005492
	(0.99)	(1.15)	(2.78)	(1.49)	(-0.81)
Adj-R^2	0.01	0.09	0.21	0.16	0.02
Sample Size	550	550	550	550	550

Table 4.32: Regression results of Ratio Model(3) for the manufacturing industry in 1992

Male

Age	20s	30s	40s	50s	60s
Intercept	-0.1202	-0.2354	-0.5819	-1.0116	-0.5795
	(-0.59)	(-1.09)	(-2.41)	(-3.74)	(-3.46)
$\ln X$	0.009579	0.02806	0.08856	0.1577	0.09604
	(0.27)	(0.76)	(2.15)	(3.41)	(3.35)
$(\ln X)^2$	0.0006424	6.288e-05	-0.00246	-0.00517	-0.003619
	(0.43)	(0.04)	(-1.41)	(-2.63)	(-2.98)
S	6.107e-09	-1.34e-07	5.03e-08	1.244e-07	2.333e-08
	(0.07)	(-1.54)	(0.52)	(1.15)	(0.35)
Adj-R^2	0.13	0.13	0.13	0.15	0.04
Sample Size	550	550	550	550	550

Female

Age	20s	30s	40s	50s	60s
Intercept	0.4067	0.6064	1.553	0.9816	-0.0187
	(1.66)	(2.48)	(5.22)	(3.39)	(-0.16)
$\ln X$	-0.04686	-0.06147	-0.1851	-0.1006	0.0142
	(-1.11)	(-1.47)	(-3.64)	(-2.03)	(0.71)
$(\ln X)^2$	0.001587	0.0015	0.005771	0.002531	-0.0008462
	(0.89)	(0.85)	(2.67)	(1.20)	(-0.99)
S	-1.607e-08	1.139e-08	-8.923e-08	-3.512e-09	2.737e-08
	(-0.16)	(0.12)	(-0.75)	(-0.03)	(0.58)
Adj-R^2	0.01	0.09	0.21	0.15	0.02
Sample Size	550	550	550	550	550

Table 4.33: Regression results of Ratio Model(4) for the manufacturing industry in 1992

Male

Age	20s	30s	40s	50s	60s
Intercept	-0.3178	0.06682	-0.176	-0.4687	-0.3258
	(-1.36)	(0.27)	(-0.65)	(-1.54)	(-1.72)
lnX	0.0458	-0.02733	0.01416	0.05814	0.04954
	(1.13)	(-0.64)	(0.30)	(1.10)	(1.50)
$(\ln X)^2$	-0.001039	0.002635	0.0009946	-0.0005487	-0.001459
	(-0.59)	(1.42)	(0.48)	(-0.24)	(-1.02)
TL	7.672e-05	-0.0001173	-0.0001576	-0.0002108	-9.85e-05
	(1.78)	(-2.58)	(-3.12)	(-3.74)	(-2.81)
S	-2.566e-07	2.677e-07	5.899e-07	8.461e-07	3.606e-07
	(-1.52)	(1.50)	(2.98)	(3.83)	(2.62)
Adj-R^2	0.13	0.14	0.15	0.17	0.06
Sample Size	550	550	550	550	550

Female

Age	20s	30s	40s	50s	60s
Intercept	-0.1091	0.2301	1.077	0.9312	0.09215
	(-0.40)	(0.83)	(3.20)	(2.82)	(0.69)
lnX	0.04768	0.007483	-0.09797	-0.09138	-0.006121
	(0.99)	(0.16)	(-1.68)	(-1.59)	(-0.26)
$(\ln X)^2$	-0.002803	-0.001702	0.001723	0.002102	9.725e-05
	(-1.34)	(-0.82)	(0.68)	(0.84)	(0.10)
TL	0.0002003	0.0001461	0.0001846	1.959e-05	-4.304e-05
	(3.92)	(2.86)	(2.96)	(0.32)	(-1.74)
S	-7.017e-07	-4.887e-07	-7.214e-07	-7.058e-08	1.747e-07
	(-3.50)	(-2.44)	(-2.96)	(-0.30)	(1.81)
Adj-R^2	0.03	0.10	0.22	0.15	0.02
Sample Size	550	550	550	550	550

Table 4.34: Regression results of Ratio Model(5) for the manufacturing industry in 1992

Male

Age	20s	30s	40s	50s	60s
Intercept	-0.3682	0.02796	-0.1302	-0.3817	-0.3325
	(-1.56)	(0.11)	(-0.47)	(-1.24)	(-1.73)
lnX	0.05507	-0.02018	0.005739	0.04214	0.05077
	(1.34)	(-0.47)	(0.12)	(0.78)	(1.51)
$(\ln X)^2$	-0.001453	0.002316	0.00137	0.0001649	-0.001514
	(-0.81)	(1.23)	(0.65)	(0.07)	(-1.04)
TL	6.239e-05	-0.0001284	-0.0001446	-0.0001861	-0.0001004
	(1.40)	(-2.73)	(-2.76)	(-3.19)	(-2.75)
S	-2.468e-07	2.752e-07	5.81e-07	8.291e-07	3.619e-07
	(-1.46)	(1.55)	(2.93)	(3.76)	(2.63)
$\bar{K}$	3.933e-09	3.033e-09	-3.574e-09	-6.79e-09	5.231e-10
	(1.20)	(0.88)	(-0.93)	(-1.59)	(0.20)
Adj-R^2	0.13	0.14	0.15	0.17	0.05
Sample Size	550	550	550	550	550

Female

Age	20s	30s	40s	50s	60s
Intercept	-0.09199	0.243	1.0847	0.8675	0.08139
	(-0.33)	(0.87)	(3.17)	(2.59)	(0.60)
lnX	0.04454	0.005121	-0.09939	-0.07967	-0.004142
	(0.91)	(0.11)	(-1.67)	(-1.36)	(-0.18)
$(\ln X)^2$	-0.002663	-0.001596	0.001787	0.00158	8.998e-06
	(-1.25)	(-0.75)	(0.69)	(0.62)	(0.01)
TL	0.0002051	0.0001497	0.0001868	1.476e-06	-4.61e-05
	(3.86)	(2.82)	(2.89)	(0.02)	(-1.80)
S	-7.051e-07	-4.912e-07	-7.229e-07	-5.816e-08	1.768e-07
	(-3.51)	(-2.45)	(-2.96)	(-0.24)	(1.83)
$\bar{K}$	-1.332e-09	-1.002e-09	-6.019e-10	4.972e-09	8.397e-10
	(-0.34)	(-0.26)	(-0.13)	(1.07)	(0.45)
Adj-R^2	0.03	0.10	0.22	0.15	0.02
Sample Size	550	550	550	550	550

Table 4.35: Regression results of Age Model(1) for the manufacturing industry in 1993

Male

Age	20s	30s	40s	50s	60s
Intercept	6.31	2.396	7.733	6.862	1.888
	(1.10)	(0.67)	(1.25)	(1.82)	(3.70)
X	1.391e-05	1.3e-05	9.721e-06	7.08e-06	1.081e-07
	(16.57)	(25.01)	(10.74)	(12.87)	(1.45)
Adj-R^2	0.52	0.72	0.32	0.40	0.00
Sample Size	248	248	248	248	248

Female

Age	20s	30s	40s	50s	60s
Intercept	15.7	11.35	24.096	16.82	1.566
	(1.83)	(4.77)	(8.06)	(6.74)	(5.57)
X	6.851e-06	1.013e-06	4.94e-07	4.776e-07	-2.914e-08
	(5.48)	(2.92)	(1.13)	(1.31)	(-0.71)
Adj-R^2	0.10	0.03	0.00	0.00	0.00
Sample Size	248	248	248	248	248

Table 4.36: Regression results of Age Model(2) for the manufacturing industry in 1993

Male

Age	20s	30s	40s	50s	60s
Intercept	-6.0175	2.319	0.6416	4.141	1.365
	(-1.25)	(0.63)	(0.11)	(1.09)	(2.71)
X	3.597e-05	1.314e-05	2.24e-05	1.195e-05	1.043e-06
	(17.42)	(8.34)	(8.60)	(7.30)	(4.81)
X^2	-3.711e-13	-2.325e-15	-2.135e-13	-8.191e-14	-1.574e-14
	(-11.32)	(-0.09)	(-5.15)	(-3.15)	(-4.57)
Adj-R^2	0.69	0.71	0.38	0.42	0.08
Sample Size	248	248	248	248	248

Female

Age	20s	30s	40s	50s	60s
Intercept	0.4581	9.124	22.87	16.11	1.58
	(0.06)	(3.86)	(7.48)	(6.29)	(5.46)
X	3.411e-05	4.994e-06	2.688e-06	1.742e-06	-5.431e-08
	(10.31)	(4.91)	(2.04)	(1.58)	(-0.44)
X^2	-4.588e-13	-6.7e-14	-3.692e-14	-2.127e-14	4.237e-16
	(-8.72)	(-4.14)	(-1.77)	(-1.22)	(0.21)
Adj-R^2	0.31	0.09	0.01	0.00	-0.01
Sample Size	248	248	248	248	248

Table 4.37: Regression results of Age Model(3) for the manufacturing industry in 1993

Male

Age	20s	30s	40s	50s	60s
Intercept	-7.876	-0.6315	-3.856	1.768	1.219
	(-1.75)	(-0.26)	(-0.88)	(0.57)	(2.50)
X	2.435e-05	-5.31e-06	-5.723e-06	-2.894e-06	1.304e-07
	(8.96)	(-3.61)	(-2.16)	(-1.54)	(0.44)
X^2	-2.455e-13	1.972e-13	9.065e-14	7.856e-14	-5.87e-15
	(-6.64)	(9.87)	(2.51)	(3.07)	(-1.46)
S	0.0005579	0.0008858	0.00135	0.0007125	4.384e-05
	(6.07)	(17.83)	(15.04)	(11.22)	(4.39)
Adj-R^2	0.73	0.88	0.68	0.62	0.14
Sample Size	248	248	248	248	248

Female

Age	20s	30s	40s	50s	60s
Intercept	-1.871	8.0323	22.61	15.75	1.568
	(-0.25)	(3.75)	(7.38)	(6.18)	(5.40)
X	1.955e-05	-1.833e-06	1.067e-06	-5.027e-07	-1.263e-07
	(4.36)	(-1.41)	(0.58)	(-0.33)	(-0.72)
X^2	-3.013e-13	6.81e-15	-1.94e-14	2.993e-15	1.202e-15
	(-4.94)	(0.39)	(-0.77)	(0.14)	(0.50)
S	0.0006994	0.0003278	7.78e-05	0.0001077	3.458e-06
	(4.61)	(7.47)	(1.24)	(2.06)	(0.58)
Adj-R^2	0.37	0.25	0.01	0.02	-0.01
Sample Size	248	248	248	248	248

Table 4.38: Regression results of Age Model(4) for the manufacturing industry in 1993

Male

Age	20s	30s	40s	50s	60s
Intercept	-17.78	-8.815	-16.28	-8.517	1.0556
	(-4.24)	(-4.82)	(-4.36)	(-3.58)	(2.07)
X	1.238e-05	-1.52e-05	-2.073e-05	-1.532e-05	-6.665e-08
	(4.34)	(-12.22)	(-8.16)	(-9.48)	(-0.19)
X^2	-1.385e-13	2.855e-13	2.248e-13	1.896e-13	-4.109e-15
	(-3.89)	(18.38)	(7.09)	(9.40)	(-0.95)
TL	0.1596	0.1318	0.2001	0.1657	0.002628
	(7.98)	(15.11)	(11.23)	(14.62)	(1.08)
S	-6.008e-05	0.0003754	0.0005757	7.103e-05	3.367e-05
	(-0.53)	(7.63)	(5.73)	(1.11)	(2.45)
Adj-R^2	0.78	0.94	0.79	0.79	0.14
Sample Size	248	248	248	248	248

Female

Age	20s	30s	40s	50s	60s
Intercept	-25.95	2.152	18.2	12.63	1.586
	(-4.50)	(1.16)	(5.93)	(4.88)	(5.21)
X	-9.545e-06	-8.936e-06	-4.257e-06	-4.271e-06	-1.048e-07
	(-2.43)	(-7.09)	(-2.04)	(-2.43)	(-0.51)
X^2	-4.13e-14	7.03e-14	2.819e-14	3.667e-14	1.01e-15
	(-0.84)	(4.46)	(1.08)	(1.67)	(0.39)
TL	0.388	0.09473	0.07101	0.05025	-0.0002869
	(14.10)	(10.71)	(4.85)	(4.07)	(-0.20)
S	-0.0008026	-3.899e-05	-0.0001971	-8.681e-05	4.569e-06
	(-5.17)	(-0.78)	(-2.39)	(-1.25)	(0.56)
Adj-R^2	0.65	0.49	0.10	0.08	-0.01
Sample Size	248	248	248	248	248

Table 4.39: Regression results of Age Model(5) for the manufacturing industry in 1993

Male

Age	20s	30s	40s	50s	60s
Intercept	-13.22	-11.61	-21.47	-9.973	1.0492
	(-3.12)	(-6.50)	(-5.82)	(-4.07)	(1.97)
X	9.813e-06	-1.362e-05	-1.78e-05	-1.45e-05	-6.31e-08
	(3.45)	(-11.35)	(-7.18)	(-8.81)	(-0.18)
X^2	-9.386e-14	2.582e-13	1.738e-13	1.754e-13	-4.171e-15
	(-2.58)	(16.82)	(5.48)	(8.33)	(-0.91)
TL	0.09152	0.1735	0.2777	0.1874	0.002722
	(3.53)	(15.87)	(12.30)	(12.51)	(0.84)
S	0.0001018	0.0002763	0.0003912	1.935e-05	3.344e-05
	(0.87)	(5.60)	(3.84)	(0.29)	(2.28)
$\bar{K}$	9.018e-06	-5.522e-06	-1.028e-05	-2.879e-06	-1.25e-08
	(3.98)	(-5.77)	(-5.20)	(-2.19)	(-0.04)
Adj-R^2	0.79	0.94	0.81	0.80	0.14
Sample Size	248	248	248	248	248

Female

Age	20s	30s	40s	50s	60s
Intercept	-28.85	-0.5564	15.17	9.524	1.558
	(-4.83)	(-0.31)	(4.88)	(3.68)	(4.91)
X	-7.914e-06	-7.411e-06	-2.55e-06	-2.521e-06	-8.91e-08
	(-1.97)	(-6.06)	(-1.22)	(-1.45)	(-0.42)
X^2	-6.97e-14	4.376e-14	-1.535e-15	6.203e-15	7.364e-16
	(-1.36)	(2.80)	(-0.06)	(0.28)	(0.27)
TL	0.4312	0.1352	0.1163	0.09669	0.0001304
	(11.81)	(12.13)	(6.11)	(6.10)	(0.07)
S	-0.0009056	-0.0001352	-0.0003048	-0.0001972	3.576e-06
	(-5.50)	(-2.69)	(-3.55)	(-2.76)	(0.41)
$\bar{K}$	-5.733e-06	-5.358e-06	-6e-06	-6.151e-06	-5.526e-08
	(-1.79)	(-5.49)	(-3.60)	(-4.43)	(-0.33)
Adj-R^2	0.65	0.55	0.14	0.14	-0.02
Sample Size	248	248	248	248	248

Table 4.40: Regression results of Ratio Model(1) for the manufacturing industry in 1993

Male

Age	20s	30s	40s	50s	60s
Intercept	-0.2197	-0.1667	-0.1622	-0.1794	-0.02993
	(-4.41)	(-3.83)	(-2.92)	(-3.88)	(-0.70)
lnX	0.02685	0.02192	0.02399	0.02361	0.006702
	(6.33)	(5.92)	(5.07)	(6.00)	(1.83)
Adj-R^2	0.14	0.12	0.09	0.12	0.01
Sample Size	248	248	248	248	248

Female

Age	20s	30s	40s	50s	60s
Intercept	0.054	0.3616	0.7671	0.5101	0.06507
	(0.98)	(8.05)	(11.95)	(8.19)	(2.88)
lnX	0.002661	-0.02293	-0.0488	-0.03089	-0.003115
	(0.57)	(-6.00)	(-8.93)	(-5.83)	(-1.62)
Adj-R^2	0.00	0.12	0.24	0.12	0.01
Sample Size	248	248	248	248	248

Table 4.41: Regression results of Ratio Model(2) for the manufacturing industry in 1993

Male

Age	20s	30s	40s	50s	60s
Intercept	-0.2114	-0.3537	-0.94	-0.8593	-0.7751
	(-0.83)	(-1.59)	(-3.35)	(-3.69)	(-3.60)
lnX	0.02549	0.05241	0.1508	0.1344	0.1282
	(0.62)	(1.46)	(3.34)	(3.59)	(3.70)
$(\mathrm{lnX})^2$	5.393e-05	-0.00121	-0.005031	-0.004397	-0.00482
	(0.03)	(-0.86)	(-2.83)	(-2.98)	(-3.53)
Adj-R^2	0.13	0.12	0.12	0.15	0.05
Sample Size	248	248	248	248	248

Female

Age	20s	30s	40s	50s	60s
Intercept	0.2053	0.9322	2.13	0.9926	-0.1202
	(0.73)	(4.10)	(6.72)	(3.12)	(-1.04)
lnX	-0.022	-0.1159	-0.2709	-0.1095	0.02708
	(-0.49)	(-3.17)	(-5.32)	(-2.14)	(1.46)
$(\mathrm{lnX})^2$	0.0009784	0.003691	0.008812	0.003121	-0.001198
	(0.55)	(2.56)	(4.38)	(1.55)	(-1.64)
Adj-R^2	-0.01	0.14	0.29	0.12	0.01
Sample Size	248	248	248	248	248

Table 4.42: Regression results of Ratio Model(3) for the manufacturing industry in 1993

Male

Age	20s	30s	40s	50s	60s
Intercept	-0.247	-0.3872	-1.0745	-0.9348	-0.7525
	(-0.84)	(-1.50)	(-3.31)	(-3.47)	(-3.02)
$\ln X$	0.03205	0.05858	0.1756	0.1483	0.124
	(0.65)	(1.36)	(3.24)	(3.30)	(2.98)
$(\ln X)^2$	-0.0002459	-0.001491	-0.006163	-0.005032	-0.00463
	(-0.12)	(-0.83)	(-2.75)	(-2.70)	(-2.68)
S	3.876e-08	3.638e-08	1.463e-07	8.208e-08	-2.454e-08
	(0.24)	(0.26)	(0.83)	(0.56)	(-0.18)
Adj-R^2	0.13	0.12	0.11	0.15	0.05
Sample Size	248	248	248	248	248

Female

Age	20s	30s	40s	50s	60s
Intercept	0.2472	0.9499	2.301	1.0314	-0.134
	(0.76)	(3.61)	(6.28)	(2.80)	(-1.00)
$\ln X$	-0.02972	-0.1192	-0.3025	-0.1167	0.02963
	(-0.55)	(-2.71)	(-4.95)	(-1.90)	(1.33)
$(\ln X)^2$	0.001331	0.00384	0.01026	0.003447	-0.001315
	(0.59)	(2.11)	(4.04)	(1.35)	(-1.42)
S	-4.563e-08	-1.927e-08	-1.869e-07	-4.222e-08	1.504e-08
	(-0.26)	(-0.13)	(-0.94)	(-0.21)	(0.21)
Adj-R^2	-0.01	0.14	0.29	0.12	0.01
Sample Size	248	248	248	248	248

Table 4.43: Regression results of Ratio Model(4) for the manufacturing industry in 1993

Male

Age	20s	30s	40s	50s	60s
Intercept	-0.2999	-0.3777	-0.8413	-0.7562	-0.5918
	(-0.88)	(-1.28)	(-2.27)	(-2.45)	(-2.07)
lnX	0.04162	0.05685	0.1334	0.116	0.09494
	(0.72)	(1.13)	(2.11)	(2.21)	(1.95)
$(\ln X)^2$	-0.0006799	-0.001413	-0.00425	-0.003568	-0.003312
	(-0.28)	(-0.66)	(-1.58)	(-1.60)	(-1.60)
TL	1.267e-05	-2.284e-06	-5.582e-05	-4.274e-05	-3.847e-05
	(0.32)	(-0.07)	(-1.29)	(-1.19)	(-1.16)
S	-1.038e-08	4.524e-08	3.629e-07	2.479e-07	1.247e-07
	(-0.05)	(0.23)	(1.49)	(1.23)	(0.67)
Adj-R^2	0.13	0.11	0.12	0.15	0.05
Sample Size	248	248	248	248	248

Female

Age	20s	30s	40s	50s	60s
Intercept	-0.2509	0.8746	2.28	1.0648	-0.1017
	(-0.68)	(2.90)	(5.43)	(2.52)	(-0.67)
lnX	0.0604	-0.1056	-0.2987	-0.1227	0.02378
	(0.96)	(-2.05)	(-4.17)	(-1.71)	(0.91)
$(\ln X)^2$	-0.002755	0.003222	0.01008	0.003721	-0.001049
	(-1.03)	(1.47)	(3.31)	(1.22)	(-0.95)
TL	0.0001193	1.804e-05	5.099e-06	-8.002e-06	-7.739e-06
	(2.79)	(0.51)	(0.10)	(-0.16)	(-0.44)
S	-5.083e-07	-8.926e-08	-2.067e-07	-1.118e-08	4.507e-08
	(-2.10)	(-0.45)	(-0.75)	(-0.04)	(0.45)
Adj-R^2	0.02	0.14	0.29	0.12	0.01
Sample Size	248	248	248	248	248

Table 4.44: Regression results of Ratio Model(5) for the manufacturing industry in 1993

Male

Age	20s	30s	40s	50s	60s
Intercept	-0.2822	-0.3805	-0.8287	-0.758	-0.5931
	(-0.84)	(-1.28)	(-2.24)	(-2.45)	(-2.07)
lnX	0.03897	0.05728	0.1315	0.1163	0.09514
	(0.68)	(1.13)	(2.08)	(2.21)	(1.95)
$(\ln X)^2$	-0.0005584	-0.001433	-0.004163	-0.00358	-0.003321
	(-0.23)	(-0.67)	(-1.55)	(-1.60)	(-1.60)
TL	-4.749e-05	7.355e-06	-9.858e-05	-3.674e-05	-3.395e-05
	(-0.92)	(0.16)	(-1.74)	(-0.78)	(-0.78)
S	1.043e-07	2.687e-08	4.444e-07	2.365e-07	1.161e-07
	(0.45)	(0.13)	(1.76)	(1.12)	(0.59)
$\bar{K}$	7.756e-09	-1.243e-09	5.513e-09	-7.741e-10	-5.82e-10
	(1.79)	(-0.33)	(1.16)	(-0.20)	(-0.16)
Adj-R^2	0.13	0.11	0.12	0.15	0.05
Sample Size	248	248	248	248	248

Female

Age	20s	30s	40s	50s	60s
Intercept	-0.2536	0.8686	2.267	1.061	-0.1008
	(-0.69)	(2.87)	(5.39)	(2.51)	(-0.66)
lnX	0.0608	-0.1047	-0.2968	-0.1222	0.02365
	(0.97)	(-2.03)	(-4.15)	(-1.70)	(0.91)
$(\ln X)^2$	-0.002773	0.003181	0.009996	0.003695	-0.001043
	(-1.04)	(1.45)	(3.28)	(1.21)	(-0.94)
TL	0.0001284	3.842e-05	4.824e-05	5.074e-06	-1.07e-05
	(2.28)	(0.83)	(0.75)	(0.08)	(-0.46)
S	-5.257e-07	-1.281e-07	-2.889e-07	-3.611e-08	5.072e-08
	(-2.09)	(-0.62)	(-1.01)	(-0.13)	(0.49)
$\bar{K}$	-1.176e-09	-2.627e-09	-5.563e-09	-1.686e-09	3.82e-10
	(-0.25)	(-0.68)	(-1.03)	(-0.31)	(0.20)
Adj-R^2	0.01	0.14	0.29	0.11	0.00
Sample Size	248	248	248	248	248

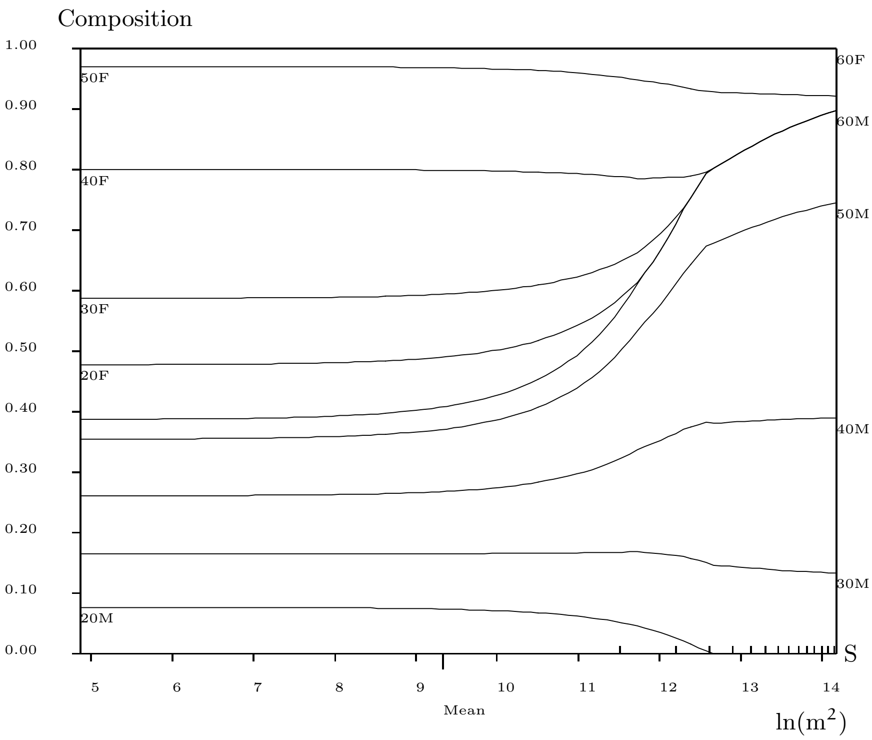


Figure 4.17: Ratio Model(5): Manufacturing Industry in 1992

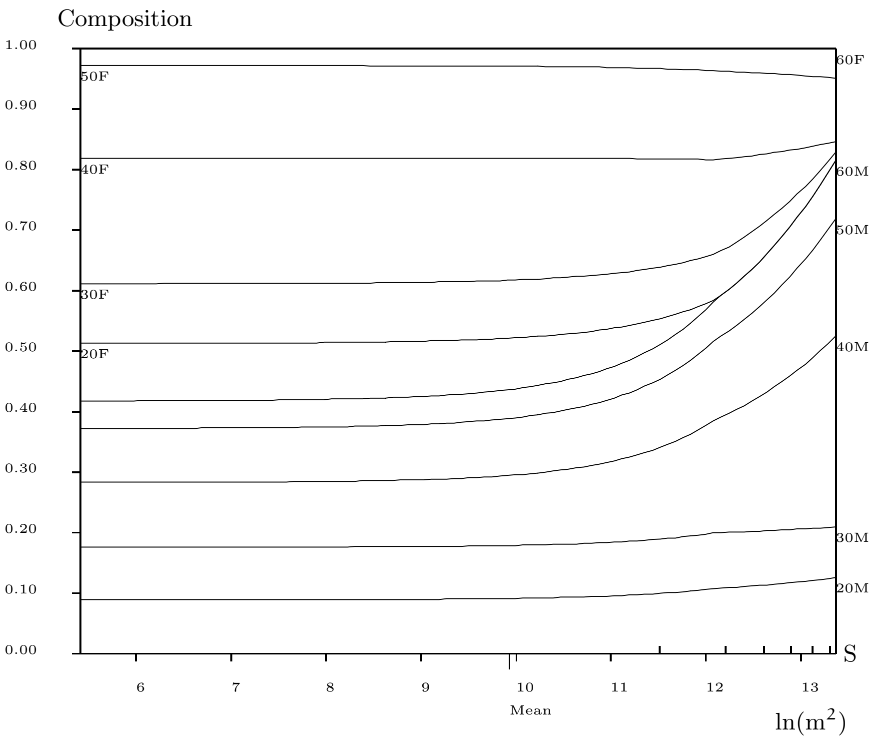


Figure 4.18: Ratio Model(5): Manufacturing Industry in 1993

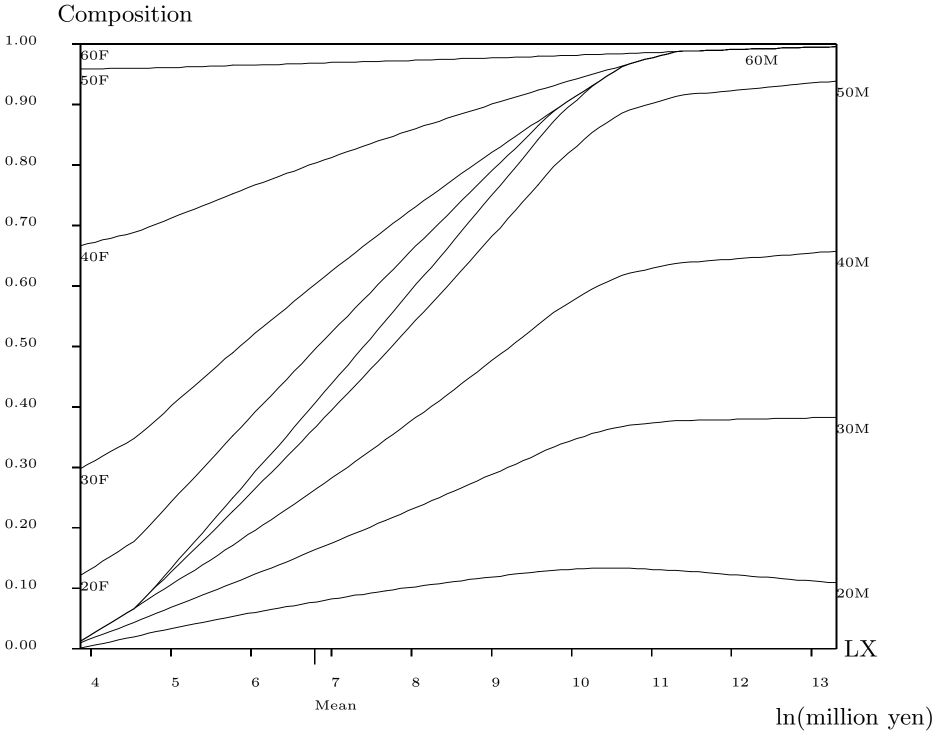


Figure 4.19: Ratio Model(5): Manufacturing Industry in 1992

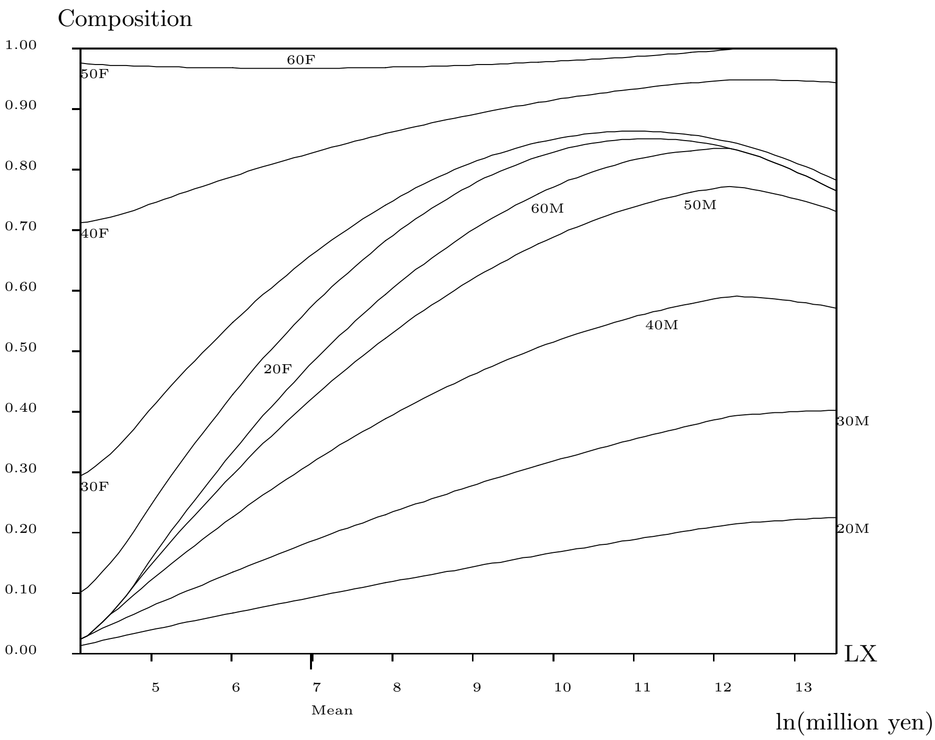


Figure 4.20: Ratio Model(5): Manufacturing Industry in 1993

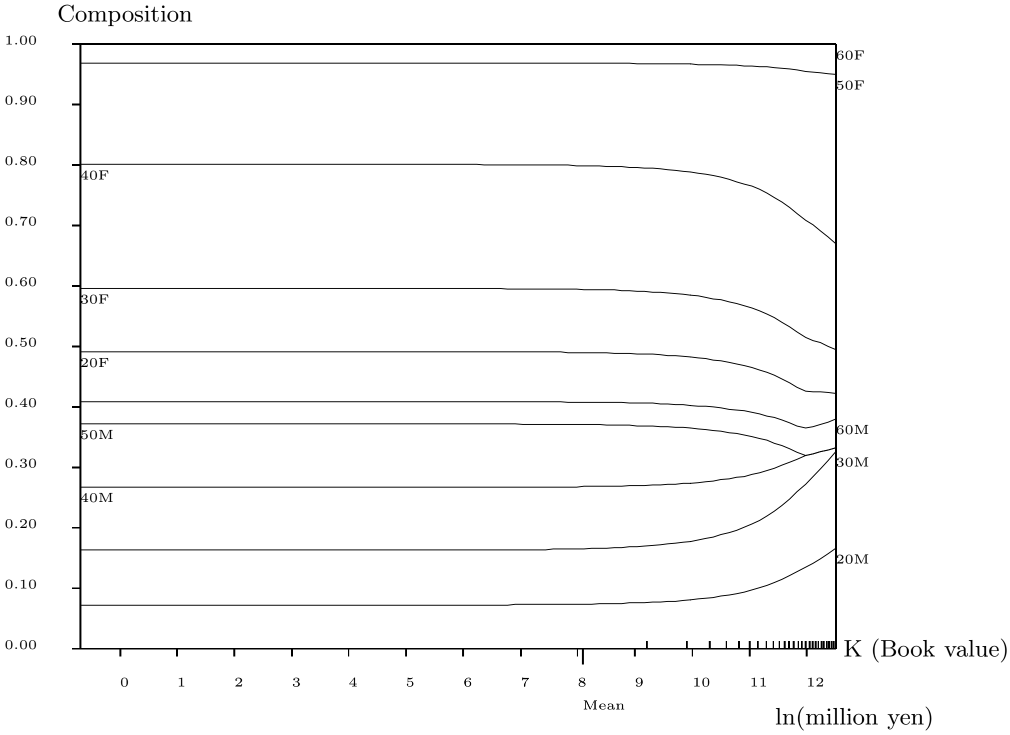


Figure 4.21: Ratio Model(5): Manufacturing Industry in 1992

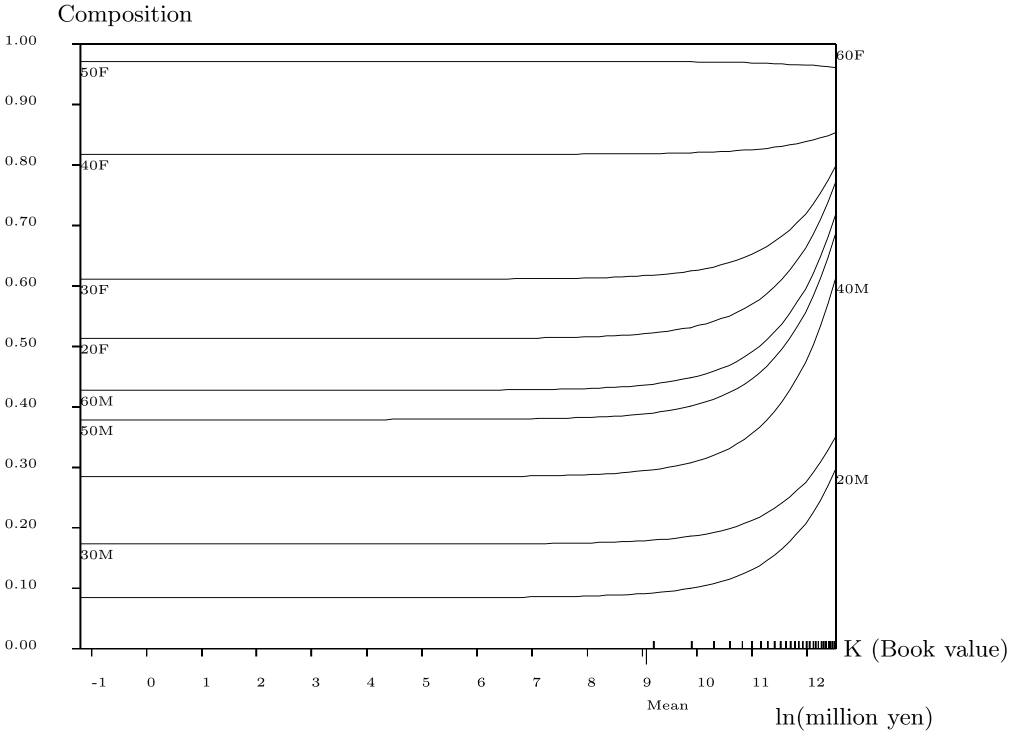
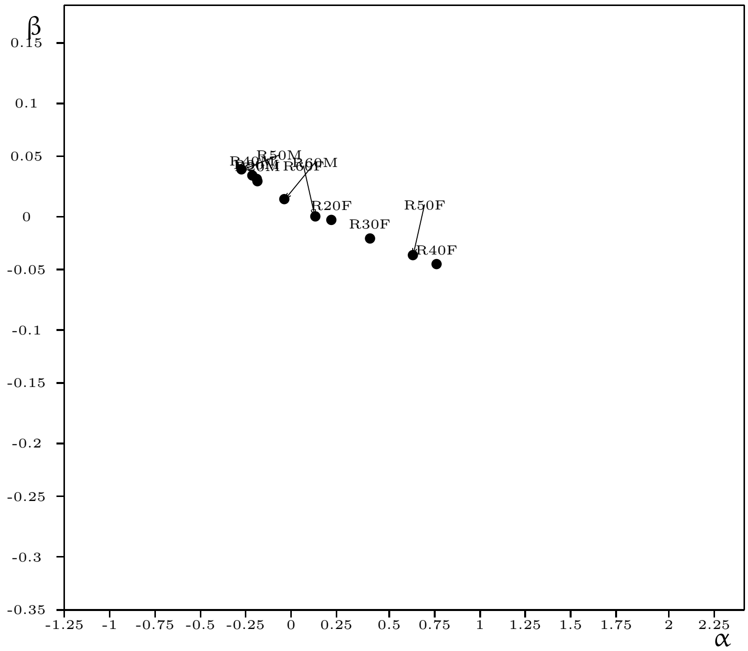


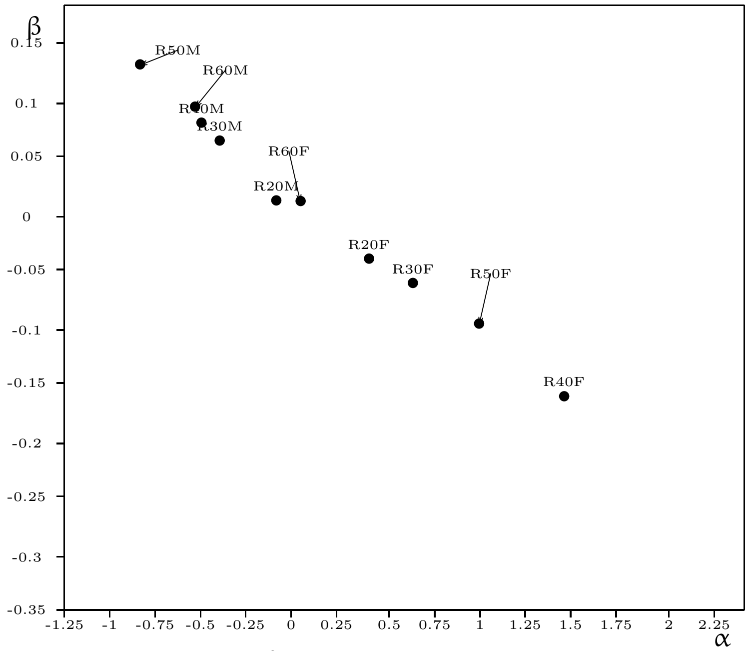
Figure 4.22: Ratio Model(5): Manufacturing Industry in 1993



$\frac{L_i}{L} = \alpha_i + \beta_i \ln X$

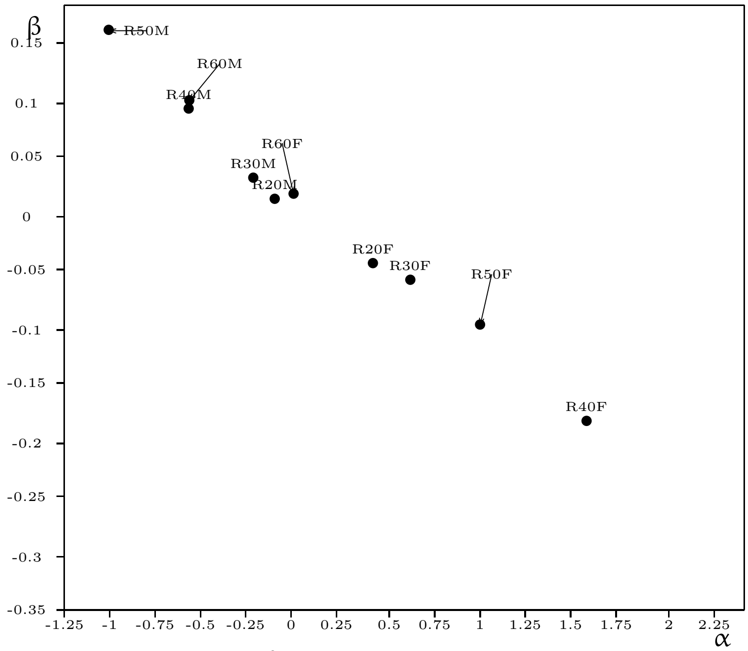
$i = 20M, 30M, \ldots, 60F$

Figure 4.23: Estimated Parameters of Ratio Model(1) of Manufacturing industry in 1992



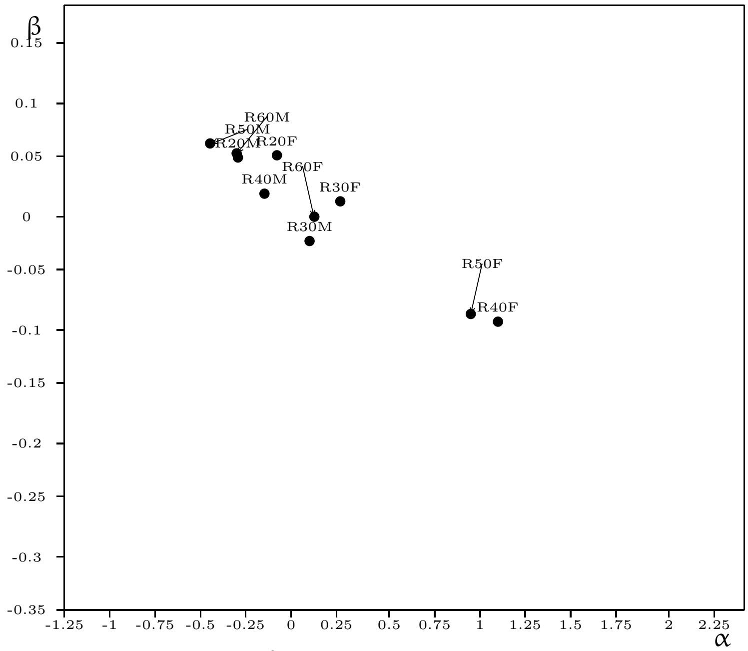
$\frac{L_i}{L} = \alpha_i + \beta_i \ln X + \gamma_i (\ln X)^2$
$i = 20M, 30M, \ldots, 60F$

Figure 4.24: Estimated Parameters of Ratio Model(2) of Manufacturing industry in 1992



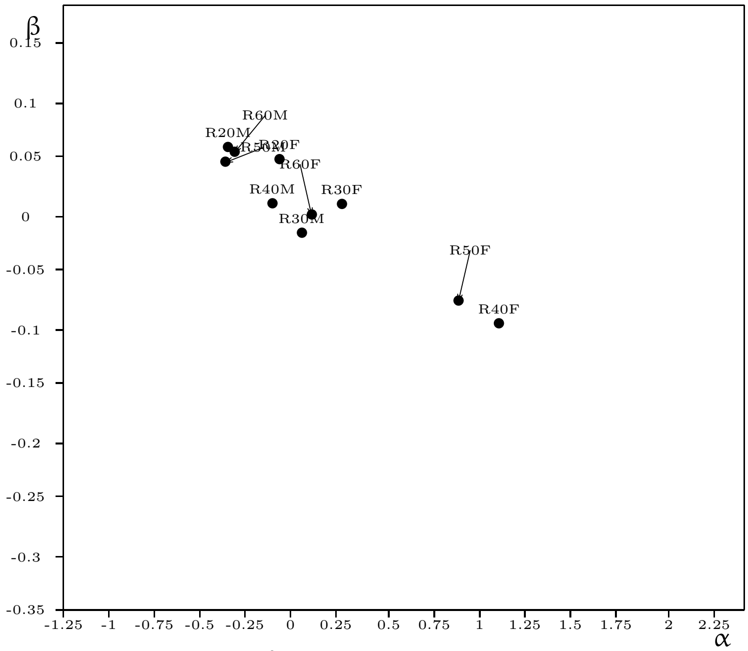
$\frac{L_i}{L} = \alpha_i + \beta_i \ln X + \gamma_i (\ln X)^2 + \gamma_{Si} S$
$i = 20M, 30M, \ldots, 60F$

Figure 4.25: Estimated Parameters of Ratio Model(3) of Manufacturing industry in 1992



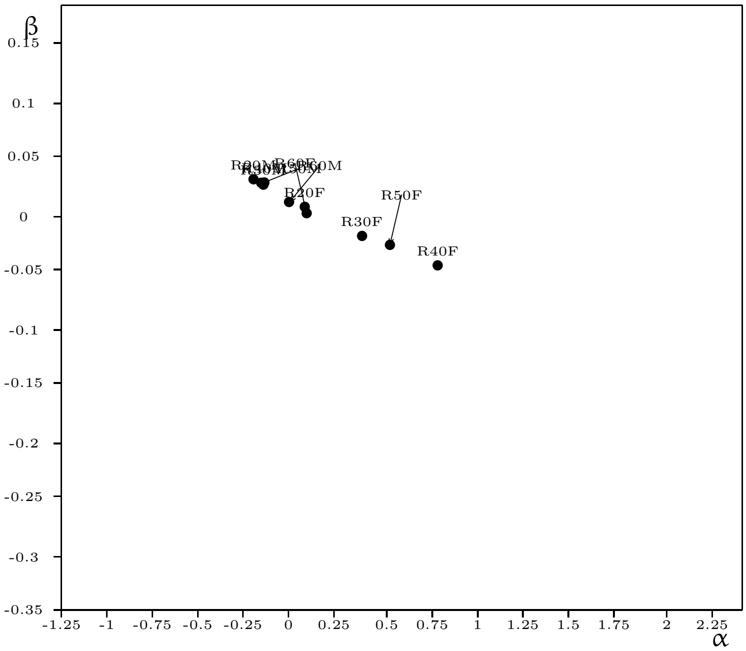
$\frac{L_i}{L} = \alpha_i + \beta_i \ln X + \gamma_i (\ln X)^2 + \gamma_{Si} S + \gamma_{TLi} TL$
$i = 20M, 30M, \ldots, 60F$

Figure 4.26: Estimated Parameters of Ratio Model(4) of Manufacturing industry in 1992



$\frac{L_i}{L} = \alpha_i + \beta_i \ln X + \gamma_i (\ln X)^2 + \gamma_{Si} S + \gamma_{TLi} TL + \gamma_{Ci} C$
$i = 20M, 30M, \ldots, 60F$

Figure 4.27: Estimated Parameters of Ratio Model(5) of Manufacturing industry in 1992



$\frac{L_i}{L} = \alpha_i + \beta_i \ln X$

$i = 20M, 30M, \ldots, 60F$

Figure 4.28: Estimated Parameters of Ratio Model(1) of Manufacturing industry in 1993

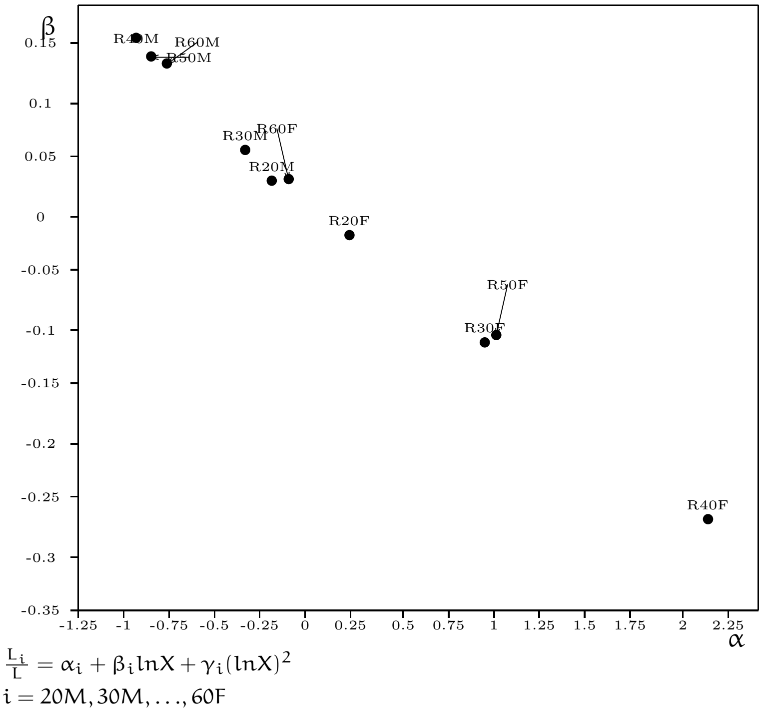
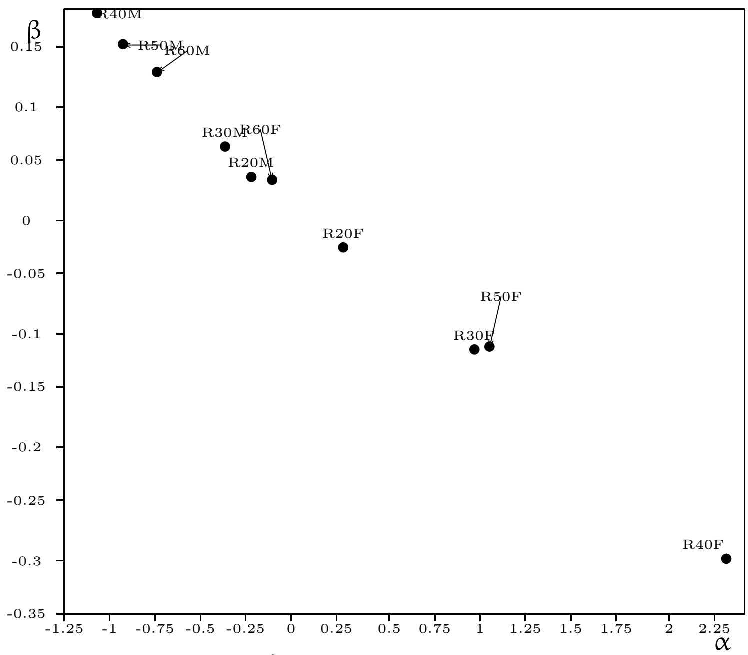


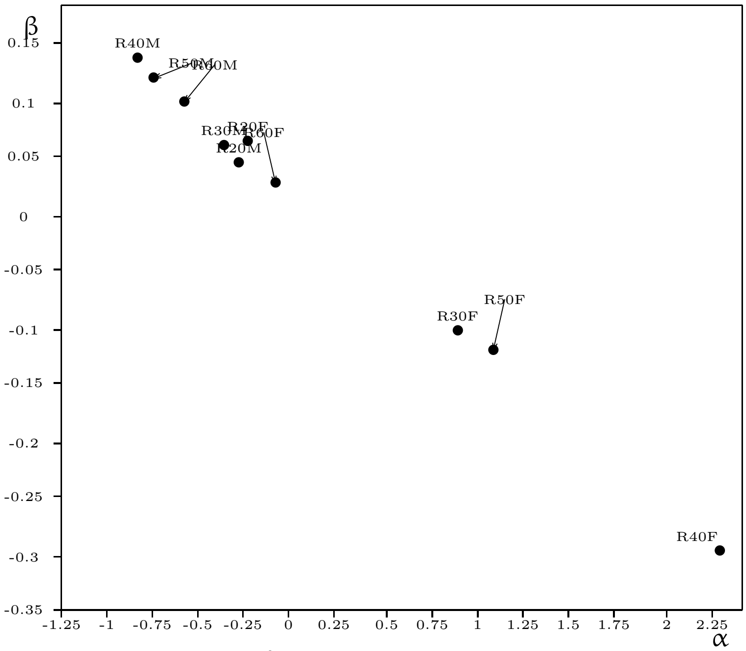
Figure 4.29: Estimated Parameters of Ratio Model(2) of Manufacturing industry in 1993



$\frac{L_i}{L} = \alpha_i + \beta_i \ln X + \gamma_i (\ln X)^2 + \gamma_{Si} S$

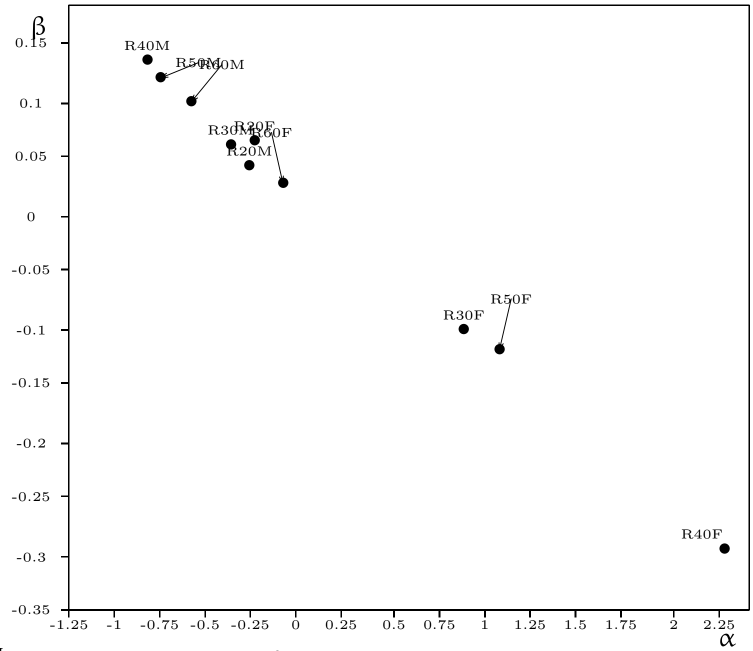
$i = 20M, 30M, \ldots, 60F$

Figure 4.30: Estimated Parameters of Ratio Model(3) of Manufacturing industry in 1993



$\frac{L_i}{L} = \alpha_i + \beta_i \ln X + \gamma_i (\ln X)^2 + \gamma_{Si} S + \gamma_{TLi} TL$
$i = 20M, 30M, \ldots, 60F$

Figure 4.31: Estimated Parameters of Ratio Model(4) of Manufacturing industry in 1993



$\frac{L_i}{L} = \alpha_i + \beta_i \ln X + \gamma_i (\ln X)^2 + \gamma_{Si} S + \gamma_{TLi} TL + \gamma_{Ci} C$

$i = 20M, 30M, \ldots, 60F$

Figure 4.32: Estimated Parameters of Ratio Model(5) of Manufacturing industry in 1993

Table 4.45: Maximum likehood estimator for censored regression: L Model for Retail in 1992

Male

Age	20s	30s	40s	50s	60s
Const	2.152	0.346	-6.861	-10.27	-5.725
	(1.69)	(0.39)	(-6.92)	(-11.55)	(-9.39)
X	0.85	1.065	1.058	0.7208	0.06746
	(10.96)	(19.70)	(18.54)	(16.27)	(2.17)
X^2	-0.001718	-0.002496	-0.002281	-0.002036	-0.000266
	(-6.37)	(-13.27)	(-11.49)	(-13.17)	(-2.25)
OX	15.91	7.785	9.63	10.07	-1.089
	(6.79)	(4.76)	(5.58)	(7.46)	(-1.20)
OX^2	-2.829	-1.616	-1.945	-1.803	0.6178
	(-5.29)	(-4.33)	(-4.94)	(-5.95)	(3.40)
YR	0.2113	0.1666	0.4645	0.3205	-0.0299
	(1.80)	(2.04)	(5.23)	(4.25)	(-0.61)
YR^2	-0.00522	-0.002102	-0.004908	-0.001628	0.001913
	(-2.34)	(-1.36)	(-2.95)	(-1.17)	(2.11)
S	-0.03136	-0.02952	-0.02784	-0.04722	-0.01546
	(-2.03)	(-2.75)	(-2.45)	(-5.17)	(-2.42)
S^2	4.8e-05	-4.3e-05	3e-05	3.4e-05	2.8e-05
	(1.73)	(-2.19)	(1.45)	(2.10)	(2.72)
$\hat{\sigma}$	17.87	12.48	13.15	9.99	5.294
	(61.94)	(63.30)	(60.12)	(46.08)	(24.37)
Sample size	2345	2345	2345	2345	2345
Mean of Dep.	9.39	7.5	6.66	3.02	0.469
Log L	-8791	-8321	-7735	-4918	-1873
Iteration	201	4	4	5	6

Female

Age	20s	30s	40s	50s	60s
Const	1.335	2.496	5.258	-2.941	-7.254
	(0.75)	(2.96)	(4.98)	(-2.83)	(-9.87)
X	0.7772	0.2768	0.2763	0.036	-0.0938
	(7.17)	(5.45)	(4.22)	(0.57)	(-1.69)
X^2	-0.000341	-0.000217	-0.000447	0.00198	0.000108
	(-0.90)	(-1.23)	(-1.97)	(0.91)	(0.29)
OX	9.33	-10.5	-18.01	-11.79	-4.092
	(2.85)	(-6.07)	(-8.02)	(-5.48)	(-2.92)
OX^2	-2.328	1.408	1.804	1.263	0.7646
	(-3.12)	(3.90)	(3.94)	(2.91)	(2.76)
YR	0.0349	-0.3469	-0.3207	-0.0325	0.0359
	(0.21)	(-4.42)	(-3.28)	(-0.34)	(0.62)
YR^2	-0.00016	0.005966	0.004855	0.001448	0.000979
	(-0.05)	(4.01)	(2.63)	(0.81)	(0.92)
S	0.2317	0.1252	0.1429	0.1178	0.0161
	(10.78)	(12.38)	(11.12)	(9.54)	(1.70)
S^2	0.000216	-0.000145	-0.000101	-8.9e-05	-1.5e-05
	(5.53)	(-7.99)	(-4.41)	(-4.17)	(-0.57)
$\hat{\sigma}$	24.99	11.54	14.5	13.42	6.079
	(63.91)	(54.32)	(56.00)	(48.86)	(23.88)
Sample size	2345	2345	2345	2345	2345
Mean of Dep.	15.2	5.03	7.77	4.4	0.49
Log L	-9810	-6546	-7312	-5927	-1866
Iteration	5	5	6	5	8

Table 4.46: Maximum likehood estimator for censored regression: Lh Model for Retail in 1992

Male

Age	20s	30s	40s	50s	60s
Const	369.1	128.2	-1153	-1748	-1014
	(1.55)	(0.77)	(-6.57)	(-11.39)	(-9.51)
X	166.8	185.4	184	119.4	9.808
	(11.48)	(18.34)	(18.22)	(15.58)	(1.81)
X^2	-0.3878	-0.4402	-0.414	-0.3439	-0.0398
	(-7.67)	(-12.51)	(-11.78)	(-12.84)	(-1.95)
OX	3073	1503	1733	1682	-210.9
	(7.00)	(4.91)	(5.67)	(7.21)	(-1.32)
OX^2	-545.4	-301.1	-355.4	-294	108.7
	(-5.45)	(-4.32)	(-5.10)	(-5.61)	(3.43)
YR	41.1	29.6	79.6	55.3	-3.96
	(1.87)	(1.94)	(5.07)	(4.24)	(-0.46)
YR^2	-0.954	-0.3413	-0.777	-0.247	0.322
	(-2.28)	(-1.18)	(-2.64)	(-1.03)	(2.04)
S	-9.06	-6.32	-5.32	-8.1	-2.55
	(-3.14)	(-3.15)	(-2.64)	(-5.13)	(-2.29)
S^2	0.0116	-0.0055	0.0038	0.0058	0.0049
	(2.22)	(-1.51)	(1.05)	(2.07)	(2.72)
$\hat{\sigma}$	3349	2334	2329	1728	920.7
	(61.94)	(63.26)	(60.01)	(45.89)	(24.32)
Sample size	2345	2345	2345	2345	2345
Mean of Dep.	1724	1402	1203	539.2	81
Log L	-19132	-19047	-17310	-10858	-3950
Iteration	14	12	12	11	9

Female

Age	20s	30s	40s	50s	60s
Const	150.6	307.6	682.1	-402.9	-1207
	(0.50)	(2.35)	(4.86)	(-2.85)	(-10.00)
X	137.3	44.5	42.6	1.23	-15.5
	(7.51)	(5.65)	(4.89)	(0.14)	(-1.70)
X^2	-0.14	-0.0489	-0.0958	0.03	0.016
	(-2.20)	(-1.79)	(-3.17)	(1.01)	(0.26)
OX	1712	-1578	-2658	-1676	-666.9
	(3.10)	(-5.90)	(-8.89)	(-5.72)	(-2.90)
OX^2	-389	223.9	306	195.4	123.9
	(-3.09)	(4.00)	(5.02)	(3.31)	(2.73)
YR	8.569	-53.57	-37.88	-1.074	7.029
	(0.31)	(-4.40)	(-2.92)	(-0.08)	(0.74)
YR^2	0.0258	0.9787	0.6378	0.2165	0.1468
	(0.05)	(4.24)	(2.60)	(0.89)	(0.84)
S	38.16	19.95	18.6	16.16	2.387
	(10.52)	(12.74)	(10.89)	(9.59)	(1.57)
S^2	0.0251	-0.0245	-0.0132	-0.0133	-0.00166
	(3.82)	(-8.70)	(-4.35)	(-4.54)	(-0.41)
$\hat{\sigma}$	4217	1788	1928	1829	995
	(63.86)	(54.35)	(55.86)	(48.58)	(23.91)
Sample size	2345	2345	2345	2345	2345
Mean of Dep.	2512	752.7	1099	646.8	78.5
Log L	-20413	-14394	-15493	-12422	-3844
Iteration	13	11	11	11	9

Table 4.47: Maximum likehood estimator for censored regression: L/TL Model for Retail in 1992

Male

Age	20s	30s	40s	50s	60s
Const	0.2372	0.123	-0.01677	-0.0843	-0.1229
	(15.27)	(10.91)	(-1.54)	(-6.11)	(-6.70)
lnX	0.04214	0.0257	0.000891	-0.00175	-0.005387
	(7.24)	(6.10)	(0.23)	(-0.37)	(-0.91)
$(\ln X)^2$	-0.001148	-0.00433	0.000331	-0.000282	-0.000447
	(-0.73)	(-3.73)	(0.31)	(-0.22)	(-0.26)
OX/X	-0.0264	0.1704	0.2603	0.2755	0.2262
	(-0.15)	(1.33)	(2.19)	(2.00)	(1.22)
$(OX/X)^2$	0.0353	-0.1936	-0.1245	-0.2387	-0.46
	(0.09)	(-0.65)	(-0.45)	(-0.76)	(-1.00)
lnYR	-0.004369	0.000683	0.005059	0.003133	0.000421
	(-3.78)	(0.81)	(6.33)	(3.16)	(0.33)
$(\ln YR)^2$	3.9e-05	-1.6e-05	-6e-05	-2e-06	2.7e-05
	(1.81)	(-1.01)	(-4.01)	(-0.11)	(1.16)
lnS	-0.0209	-0.0112	-0.0021	-0.0072	0.000251
	(-3.54)	(-2.60)	(-0.53)	(-1.54)	(0.04)
$(\ln S)^2$	-0.001976	-4.2e-05	0.001348	0.002051	-0.0006
	(-1.31)	(-0.04)	(1.30)	(1.68)	(-0.37)
$\hat{\sigma}$	0.141	0.103	0.095	0.105	0.11
	(47.65)	(48.89)	(44.40)	(32.73)	(19.73)
Sample size	1526	1526	1526	1526	1526
Mean of Dep.	0.1298	0.1071	0.0777	0.0366	0.0116
Log L	389	859	674	68	-201
Iteration	10	10	11	10	11

Female

Age	20s	30s	40s	50s	60s
Const	0.1868	0.1056	0.1931	0.0382	-0.1732
	(10.42)	(8.57)	(11.68)	(2.69)	(-8.07)
lnX	0.0215	-0.0208	-0.0183	-0.0091	-0.0343
	(3.25)	(-4.56)	(-2.99)	(-1.75)	(-4.85)
$(\ln X)^2$	0.0027	0.0013	0.000694	-0.003392	-0.002957
	(1.49)	(1.05)	(0.42)	(-2.42)	(-1.40)
OX/X	0.3677	-0.2513	-0.5033	-0.3365	-0.1544
	(1.80)	(-1.77)	(-2.67)	(-2.05)	(-0.70)
$(OX/X)^2$	-0.7129	0.4201	0.6888	0.5141	0.2119
	(-1.51)	(1.28)	(1.57)	(1.33)	(0.43)
lnYR	-0.002698	-0.00271	-0.000813	0.004348	0.003058
	(-2.03)	(-2.95)	(-0.66)	(4.13)	(2.07)
$(\ln YR)^2$	3.2e-05	3.4e-05	-1e-05	-6e-05	-1.1e-05
	(1.30)	(1.95)	(-0.42)	(-3.03)	(-0.42)
lnS	0.0144	0.0122	0.0203	-0.0024	0.000632
	(2.05)	(2.57)	(3.22)	(-0.46)	(0.09)
$(\ln S)^2$	0.000856	0.000327	-0.003305	0.001602	0.002398
	(0.48)	(0.27)	(-2.04)	(1.19)	(1.31)
$\hat{\sigma}$	0.1637	0.1125	0.1518	0.1268	0.1293
	(50.46)	(47.48)	(50.42)	(44.80)	(21.81)
Sample size	1526	1526	1526	1526	1526
Mean of Dep.	0.213	0.109	0.192	0.106	0.0165
Log L	335	650	427	362	-229
Iteration	10	10	10	10	10

Table 4.48: Maximum likehood estimator for censored regression: Lh/TLh Model for Retail in 1992

Male					
Age	20s	30s	40s	50s	60s
Const	0.2666	0.1449	-0.0138	-0.0864	-0.128
	(16.38)	(12.14)	(-1.19)	(-5.87)	(-6.84)
lnX	0.0463	0.027	0.0001	-0.002	-0.006
	(7.59)	(6.06)	(0.03)	(-0.31)	(-1.00)
$(\ln X)^2$	-0.0018	-0.0044	0.0005	-0.0004	-0.0003
	(-1.09)	(-3.56)	(0.46)	(-0.26)	(-0.19)
OX/X	-0.067	0.1474	0.228	0.2711	0.2398
	(-0.36)	(1.09)	(1.80)	(1.84)	(1.27)
$(OX/X)^2$	0.1006	-0.1551	-0.0754	-0.2321	-0.493
	(0.23)	(-0.49)	(-0.26)	(-0.69)	(-1.05)
lnYR	-0.0054	0.0001	0.0053	0.0032	0.0006
	(-4.49)	(0.15)	(6.20)	(3.04)	(0.46)
$(\ln YR)^2$	5.3e-05	-1e-05	-6.3e-05	-1e-06	2.5e-05
	(2.33)	(-0.62)	(-3.97)	(-0.03)	(1.05)
lnS	-0.0217	-0.0092	-0.0016	-0.0083	0.0006
	(-3.51)	(-2.02)	(-0.37)	(-1.66)	(0.10)
$(\ln S)^2$	-0.0022	-0.0007	0.0013	0.0022	-0.0007
	(-1.40)	(-0.62)	(1.16)	(1.69)	(-0.40)
$\hat{\sigma}$	0.1477	0.1091	0.1016	0.1118	0.1115
	(47.61)	(48.79)	(44.27)	(32.63)	(19.76)
Sample size	1526	1526	1526	1526	1526
Mean of Dep.	0.1414	0.1205	0.0851	0.0392	0.0116
Log L	330	778	593	21	-204
Iteration	10	10	10	10	11
Female					
Age	20s	30s	40s	50s	60s
Const	0.1721	0.0884	0.1718	0.0339	-0.1667
	(9.77)	(7.70)	(11.17)	(2.46)	(-8.03)
lnX	0.022	-0.0208	-0.0215	-0.0106	-0.0328
	(3.39)	(-4.90)	(-3.79)	(-2.09)	(-4.80)
$(\ln X)^2$	0.00148	0.00206	0.0015	-0.00326	-0.00288
	(0.83)	(1.78)	(0.97)	(-2.39)	(-1.42)
OX/X	0.3295	-0.1965	-0.4331	-0.301	-0.1647
	(1.64)	(-1.48)	(-2.47)	(-1.89)	(-0.78)
$(OX/X)^2$	-0.6418	0.339	0.5434	0.4737	0.2486
	(-1.38)	(1.11)	(1.33)	(1.27)	(0.52)
lnYR	-0.0018	-0.0023	-0.00058	0.0043	0.0029
	(-1.42)	(-2.65)	(-0.51)	(4.24)	(2.01)
$(\ln YR)^2$	1.9e-05	2.8e-05	-1e-05	-5.9e-05	-1e-05
	(0.77)	(1.75)	(-0.49)	(-3.08)	(-0.37)
lnS	0.0164	0.0124	0.019	-0.00446	0.0002
	(2.37)	(2.81)	(3.25)	(-0.87)	(0.03)
$(\ln S)^2$	0.00119	0.0002	-0.003	0.002	0.0024
	(0.68)	(0.18)	(-1.99)	(1.49)	(1.36)
$\hat{\sigma}$	0.1609	0.1048	0.1412	0.1231	0.1248
	(50.45)	(47.54)	(50.43)	(44.87)	(21.77)
Sample size	1526	1526	1526	1526	1526
Mean of Dep.	0.2112	0.099	0.1763	0.1	0.0156
Log L	358	741	526	398	-217
Iteration	10	10	10	10	10

Table 4.49: Maximum likehood estimator for censored regression: whL/C Model for Retail in 1992

Male

Age	20s	30s	40s	50s	60s
Const	0.2751	0.2139	-0.0085	-0.1259	-0.1342
	(17.35)	(13.95)	(-0.50)	(-6.00)	(-6.87)
lnX	0.0414	0.0355	0.00428	0.0015	-0.0074
	(6.97)	(6.20)	(0.69)	(0.21)	(-1.17)
$(\ln X)^2$	-0.0024	-0.0065	0.001	0.0004	3e-05
	(-1.48)	(-4.09)	(0.58)	(0.23)	(0.02)
OX/X	-0.1233	0.0578	0.2567	0.3657	0.2545
	(-0.68)	(0.33)	(1.37)	(1.74)	(1.29)
$(OX/X)^2$	0.1811	-0.0116	-0.078	-0.2901	-0.5336
	(0.43)	(-0.03)	(-0.18)	(-0.60)	(-1.08)
lnYR	-0.0068	-0.0008	0.0079	0.0051	0.0004
	(-5.74)	(-0.74)	(6.30)	(3.37)	(0.29)
$(\ln YR)^2$	7.1e-05	-6e-06	-0.000107	-1e-05	3e-05
	(3.20)	(-0.26)	(-4.55)	(-0.36)	(1.23)
lnS	-0.0187	-0.0058	0.002	-0.0106	0.002
	(-3.10)	(-0.98)	(0.30)	(-1.48)	(0.31)
$(\ln S)^2$	-0.0022	-0.0016	0.0018	0.0027	-0.0009
	(-1.41)	(-1.09)	(1.07)	(1.44)	(-0.52)
$\hat{\sigma}$	0.144	0.1402	0.1505	0.1595	0.1166
	(47.63)	(48.68)	(44.01)	(32.50)	(19.93)
Sample size	1526	1526	1526	1526	1526
Mean of Dep.	0.1374	0.1708	0.1396	0.0592	0.0118
Log L	362	448	144	-220	-214
Iteration	10	10	10	10	10

Female

Age	20s	30s	40s	50s	60s
Const	0.1416	0.0697	0.1312	0.0238	-0.1408
	(9.39)	(6.94)	(10.09)	(2.02)	(-7.93)
lnX	0.0112	-0.018	-0.0207	-0.0106	-0.0279
	(2.01)	(-4.84)	(-4.31)	(-2.46)	(-4.76)
$(\ln X)^2$	-0.0008	0.0023	0.0028	-0.0018	-0.0022
	(-0.55)	(2.25)	(2.12)	(-1.52)	(-1.27)
OX/X	0.1824	-0.1624	-0.3128	-0.1629	-0.1594
	(1.06)	(-1.40)	(-2.11)	(-1.19)	(-0.87)
$(OX/X)^2$	-0.38	0.28	0.314	0.187	0.221
	(-0.95)	(1.05)	(0.91)	(0.58)	(0.53)
lnYR	-0.0019	-0.0018	-0.0001	0.0035	0.0021
	(-1.67)	(-2.41)	(-0.13)	(4.02)	(1.69)
$(\ln YR)^2$	1.3e-05	2.2e-05	-1e-05	-4.4e-05	0
	(0.63)	(1.58)	(-0.55)	(-2.70)	(0.01)
lnS	0.015	0.009	0.013	-0.004	0.0006
	(2.52)	(2.41)	(2.69)	(-1.03)	(0.11)
$(\ln S)^2$	0.0016	0.0004	-0.0025	0.0015	0.0018
	(1.06)	(0.45)	(-1.94)	(1.35)	(1.18)
$\hat{\sigma}$	0.1377	0.092	0.119	0.105	0.107
	(50.55)	(47.66)	(50.49)	(45.01)	(22.15)
Sample size	1526	1526	1526	1526	1526
Mean of Dep.	0.1672	0.0813	0.1396	0.0804	0.0127
Log L	574	913	757	587	-161
Iteration	10	11	10	10	10

Table 4.50: Maximum likehood estimator for censored regression: L/X Model for Retail in 1992

Male

Age	20s	30s	40s	50s	60s
Const	7.786	-2.465	-12.91	-10.05	-8.721
	(3.34)	(-0.76)	(-5.53)	(-7.33)	(-7.03)
lnX	-2.438	-4.011	-5.765	-1.633	-0.9217
	(-2.81)	(-3.35)	(-6.98)	(-3.52)	(-2.29)
$(\ln X)^2$	0.9851	1.618	1.574	0.1508	0.0425
	(4.21)	(4.98)	(6.95)	(1.23)	(0.38)
OX/X	-24.32	12.61	11.19	12.58	10.8
	(-0.91)	(0.34)	(0.44)	(0.92)	(0.87)
$(OX/X)^2$	33.34	-36.54	-13.91	-5.76	-21.75
	(0.53)	(-0.42)	(-0.24)	(-0.18)	(-0.71)
YR	-0.1831	0.0621	0.577	0.3493	0.038
	(-1.05)	(0.26)	(3.39)	(3.53)	(0.44)
YR^2	0.0006	-0.0028	-0.0085	-0.0021	0.0016
	(0.18)	(-0.62)	(-2.69)	(-1.17)	(1.03)
lnS	-1.755	2.092	1.174	-1.352	-0.4422
	(-1.99)	(1.70)	(1.33)	(-2.97)	(-1.12)
$(\ln S)^2$	0.1334	-0.3967	0.07	0.3728	0.0757
	(0.59)	(-1.26)	(0.31)	(3.12)	(0.71)
$\hat{\sigma}$	21.07	29.27	19.95	10.28	7.458
	(48.53)	(49.96)	(46.03)	(34.42)	(20.67)
Sample size	1526	1526	1526	1526	1526
Mean of Dep.	6.088	5.212	4.166	1.923	0.637
Log L	-5738	-6350	-5188	-2929	-1351
Iteration	4	5	4	5	5

Female

Age	20s	30s	40s	50s	60s
Const	0.1825	2.076	1.601	-5.939	-14.73
	(0.03)	(0.86)	(0.51)	(-2.00)	(-8.36)
lnX	-8.806	-7.617	-12.91	-7.036	-3.438
	(-4.26)	(-8.54)	(-11.14)	(-6.41)	(-5.90)
$(\ln X)^2$	3.605	1.625	2.998	1.287	-0.0558
	(6.22)	(6.73)	(9.65)	(4.43)	(-0.34)
OX/X	-46.53	-48.17	-77.44	-72.76	-23.17
	(-0.72)	(-1.72)	(-2.17)	(-2.10)	(-1.27)
$(OX/X)^2$	47.11	73.27	93.44	102.1	33.27
	(0.32)	(1.14)	(1.13)	(1.26)	(0.81)
YR	-0.2368	-0.3224	0.1929	0.5185	0.2844
	(-0.57)	(-1.79)	(0.83)	(2.35)	(2.33)
YR^2	-9.1e-05	0.003244	-0.007491	-0.008939	-0.0017
	(-0.01)	(0.96)	(-1.72)	(-2.17)	(-0.76)
lnS	5.359	0.4821	0.1668	-2.112	-0.633
	(2.31)	(0.52)	(0.14)	(-1.93)	(-1.20)
$(\ln S)^2$	-0.9959	0.2964	0.3791	0.6715	0.3287
	(-1.72)	(1.26)	(1.25)	(2.39)	(2.24)
$\hat{\sigma}$	50.89	21.81	28.41	26.17	10.59
	(51.35)	(48.96)	(51.41)	(46.66)	(22.76)
Sample size	1526	1526	1526	1526	1526
Mean of Dep.	10.32	6.04	10.7	6.3	1.12
Log L	-7334	-5782	-6583	-5596	-1627
Iteration	6	4	5	5	6

Table 4.51: Maximum likehood estimator for censored regression: Lh/X Model for Retail in 1992

Male

Age	20s	30s	40s	50s	60s
Const	1260	-349.5	-2422	-1879	-1697
	(2.91)	(-0.60)	(-5.53)	(-7.21)	(-7.03)
lnX	-448.4	-756.2	-1136	-324.4	-165.7
	(-2.78)	(-3.51)	(-7.32)	(-3.68)	(-2.12)
$(\ln X)^2$	167.2	295.4	307.3	25.46	6.616
	(3.85)	(5.05)	(7.23)	(1.10)	(0.30)
OX/X	-4491	2568	2271	2408	2303
	(-0.91)	(0.39)	(0.48)	(0.92)	(0.95)
$(OX/X)^2$	6474	-7264	-3158	-1407	-4618
	(0.56)	(-0.47)	(-0.29)	(-0.24)	(-0.78)
YR	-26.43	12.55	109.5	64.9	6.104
	(-0.82)	(0.29)	(3.43)	(3.45)	(0.36)
YR^2	0.0549	-0.5125	-1.603	-0.3411	0.3502
	(0.09)	(-0.63)	(-2.70)	(-1.00)	(1.14)
lnS	-337.5	350.6	210.2	-290.5	-81.091
	(-2.06)	(1.58)	(1.27)	(-3.37)	(-1.05)
$(\ln S)^2$	34.97	-68.78	15.76	78.25	12.46
	(0.84)	(-1.22)	(0.37)	(3.45)	(0.60)
$\hat{\sigma}$	3908	5274	3748	1955	1443
	(48.55)	(49.92)	(45.97)	(34.36)	(20.84)
Sample size	1526	1526	1526	1526	1526
Mean of Dep.	1090	1015	816	377	116
Log L	-12177	-13032	-10998	-6417	-2795
Iteration	12	13	12	11	10

Female

Age	20s	30s	40s	50s	60s
Const	8.182	29.21	248	-814	-2295
	(0.01)	(0.08)	(0.59)	(-1.96)	(-8.34)
lnX	-1176	-1096	-1757	-1061	-538.1
	(-3.70)	(-7.67)	(-11.30)	(-6.92)	(-5.92)
$(\ln X)^2$	457.2	245.9	398.2	185.2	-13.76
	(5.14)	(6.35)	(9.55)	(4.55)	(-0.53)
OX/X	-6.297e+04	-5873	-9338	-1.021e+04	-3620
	(-0.64)	(-1.31)	(-1.95)	(-2.11)	(-1.27)
$(OX/X)^2$	6883	8866	1.04e+04	1.438e+04	5437
	(0.30)	(0.86)	(0.94)	(1.27)	(0.85)
YR	-26.33	-39.93	23.82	75.98	43.83
	(-0.41)	(-1.38)	(0.77)	(2.46)	(2.30)
YR^2	0.0649	0.4331	-0.7884	-1.208	-0.2314
	(0.05)	(0.80)	(-1.35)	(-2.09)	(-0.67)
lnS	777.8	213.4	73.8	-311.2	-110.4
	(2.19)	(1.44)	(0.47)	(-2.03)	(-1.35)
$(\ln S)^2$	-139.9	12.85	36.91	97.91	54.85
	(-1.58)	(0.34)	(0.91)	(2.49)	(2.40)
$\hat{\sigma}$	7816	3493	3812	3663	1651
	(51.33)	(49.01)	(51.36)	(46.57)	(22.59)
Sample size	1526	1526	1526	1526	1526
Mean of Dep.	1641	892	1555	982	180
Log L	-14095	-12054	-13205	-11210	-3237
Iteration	14	12	13	12	10

Table 4.52: Maximum likehood estimator for censored regression: L Model for Retail in 1993

Male

Age	20s	30s	40s	50s	60s
Const	3.885	0.2312	-4.773	-7.653	-6.617
	(5.59)	(0.57)	(-8.81)	(-14.81)	(-14.41)
X	0.5019	0.6424	0.5916	0.3418	0.02091
	(13.25)	(29.56)	(21.20)	(15.00)	(1.06)
X^2	-0.001067	-0.001305	-0.001101	-0.000563	-3.7e-05
	(-10.61)	(-22.62)	(-14.86)	(-9.35)	(-0.69)
OX	15.66	2.327	9.706	5.482	2.175
	(15.21)	(3.94)	(12.79)	(8.87)	(3.32)
OX^2	-0.4797	0.243	-0.2258	-0.2032	-0.1189
	(-10.37)	(9.15)	(-6.63)	(-7.35)	(-1.47)
YR	0.0178	0.1877	0.2898	0.1127	0.0078
	(0.27)	(5.00)	(5.87)	(2.53)	(0.21)
YR^2	-0.003	-0.0042	-0.0031	0.002	0.0016
	(-2.34)	(-5.68)	(-3.19)	(2.40)	(2.33)
S	0.0473	0.0262	0.0418	0.0024	0.0068
	(6.57)	(6.34)	(7.82)	(0.53)	(1.66)
S^2	-2.2e-05	-3.1e-05	-1e-06	2.7e-05	-2.3e-05
	(-1.27)	(-3.17)	(-0.06)	(2.53)	(-2.13)
$\hat{\sigma}$	13.93	8.006	10.26	8.217	5.489
	(83.73)	(83.89)	(80.46)	(58.58)	(33.34)
Sample size	4131	4131	4131	4131	4131
Mean of Dep.	8.699	6.286	5.727	2.304	0.483
Log L	-14996	-13071	-13004	-7805	-3442
Iteration	4	4	4	65	6

Female

Age	20s	30s	40s	50s	60s
Const	2.182	0.7805	3.018	-5.973	-7.17
	(2.20)	(1.73)	(3.89)	(-9.32)	(-15.33)
X	1.0773	0.3202	0.2142	0.09374	-0.01166
	(19.87)	(13.40)	(5.14)	(2.82)	(-0.56)
X^2	-0.002203	-0.000604	-0.000429	-4.9e-05	5.6e-05
	(-15.29)	(-9.53)	(-3.90)	(-0.55)	(1.10)
OX	21.97	-2.0353	-8.172	-7.841	-1.24
	(14.88)	(-3.07)	(-6.91)	(-8.23)	(-2.03)
OX^2	-0.527	0.3026	0.4368	0.4536	0.07126
	(-7.95)	(10.22)	(8.36)	(10.88)	(2.91)
YR	-0.1492	-0.1704	-0.1702	0.3915	0.1225
	(-1.61)	(-4.03)	(-2.35)	(6.69)	(3.36)
YR^2	0.001215	0.002472	0.000828	-0.007442	-0.001152
	(0.67)	(2.98)	(0.58)	(-6.54)	(-1.67)
S	0.2712	0.1194	0.2213	0.166	0.01485
	(26.32)	(25.86)	(27.77)	(26.14)	(3.59)
S^2	2e-05	-0.000169	-0.00028	-0.000198	-2.8e-05
	(0.81)	(-15.43)	(-14.81)	(-13.39)	(-2.33)
$\hat{\sigma}$	19.99	8.759	15.13	11.71	5.458
	(86.91)	(75.07)	(77.65)	(70.33)	(32.63)
Sample size	4131	4131	4131	4131	4131
Mean of Dep.	17.37	5.592	9.961	6.192	0.5176
Log L	-17019	-11472	-13754	-11314	-3459
Iteration	5	4	4	5	6

Table 4.53: Maximum likehood estimator for censored regression: Lh Model for Retail in 1993

Male

Age	20s	30s	40s	50s	60s
Const	663.3	89.9	-765.1	-1279	-1089
	(5.50)	(1.27)	(-8.45)	(-14.67)	(-14.41)
X	86.44	106.3	97	52.5	2.0881
	(13.14)	(27.81)	(20.76)	(13.64)	(0.63)
X^2	-0.185	-0.2154	-0.178	-0.08168	-0.003871
	(-10.59)	(-21.22)	(-14.35)	(-8.03)	(-0.43)
OX	2703	427.6	1541	938	322
	(15.12)	(4.11)	(12.13)	(8.99)	(3.02)
OX^2	-84.51	43.91	-35.22	-34.33	-15.37
	(-10.52)	(9.40)	(-6.17)	(-7.36)	(-1.21)
YR	3.99	32.12	48.31	18.8	1.275
	(0.35)	(4.87)	(5.85)	(2.51)	(0.21)
YR^2	-0.4852	-0.7009	-0.4758	0.3629	0.2734
	(-2.18)	(-5.41)	(-2.97)	(2.56)	(2.44)
S	6.658	4.0892	7.257	0.9005	1.0259
	(5.32)	(5.62)	(8.11)	(1.17)	(1.52)
S^2	-0.002574	-0.004939	-0.002119	0.003528	-0.003252
	(-0.86)	(-2.83)	(-0.99)	(1.98)	(-1.85)
$\hat{\sigma}$	2419	1408	1718	1386	902.7
	(83.70)	(83.83)	(80.35)	(58.39)	(33.40)
Sample size	4131	4131	4131	4131	4131
Mean of Dep.	1481	1110	989.6	396.2	78.64
Log L	-33518	-31754	-29994	-17464	-7246
Iteration	12	11	11	37	10

Female

Age	20s	30s	40s	50s	60s
Const	277.4	20.34	347.6	-786.3	-1002
	(1.80)	(0.31)	(3.77)	(-9.50)	(-15.47)
X	155.006	44.22	23.31	13.68	-2.644
	(18.44)	(12.98)	(4.70)	(3.19)	(-0.88)
X^2	-0.3156	-0.08233	-0.04747	-0.01487	0.008121
	(-14.13)	(-9.11)	(-3.62)	(-1.30)	(1.11)
OX	3345	-180.2	-891.6	-1151	-201.3
	(14.62)	(-1.91)	(-6.35)	(-9.33)	(-2.35)
OX^2	-76.55	44.81	54.47	69.54	11.95
	(-7.45)	(10.63)	(8.78)	(12.88)	(3.49)
YR	-22.0065	-23.8	-18.49	52.59	17.53
	(-1.53)	(-3.94)	(-2.15)	(6.97)	(3.48)
YR^2	0.3011	0.4267	0.1709	-0.9142	-0.1509
	(1.06)	(3.61)	(1.01)	(-6.24)	(-1.59)
S	44.89	17.6	28.19	21.36	2.0217
	(28.10)	(26.73)	(29.70)	(26.04)	(3.51)
S^2	-0.001134	-0.02459	-0.03565	-0.02619	-0.003473
	(-0.30)	(-15.74)	(-15.84)	(-13.71)	(-2.10)
$\hat{\sigma}$	3100	1249	1803	1512	752.9
	(86.84)	(75.11)	(77.45)	(70.12)	(32.61)
Sample size	4131	4131	4131	4131	4131
Mean of Dep.	2739	779.7	1291	837.1	71.79
Log L	-36157	-26163	-28858	-24298	-7111
Iteration	12	11	11	11	8

Table 4.54: Maximum likehood estimator for censored regression: L/TL Model for Retail in 1993

Male

Age	20s	30s	40s	50s	60s
Const	0.2465	0.1007	0.01542	-0.0422	-0.1044
	(25.86)	(15.60)	(2.26)	(-4.99)	(-8.64)
lnX	0.02727	0.01455	0.004965	0.00721	-0.00461
	(8.35)	(6.63)	(2.18)	(2.66)	(-1.22)
$(\ln X)^2$	0.003335	0.001035	0.000871	0.000668	-0.002466
	(5.90)	(2.67)	(2.21)	(1.29)	(-2.36)
OX/X	0.1727	0.3761	0.5251	0.4159	0.1467
	(1.27)	(4.11)	(5.53)	(3.71)	(1.04)
$(OX/X)^2$	-0.05758	-0.6684	-1.166	-1.0761	-0.1832
	(-0.16)	(-2.74)	(-4.61)	(-3.40)	(-0.49)
lnYR	-0.005924	0.000249	0.003487	0.001945	0.000806
	(-8.53)	(0.53)	(7.08)	(3.25)	(1.02)
$(\ln YR)^2$	6.7e-05	-1e-05	-3.6e-05	1.5e-05	2.4e-05
	(5.04)	(-1.13)	(-3.84)	(1.32)	(1.64)
lnS	-0.01243	-0.000233	-0.007524	-0.0202	-0.00721
	(-3.43)	(-0.09)	(-2.96)	(-6.79)	(-1.69)
$(\ln S)^2$	-0.003902	-0.002445	0.001356	0.002112	0.000946
	(-4.34)	(-4.01)	(2.15)	(2.82)	(0.87)
$\hat{\sigma}$	0.1279	0.08639	0.08913	0.09509	0.1062
	(70.80)	(70.82)	(66.81)	(45.54)	(29.53)
Sample size	3158	3158	3158	3158	3158
Mean of Dep.	0.1306	0.0938	0.07765	0.03116	0.01233
Log L	1232	2293	1814	186	-380
Iteration	10	11	11	11	11

Female

Age	20s	30s	40s	50s	60s
Const	0.2273	0.08248	0.1514	0.00125	-0.1183
	(20.25)	(11.39)	(14.78)	(0.14)	(-9.72)
lnX	0.01354	-0.01162	-0.02149	-0.008063	-0.01268
	(3.54)	(-4.72)	(-6.18)	(-2.61)	(-3.32)
$(\ln X)^2$	0.002122	-0.001503	-0.00398	-0.002065	-0.002093
	(3.18)	(-3.37)	(-6.17)	(-3.53)	(-2.37)
OX/X	-0.0521	-0.2768	-0.7218	-0.4081	-0.09475
	(-0.32)	(-2.65)	(-4.90)	(-3.09)	(-0.58)
$(OX/X)^2$	0.05028	0.6783	1.615	0.6176	-0.2863
	(0.12)	(2.45)	(4.12)	(1.75)	(-0.61)
lnYR	-0.0041	-0.001925	0.000464	0.007619	0.00408
	(-5.03)	(-3.67)	(0.63)	(11.56)	(4.97)
$(\ln YR)^2$	5.9e-05	2.9e-05	-2.4e-05	-0.00013	-4.9e-05
	(3.76)	(2.84)	(-1.69)	(-10.28)	(-3.18)
lnS	-0.002905	0.01748	0.02864	0.01583	-0.01159
	(-0.68)	(6.21)	(7.30)	(4.51)	(-2.86)
$(\ln S)^2$	0.004332	-0.000531	-0.001567	-0.000812	0.002278
	(4.07)	(-0.77)	(-1.60)	(-0.93)	(2.16)
$\hat{\sigma}$	0.1518	0.09641	0.1375	0.1194	0.11
	(75.34)	(69.35)	(73.00)	(67.10)	(31.34)
Sample size	3158	3158	3158	3158	3158
Mean of Dep.	0.2371	0.09996	0.1885	0.1144	0.01449
Log L	1120	1851	1204	1111	-401
Iteration	10	10	10	10	11

Table 4.55: Maximum likehood estimator for censored regression: Lh/TLh Model for Retail in 1993

Male

Age	20s	30s	40s	50s	60s
Const	0.2668	0.1171	0.0203	-0.04438	-0.109
	(26.87)	(16.97)	(2.79)	(-4.88)	(-8.80)
lnX	0.02938	0.01515	0.005041	0.007435	-0.005376
	(8.64)	(6.46)	(2.08)	(2.55)	(-1.39)
$(\ln X)^2$	0.003501	0.001012	0.000734	0.00071	-0.002563
	(5.95)	(2.45)	(1.74)	(1.28)	(-2.41)
OX/X	0.127	0.3454	0.5028	0.4377	0.1459
	(0.90)	(3.53)	(4.97)	(3.62)	(1.01)
$(OX/X)^2$	0.03761	-0.5949	-1.103	-1.154	-0.1758
	(0.10)	(-2.28)	(-4.09)	(-3.38)	(-0.46)
lnYR	-0.006669	-2.1e-05	0.003668	0.001957	0.000856
	(-9.21)	(-0.04)	(7.00)	(3.04)	(1.05)
$(\ln YR)^2$	7.6e-05	-9e-06	-3.9e-05	1.7e-05	2.4e-05
	(5.46)	(-0.95)	(-3.92)	(1.43)	(1.60)
lnS	-0.008611	0.002348	-0.007015	-0.02094	-0.007306
	(-2.28)	(0.89)	(-2.59)	(-6.54)	(-1.67)
$(\ln S)^2$	-0.004928	-0.003108	0.001333	0.002181	0.001134
	(-5.26)	(-4.77)	(1.98)	(2.70)	(1.02)
$\hat{\sigma}$	0.1332	0.09241	0.09493	0.1024	0.1085
	(70.74)	(70.71)	(66.69)	(45.41)	(29.58)
Sample size	3158	3158	3158	3158	3158
Mean of Dep.	0.1425	0.106	0.0856	0.03354	0.01241
Log L	1115	2100	1649	84	-392
Iteration	10	11	11	11	11

Female

Age	20s	30s	40s	50s	60s
Const	0.213	0.07232	0.1373	-0.000392	-0.1218
	(19.43)	(10.63)	(14.38)	(-0.04)	(-10.14)
lnX	0.01449	-0.01178	-0.0231	-0.008757	-0.01339
	(3.88)	(-5.09)	(-7.12)	(-2.97)	(-3.55)
$(\ln X)^2$	0.001583	-0.00126	-0.003676	-0.001992	-0.001866
	(2.43)	(-3.02)	(-6.16)	(-3.57)	(-2.25)
OX/X	-0.04676	-0.2116	-0.6614	-0.4381	-0.0516
	(-0.30)	(-2.16)	(-4.82)	(-3.47)	(-0.32)
$(OX/X)^2$	0.1114	0.5288	1.425	0.6859	-0.4036
	(0.26)	(2.03)	(3.90)	(2.03)	(-0.86)
lnYR	-0.003703	-0.001708	0.00081	0.007442	0.004216
	(-4.65)	(-3.47)	(1.17)	(11.82)	(5.19)
$(\ln YR)^2$	5.2e-05	2.6e-05	-2.6e-05	-0.000125	-5.2e-05
	(3.39)	(2.78)	(-1.96)	(-10.34)	(-3.44)
lnS	0.003266	0.01415	0.02129	0.01288	-0.01077
	(0.78)	(5.37)	(5.83)	(3.85)	(-2.73)
$(\ln S)^2$	0.003987	9.4e-05	-0.000571	-0.000501	0.002234
	(3.83)	(0.15)	(-0.63)	(-0.60)	(2.17)
$\hat{\sigma}$	0.1482	0.09056	0.1282	0.1141	0.1086
	(75.30)	(69.35)	(73.01)	(67.13)	(31.62)
Sample size	3158	3158	3158	3158	3158
Mean of Dep.	0.2391	0.09082	0.1703	0.1063	0.01351
Log L	1187	2014	1402	1228	-382
Iteration	10	11	10	10	11

Table 4.56: Maximum likehood estimator for censored regression: whL/C Model for Retail in 1993

Male

Age	20s	30s	40s	50s	60s
Const	0.2651	0.1707	0.02976	-0.07194	-0.1071
	(27.05)	(18.24)	(2.72)	(-5.26)	(-8.58)
lnX	0.02331	0.01982	0.009134	0.01404	-0.004887
	(6.94)	(6.23)	(2.50)	(3.21)	(-1.25)
$(\ln X)^2$	0.002872	0.000713	0.000697	0.001466	-0.002427
	(4.95)	(1.27)	(1.10)	(1.78)	(-2.27)
OX/X	-0.007189	0.2182	0.6011	0.6266	0.1571
	(-0.05)	(1.64)	(3.94)	(3.45)	(1.07)
$(OX/X)^2$	0.3472	-0.2624	-1.277	-1.663	-0.2468
	(0.93)	(-0.74)	(-3.14)	(-3.23)	(-0.64)
lnYR	-0.007588	-0.00055	0.00587	0.002829	0.000699
	(-10.62)	(-0.81)	(7.45)	(2.93)	(0.85)
$(\ln YR)^2$	8.7e-05	-1.4e-05	-7.6e-05	2.7e-05	2.9e-05
	(6.32)	(-1.11)	(-5.07)	(1.51)	(1.89)
lnS	-0.002708	0.0116	-0.000925	-0.02692	-0.008551
	(-0.73)	(3.25)	(-0.23)	(-5.59)	(-1.95)
$(\ln S)^2$	-0.005004	-0.00494	0.001915	0.002846	0.00109
	(-5.41)	(-5.58)	(1.89)	(2.35)	(0.97)
$\hat{\sigma}$	0.1314	0.1253	0.143	0.1539	0.1098
	(70.79)	(70.62)	(66.39)	(45.11)	(29.85)
Sample size	3158	3158	3158	3158	3158
Mean of Dep.	0.1382	0.1558	0.1492	0.05321	0.01223
Log L	1156	1270	618	-460	-392
Iteration	10	10	10	10	11

Female

Age	20s	30s	40s	50s	60s
Const	0.1684	0.05596	0.1107	0.002739	-0.106
	(18.08)	(9.14)	(13.72)	(0.37)	(-10.28)
lnX	0.004987	-0.009899	-0.02027	-0.008532	-0.01211
	(1.57)	(-4.76)	(-7.39)	(-3.43)	(-3.73)
$(\ln X)^2$	1e-05	-0.000873	-0.002636	-0.001349	-0.001421
	(0.02)	(-2.34)	(-5.31)	(-2.93)	(-2.10)
OX/X	-0.1752	-0.2023	-0.5095	-0.3027	-0.0217
	(-1.31)	(-2.29)	(-4.39)	(-2.85)	(-0.16)
$(OX/X)^2$	0.3951	0.4691	1.0614	0.4313	-0.4172
	(1.10)	(2.00)	(3.44)	(1.51)	(-1.03)
lnYR	-0.002853	-0.001047	0.00076	0.005862	0.003614
	(-4.22)	(-2.36)	(1.30)	(11.02)	(5.15)
$(\ln YR)^2$	2.7e-05	1.5e-05	-1.6e-05	-9.2e-05	-4.4e-05
	(2.10)	(1.79)	(-1.44)	(-9.02)	(-3.38)
lnS	0.008804	0.009286	0.009937	0.00517	-0.009197
	(2.46)	(3.92)	(3.23)	(1.84)	(-2.74)
$(\ln S)^2$	0.003068	0.00065	0.000295	0.000132	0.001828
	(3.47)	(1.11)	(0.39)	(0.19)	(2.08)
$\hat{\sigma}$	0.1258	0.08143	0.1083	0.09632	0.09339
	(75.41)	(69.59)	(73.08)	(67.24)	(32.17)
Sample size	3158	3158	3158	3158	3158
Mean of Dep.	0.1916	0.07531	0.1306	0.08302	0.01076
Log L	1678	2313	1885	1657	-262
Iteration	10	11	10	11	11

Table 4.57: Maximum likehood estimator for censored regression: L/X Model for Retail in 1993

Male

Age	20s	30s	40s	50s	60s
Const	-2410	-3615	-4807	-448	-8.132
	(-13.10)	(-16.52)	(-15.47)	(-12.87)	(-10.23)
lnX	-470.04	-703.2	-697.3	-23.91	-1.0195
	(-7.51)	(-9.57)	(-6.82)	(-2.19)	(-4.08)
$(\ln X)^2$	567.2	774.4	700.2	18.4	-0.1052
	(52.79)	(57.27)	(39.84)	(10.31)	(-2.10)
OX/X	-133.5	478.8	3833	1189	13.87
	(-0.05)	(0.16)	(0.89)	(2.56)	(1.46)
$(OX/X)^2$	-2186	-3747	-1.139e+04	-3450	-24.56
	(-0.31)	(-0.46)	(-1.00)	(-2.59)	(-0.98)
YR	48.27	89.52	136.1	7.497	0.05787
	(3.62)	(5.68)	(6.11)	(3.04)	(1.08)
YR^2	-1.369	-2.13	-2.609	-0.04326	0.001256
	(-5.32)	(-7.03)	(-6.15)	(-0.94)	(1.26)
lnS	1537	2188	1973	21.19	-0.6093
	(21.78)	(25.82)	(17.03)	(1.76)	(-2.34)
$(\ln S)^2$	-336.7	-471.5	-388.1	-1.959	0.1793
	(-19.45)	(-22.65)	(-13.58)	(-0.65)	(2.60)
$\hat{\sigma}$	2421	2866	3955	378.3	7.0789
	(72.85)	(72.83)	(69.60)	(50.72)	(31.78)
Sample size	3158	3158	3158	3158	3158
Mean of Dep.	128.5	139.4	152.9	5.78	0.5103
Log L	-25071	-25648	-24310	-10371	-2891
Iteration	12	12	62	8	7

Female

Age	20s	30s	40s	50s	60s
Const	-4674	-9269	-8807	-4434	-17.15
	(-11.12)	(-12.79)	(-10.35)	(-14.12)	(-11.00)
lnX	-1412	-2152	-2370	-907.9	-2.579
	(-9.93)	(-8.89)	(-8.29)	(-8.75)	(-5.20)
$(\ln X)^2$	717	1344	1203	456.7	-0.1389
	(28.89)	(26.01)	(21.36)	(21.87)	(-1.61)
OX/X	866	-8905	-1.718e+04	-8133	6.863
	(0.14)	(-0.86)	(-1.40)	(-1.80)	(0.32)
$(OX/X)^2$	-9152	1.958e+04	2.993e+04	1.187e+04	-81.37
	(-0.56)	(0.71)	(0.92)	(0.98)	(-1.31)
YR	63.46	115.1	162.1	105.4	0.4855
	(2.09)	(2.23)	(2.65)	(4.76)	(4.51)
YR^2	-1.644	-3.0227	-3.548	-2.0174	-0.006627
	(-2.81)	(-3.04)	(-3.02)	(-4.76)	(-3.29)
lnS	2560	4840	4184	1719	-2.455
	(15.23)	(16.19)	(12.57)	(13.90)	(-5.01)
$(\ln S)^2$	-389	-793.2	-631.06	-247.7	0.6349
	(-9.53)	(-11.00)	(-7.68)	(-8.26)	(4.85)
$\hat{\sigma}$	5603	9311	1.117e+04	3914	14.092
	(76.54)	(72.26)	(75.07)	(70.36)	(34.76)
Sample size	3158	3158	3158	3158	3158
Mean of Dep.	209.08	216.4	256.4	85.55	0.7887
Log L	-29664	-27952	-30515	-24527	-3602
Iteration	13	14	14	13	6

Table 4.58: Maximum likehood estimator for censored regression: Lh/X Model for Retail in 1993

Male

Age	20s	30s	40s	50s	60s
Const	-4.777e+05	-7.242e+05	-8.613e+05	-9.796e+04	-1450
	(-12.50)	(-16.94)	(-15.58)	(-12.90)	(-10.51)
lnX	-8.835e+04	-1.489e+05	-1.246e+05	-5112	-180
	(-6.80)	(-10.37)	(-6.85)	(-2.15)	(-4.17)
$(\text{lnX})^2$	1.132e+05	1.516e+05	1.27e+05	4015	-17.85
	(50.74)	(57.41)	(40.61)	(10.31)	(-2.08)
OX/X	-2.449e+04	1.032e+05	6.775e+05	2.622e+05	2383
	(-0.04)	(0.17)	(0.89)	(2.59)	(1.45)
$(\text{OX/X})^2$	-4.169e+05	-7.717e+05	-2.031e+06	-7.577e+05	-4046
	(-0.29)	(-0.48)	(-1.00)	(-2.61)	(-0.93)
YR	9577	1.753e+04	2.446e+04	1620	12.31
	(3.46)	(5.70)	(6.17)	(3.01)	(1.33)
YR^2	-273.5	-416.5	-470.1	-9.1	0.189
	(-5.12)	(-7.04)	(-6.23)	(-0.91)	(1.10)
lnS	3.056e+05	4.319e+05	3.57e+05	4824	-104.2
	(20.86)	(26.10)	(17.32)	(1.83)	(-2.31)
$(\text{lnS})^2$	-6.767e+04	-9.108e+04	-7.076e+04	-467	31.5
	(-18.82)	(-22.41)	(-13.91)	(-0.70)	(2.64)
$\hat{\sigma}$	5.027e+05	5.597e+05	7.036e+05	8.251e+04	1225
	(72.88)	(72.82)	(69.60)	(50.69)	(31.87)
Sample size	3158	3158	3158	3158	3158
Mean of Dep.	2.509e+04	2.79e+04	2.765e+04	1222	86.4
Log L	-39407	-39885	-37056	-17367	-6042
Iteration	20	20	201	16	10

Female

Age	20s	30s	40s	50s	60s
Const	-8.019e+05	-1.503e+06	-1.124e+06	-5.991e+05	-1960
	(-11.27)	(-12.77)	(-10.67)	(-14.05)	(-11.09)
lnX	-2.402e+05	-3.465e+05	-3.059e+05	-1.22e+05	-311.9
	(-9.97)	(-8.82)	(-8.63)	(-8.65)	(-5.55)
$(\text{lnX})^2$	1.239e+05	2.179e+05	1.548e+05	6.162e+04	-18.1
	(29.47)	(25.98)	(22.18)	(21.72)	(-1.84)
OX/X	1.581e+05	-1.432e+06	-2.137e+06	-1.102e+06	-233.7
	(0.15)	(-0.85)	(-1.40)	(-1.79)	(-0.10)
$(\text{OX/X})^2$	-1.579e+06	3.17e+06	3.682e+06	1.61e+06	-6808
	(-0.57)	(0.71)	(0.91)	(0.98)	(-0.98)
YR	1.1e+04	1.874e+04	2.072e+04	1.428e+04	60.3
	(2.14)	(2.23)	(2.74)	(4.75)	(4.96)
YR^2	-283.9	-493	-454	-273.7	-0.8065
	(-2.87)	(-3.05)	(-3.12)	(-4.75)	(-3.54)
lnS	4.405e+05	7.845e+05	5.37e+05	2.32e+05	-277.1
	(15.47)	(16.16)	(13.01)	(13.81)	(-5.00)
$(\text{lnS})^2$	-6.753e+04	-1.288e+05	-8.107e+04	-3.35e+04	71.46
	(-9.77)	(-11.01)	(-7.96)	(-8.22)	(4.82)
$\hat{\sigma}$	9.49e+05	1.512e+06	1.384e+06	5.318e+05	1598
	(76.50)	(72.21)	(75.07)	(70.34)	(34.21)
Sample size	3158	3158	3158	3158	3158
Mean of Dep.	3.567e+04	3.497e+04	3.319e+04	1.154e+04	110.9
Log L	-44694	-41222	-44110	-36738	-6832
Iteration	21	22	22	20	10

Table 4.59: Maximum likehood estimator for censored regression: L Model for Retail in 1994

Male

Age	20s	30s	40s	50s	60s
Const	3.98	0.6814	-3.386	-7.776	-6.676
	(6.43)	(1.48)	(-6.54)	(-13.65)	(-14.73)
X	0.379	0.6925	0.6454	0.4243	-0.023
	(12.01)	(29.73)	(25.69)	(17.56)	(-1.29)
X^2	-0.000627	-0.001261	-0.001075	-0.000636	6.7e-05
	(-7.59)	(-20.70)	(-16.34)	(-10.31)	(1.52)
OX	11.96	6.502	2.634	5.0774	-0.6454
	(14.51)	(10.71)	(4.00)	(8.22)	(-1.41)
OX^2	-0.3567	-0.1292	-0.04308	-0.2261	0.03041
	(-9.63)	(-4.73)	(-1.46)	(-8.17)	(1.59)
YR	-0.006714	0.1085	0.1921	0.1299	0.1204
	(-0.12)	(2.64)	(4.24)	(2.75)	(3.63)
YR^2	-0.00198	-0.002826	-0.001469	0.001078	-0.000512
	(-1.88)	(-3.65)	(-1.74)	(1.25)	(-0.87)
S	0.04638	0.005943	0.02262	-0.005333	0.002073
	(7.90)	(1.37)	(4.80)	(-1.14)	(0.62)
S^2	1.4e-05	4.3e-05	4.3e-05	4.2e-05	1.9e-05
	(1.04)	(4.16)	(3.90)	(3.93)	(2.86)
$\hat{\sigma}$	11.12	8.193	8.869	8.194	4.533
	(81.24)	(81.05)	(77.50)	(57.50)	(31.39)
Sample size	3876	3876	3876	3876	3876
Mean of Dep.	8.0676	6.249	5.522	2.333	0.4202
Log L	-13381	-12261	-11727	-7403	-3005
Iteration	201	4	201	201	6

Female

Age	20s	30s	40s	50s	60s
Const	3.576	0.3306	2.64	-6.402	-6.886
	(3.33)	(0.55)	(2.80)	(-8.76)	(-14.14)
X	0.8407	0.2829	0.267	0.1233	-0.05799
	(15.38)	(9.66)	(5.66)	(3.48)	(-2.22)
X^2	-0.001283	-0.000389	-0.000453	-9.6e-05	0.000103
	(-8.96)	(-5.07)	(-3.69)	(-1.05)	(1.54)
OX	12.12	0.4795	-9.238	-8.0538	-1.182
	(8.46)	(0.61)	(-7.16)	(-8.17)	(-1.93)
OX^2	-0.51	0.04505	0.5123	0.3752	0.03448
	(-7.92)	(1.28)	(9.00)	(8.71)	(1.23)
YR	-0.2133	-0.1725	-0.1082	0.4617	0.1362
	(-2.22)	(-3.24)	(-1.29)	(7.23)	(3.69)
YR^2	0.002379	0.002602	-0.000376	-0.008819	-0.001191
	(1.31)	(2.60)	(-0.24)	(-7.38)	(-1.78)
S	0.244	0.117	0.1994	0.1628	0.008625
	(23.96)	(21.07)	(22.60)	(24.52)	(2.11)
S^2	0.000165	-9.7e-05	-0.000212	-0.000156	1.1e-05
	(6.84)	(-7.45)	(-10.26)	(-10.19)	(1.29)
$\hat{\sigma}$	19.34	10.31	16.41	12.051	5.272
	(83.84)	(72.88)	(75.96)	(69.37)	(32.76)
Sample size	3876	3876	3876	3876	3876
Mean of Dep.	16.87	5.946	10.17	6.773	0.5348
Log L	-15762	-11220	-13300	-10949	-3382
Iteration	5	201	4	5	7

Table 4.60: Maximum likehood estimator for censored regression: Lh Model for Retail in 1994

Male

Age	20s	30s	40s	50s	60s
Const	659.7	168.6	-536	-1325	-1125
	(6.30)	(2.12)	(-6.17)	(-13.66)	(-14.85)
X	67.7	115.6	107.3	60	-1.997
	(12.69)	(28.87)	(25.43)	(14.89)	(-0.69)
X^2	-0.118	-0.213	-0.175	-0.0908	0.0073
	(-8.47)	(-20.35)	(-15.81)	(-8.64)	(1.01)
OX	2154	1240	461.3	903.6	-86.1
	(15.46)	(11.88)	(4.17)	(8.59)	(-1.13)
OX^2	-67	-31	-12.3	-38.9	3.67
	(-10.71)	(-6.60)	(-2.47)	(-8.26)	(1.15)
YR	1.55	16.8	31.7	23.4	20.1
	(0.17)	(2.38)	(4.18)	(2.90)	(3.64)
YR^2	-0.337	-0.43	-0.214	0.176	-0.0794
	(-1.90)	(-3.23)	(-1.51)	(1.20)	(-0.81)
S	5.896	0.722	3.826	-0.0009	0.3758
	(5.94)	(0.97)	(4.83)	(0.00)	(0.68)
S^2	0.003	0.006	0.005	0.008	0.002
	(1.42)	(3.24)	(2.69)	(4.49)	(1.51)
$\hat{\sigma}$	1880	1409	1490	1395	756.4
	(81.20)	(80.96)	(77.42)	(57.33)	(31.48)
Sample size	3876	3876	3876	3876	3876
Mean of Dep.	1357	1086	950	399	68.6
Log L	-30775	-29579	-27607	-16636	-6466
Iteration	12	11	201	201	8

Female

Age	20s	30s	40s	50s	60s
Const	470.2	-48.8	270.9	-810.3	-997.1
	(2.82)	(-0.60)	(2.45)	(-8.84)	(-14.07)
X	128.2	43.8	35.2	14.9	-9.6
	(15.07)	(10.95)	(6.36)	(3.35)	(-2.48)
X^2	-0.199	-0.068	-0.0566	-0.0121	0.0178
	(-8.95)	(-6.50)	(-3.93)	(-1.06)	(1.85)
OX	1931	130.4	-1153	-1057	-143.5
	(8.66)	(1.21)	(-7.61)	(-8.54)	(-1.63)
OX^2	-81.2	7.68	64	52	3.79
	(-8.11)	(1.60)	(9.58)	(9.61)	(0.94)
YR	-33.2	-21.8	-8.29	59.6	18.8
	(-2.22)	(-2.99)	(-0.84)	(7.45)	(3.49)
YR^2	0.497	0.401	-0.018	-1.06	-0.142
	(1.77)	(2.93)	(-0.10)	(-7.09)	(-1.46)
S	39.39	16.44	23.52	20.39	1.14
	(24.86)	(21.66)	(22.71)	(24.47)	(1.90)
S^2	0.0206	-0.0144	-0.023	-0.02	0.0019
	(5.50)	(-8.09)	(-9.34)	(-10.34)	(1.61)
$\hat{\sigma}$	3008	1409	1927	1513	767
	(83.82)	(72.85)	(75.79)	(69.14)	(32.90)
Sample size	3876	3876	3876	3876	3876
Mean of Dep.	2624	822	1290	890	76.2
Log L	-33631	-24907	-27631	-23435	-7073
Iteration	12	201	11	11	9

Table 4.61: Maximum likehood estimator for censored regression: L/TL Model for Retail in 1994

Male

Age	20s	30s	40s	50s	60s
Const	0.2462	0.105	0.03802	-0.04605	-0.1266
	(24.40)	(14.83)	(5.19)	(-4.85)	(-9.94)
lnX	0.02561	0.01881	0.01568	0.01073	-0.007774
	(7.54)	(7.93)	(6.48)	(3.57)	(-2.09)
$(\ln X)^2$	0.002791	0.001337	0.000398	0.000968	-0.001564
	(5.23)	(3.60)	(0.94)	(1.84)	(-1.79)
OX/X	-0.06039	0.3401	0.4584	0.5102	0.1993
	(-0.43)	(3.48)	(4.62)	(4.13)	(1.36)
$(OX/X)^2$	0.5376	-0.7249	-0.9907	-1.297	-0.6895
	(1.40)	(-2.66)	(-3.57)	(-3.60)	(-1.61)
lnYR	-0.005582	-0.000341	0.00206	0.002342	0.003385
	(-7.81)	(-0.68)	(4.03)	(3.57)	(4.19)
$(\ln YR)^2$	6.2e-05	0	-1.3e-05	5e-06	-2.1e-05
	(4.71)	(0.00)	(-1.35)	(0.46)	(-1.45)
lnS	-0.01704	-0.001347	-0.009295	-0.01695	-0.01243
	(-4.81)	(-0.54)	(-3.58)	(-5.39)	(-3.27)
$(\ln S)^2$	-0.002831	-0.002642	0.000268	0.001001	0.002109
	(-3.24)	(-4.29)	(0.42)	(1.27)	(2.14)
$\hat{\sigma}$	0.1236	0.08634	0.08716	0.09869	0.09661
	(69.11)	(68.28)	(64.37)	(45.67)	(27.73)
Sample size	2985	2985	2985	2985	2985
Mean of Dep.	0.1253	0.09032	0.07519	0.03246	0.01122
Log L	1273	2115	1717	190	-306
Iteration	10	11	11	11	11

Female

Age	20s	30s	40s	50s	60s
Const	0.2377	0.07958	0.1377	-0.01324	-0.1279
	(19.74)	(9.97)	(12.31)	(-1.27)	(-9.63)
lnX	0.01122	-0.01225	-0.02461	-0.01386	-0.01638
	(2.78)	(-4.60)	(-6.61)	(-4.04)	(-4.05)
$(\ln X)^2$	0.001848	-0.000618	-0.00357	-0.002027	-0.002245
	(2.90)	(-1.48)	(-5.85)	(-3.60)	(-2.47)
OX/X	0.05482	-0.1668	-0.51	-0.5292	-0.03689
	(0.33)	(-1.51)	(-3.32)	(-3.69)	(-0.23)
$(OX/X)^2$	-0.06253	0.6589	1.0391	0.9445	-0.1477
	(-0.13)	(2.16)	(2.43)	(2.37)	(-0.32)
lnYR	-0.005579	-0.002051	0.001202	0.009539	0.004072
	(-6.56)	(-3.66)	(1.53)	(13.14)	(4.69)
$(\ln YR)^2$	8.1e-05	3.1e-05	-3.4e-05	-0.000161	-4.1e-05
	(5.13)	(3.02)	(-2.35)	(-12.05)	(-2.61)
lnS	-0.004495	0.0201	0.03607	0.01584	-0.005067
	(-1.06)	(7.04)	(9.10)	(4.33)	(-1.23)
$(\ln S)^2$	0.004903	-0.000885	-0.002722	-2.4e-05	0.001395
	(4.71)	(-1.27)	(-2.80)	(-0.03)	(1.31)
$\hat{\sigma}$	0.1486	0.09687	0.1368	0.1242	0.1117
	(72.97)	(67.45)	(71.58)	(66.42)	(31.69)
Sample size	2985	2985	2985	2985	2985
Mean of Dep.	0.2305	0.102	0.1907	0.1263	0.01602
Log L	1095	1738	1201	1046	-369
Iteration	10	10	10	10	11

Table 4.62: Maximum likehood estimator for censored regression: Lh/TLh Model for Retail in 1994

Male

Age	20s	30s	40s	50s	60s
Const	0.2632	0.121	0.04455	-0.04811	-0.1274
	(24.90)	(15.87)	(5.63)	(-4.77)	(-9.89)
lnX	0.02795	0.01916	0.01565	0.01155	-0.006968
	(7.85)	(7.50)	(5.99)	(3.61)	(-1.85)
$(\ln X)^2$	0.003187	0.001305	0.000313	0.001058	-0.001593
	(5.71)	(3.26)	(0.69)	(1.90)	(-1.76)
OX/X	-0.08543	0.3119	0.4419	0.5189	0.1968
	(-0.59)	(2.97)	(4.12)	(3.95)	(1.33)
$(OX/X)^2$	0.637	-0.6652	-0.9751	-1.322	-0.6798
	(1.58)	(-2.27)	(-3.25)	(-3.45)	(-1.58)
lnYR	-0.006066	-0.000663	0.002123	0.002444	0.003462
	(-8.10)	(-1.23)	(3.84)	(3.51)	(4.23)
$(\ln YR)^2$	6.5e-05	2e-06	-1.4e-05	6e-06	-2.2e-05
	(4.72)	(0.21)	(-1.38)	(0.48)	(-1.54)
lnS	-0.01309	0.001611	-0.008418	-0.01719	-0.01252
	(-3.52)	(0.60)	(-3.00)	(-5.14)	(-3.24)
$(\ln S)^2$	-0.003892	-0.003289	0.000154	0.000906	0.002009
	(-4.25)	(-4.96)	(0.22)	(1.08)	(2.00)
$\hat{\sigma}$	0.1295	0.09302	0.09423	0.1051	0.09757
	(69.08)	(68.14)	(64.23)	(45.53)	(27.78)
Sample size	2985	2985	2985	2985	2985
Mean of Dep.	0.1367	0.1025	0.08378	0.03498	0.01118
Log L	1151	1916	1527	103	-310
Iteration	10	11	11	11	11

Female

Age	20s	30s	40s	50s	60s
Const	0.2215	0.07107	0.1227	-0.01385	-0.1204
	(18.80)	(9.36)	(11.74)	(-1.38)	(-9.61)
lnX	0.01333	-0.01236	-0.02605	-0.01719	-0.01587
	(3.38)	(-4.88)	(-7.48)	(-5.19)	(-4.16)
$(\ln X)^2$	0.001212	-0.000716	-0.003163	-0.001975	-0.002151
	(1.94)	(-1.80)	(-5.59)	(-3.66)	(-2.51)
OX/X	0.03602	-0.1547	-0.4148	-0.5363	-0.03647
	(0.22)	(-1.48)	(-2.89)	(-3.87)	(-0.24)
$(OX/X)^2$	0.07898	0.5946	0.7785	0.935	-0.1599
	(0.17)	(2.05)	(1.95)	(2.43)	(-0.37)
lnYR	-0.005061	-0.001769	0.001481	0.00919	0.003764
	(-6.08)	(-3.32)	(2.02)	(13.11)	(4.59)
$(\ln YR)^2$	7.2e-05	2.8e-05	-3.4e-05	-0.000153	-3.7e-05
	(4.70)	(2.83)	(-2.54)	(-11.85)	(-2.54)
lnS	0.002097	0.01618	0.02927	0.01161	-0.005095
	(0.51)	(5.97)	(7.92)	(3.30)	(-1.31)
$(\ln S)^2$	0.004434	-0.000128	-0.001896	0.000777	0.00146
	(4.35)	(-0.19)	(-2.09)	(0.90)	(1.46)
$\hat{\sigma}$	0.1454	0.09207	0.1279	0.1198	0.1054
	(73.00)	(67.47)	(71.59)	(66.42)	(31.80)
Sample size	2985	2985	2985	2985	2985
Mean of Dep.	0.2324	0.09394	0.1718	0.118	0.01484
Log L	1159	1865	1383	1132	-326
Iteration	10	11	10	10	11

Table 4.63: Maximum likehood estimator for censored regression: whL/C Model for Retail in 1994

Male

Age	20s	30s	40s	50s	60s
Const	0.2603	0.169	0.06099	-0.07467	-0.1388
	(24.67)	(16.33)	(5.02)	(-4.95)	(-10.10)
lnX	0.02239	0.02345	0.02247	0.01994	-0.008181
	(6.30)	(6.76)	(5.60)	(4.17)	(-2.04)
$(\ln X)^2$	0.002714	0.001349	-0.000208	0.002015	-0.001344
	(4.87)	(2.48)	(-0.29)	(2.47)	(-1.53)
OX/X	-0.2586	0.1656	0.5463	0.766	0.174
	(-1.78)	(1.16)	(3.32)	(3.90)	(1.09)
$(OX/X)^2$	1.097	-0.3066	-1.156	-1.94	-0.6684
	(2.72)	(-0.77)	(-2.52)	(-3.38)	(-1.43)
lnYR	-0.006483	-0.001189	0.003812	0.003424	0.003741
	(-8.67)	(-1.63)	(4.50)	(3.29)	(4.26)
$(\ln YR)^2$	6.6e-05	-3e-06	-4.2e-05	1.3e-05	-2.4e-05
	(4.80)	(-0.24)	(-2.70)	(0.69)	(-1.54)
lnS	-0.009041	0.01284	-0.001806	-0.02099	-0.01296
	(-2.44)	(3.50)	(-0.42)	(-4.19)	(-3.21)
$(\ln S)^2$	-0.003732	-0.005326	0.000206	0.000858	0.001999
	(-4.08)	(-5.90)	(0.20)	(0.69)	(1.89)
$\hat{\sigma}$	0.1293	0.1263	0.1445	0.1571	0.1045
	(69.13)	(68.08)	(63.97)	(45.14)	(28.22)
Sample size	2985	2985	2985	2985	2985
Mean of Dep.	0.1335	0.1502	0.1468	0.05649	0.01123
Log L	1160	1140	526	-433	-335
Iteration	10	10	10	10	11

Female

Age	20s	30s	40s	50s	60s
Const	0.1779	0.05478	0.0956	-0.008844	-0.09861
	(17.71)	(8.05)	(10.54)	(-1.04)	(-9.65)
lnX	0.003742	-0.01057	-0.02384	-0.0172	-0.01411
	(1.11)	(-4.65)	(-7.89)	(-6.14)	(-4.53)
$(\ln X)^2$	-0.000315	-0.000618	-0.002171	-0.001435	-0.001686
	(-0.59)	(-1.74)	(-4.46)	(-3.18)	(-2.56)
OX/X	-0.07564	-0.0951	-0.2964	-0.4176	-0.01301
	(-0.54)	(-1.01)	(-2.38)	(-3.56)	(-0.10)
$(OX/X)^2$	0.3024	0.3976	0.4567	0.694	-0.1943
	(0.78)	(1.53)	(1.32)	(2.13)	(-0.54)
lnYR	-0.004056	-0.00125	0.001331	0.007296	0.002868
	(-5.71)	(-2.61)	(2.09)	(12.29)	(4.28)
$(\ln YR)^2$	4.6e-05	2e-05	-2.2e-05	-0.000115	-2.6e-05
	(3.54)	(2.23)	(-1.86)	(-10.55)	(-2.14)
lnS	0.005678	0.01157	0.01848	0.004056	-0.004426
	(1.61)	(4.77)	(5.78)	(1.37)	(-1.41)
$(\ln S)^2$	0.00402	0.000485	-0.001052	0.001298	0.001336
	(4.62)	(0.82)	(-1.34)	(1.78)	(1.65)
$\hat{\sigma}$	0.1239	0.08251	0.111	0.1015	0.08618
	(73.06)	(67.67)	(71.68)	(66.53)	(32.15)
Sample size	2985	2985	2985	2985	2985
Mean of Dep.	0.1882	0.07817	0.1323	0.09158	0.01153
Log L	1606	2152	1775	1541	-176
Iteration	10	11	10	10	11

Table 4.64: Maximum likehood estimator for censored regression: L/X Model for Retail in 1994

Male

Age	20s	30s	40s	50s	60s
Const	-7937	-4316	-2253	-665.5	-19.62
	(-7.30)	(-12.54)	(-17.75)	(-12.67)	(-11.78)
lnX	-898.9	-646.2	-398.5	-60.46	-1.92
	(-2.46)	(-5.66)	(-9.67)	(-3.69)	(-3.92)
$(\ln X)^2$	1928	964.7	382.5	21.25	-0.08241
	(33.97)	(54.20)	(49.59)	(8.81)	(-1.05)
OX/X	102.5	2422	2576	1764	3.589
	(0.01)	(0.51)	(1.54)	(2.57)	(0.18)
$(OX/X)^2$	5389	-8241	-7317	-4928	-37.15
	(0.13)	(-0.63)	(-1.57)	(-2.42)	(-0.64)
YR	125.08	94.73	52.67	9.98	0.5119
	(1.63)	(3.93)	(6.04)	(2.76)	(4.70)
YR^2	-4.235	-2.257	-1.0491	-0.05283	-0.004728
	(-2.97)	(-5.07)	(-6.56)	(-0.82)	(-2.48)
lnS	5137	2647	1107	42.45	-2.0397
	(13.15)	(21.31)	(23.53)	(2.45)	(-4.43)
$(\ln S)^2$	-1197	-600.6	-223.4	1.548	0.5029
	(-12.62)	(-19.86)	(-19.86)	(0.36)	(4.07)
$\hat{\sigma}$	1.308e+04	4112	1458	526.8	12.61
	(71.29)	(70.23)	(66.96)	(50.42)	(31.38)
Sample size	2985	2985	2985	2985	2985
Mean of Dep.	357.5	188.4	49.13	7.745	0.5595
Log L	-28119	-24862	-20444	-10642	-2872
Iteration	14	13	11	9	6

Female

Age	20s	30s	40s	50s	60s
Const	-1.456e+04	-1.131e+04	-5058	-1732	-14.08
	(-8.94)	(-9.82)	(-15.34)	(-17.65)	(-10.45)
lnX	-3411	-1934	-1389	-423.9	-2.85
	(-6.29)	(-5.10)	(-12.87)	(-13.38)	(-6.83)
$(\ln X)^2$	2811	1799	798.7	217.3	-0.1472
	(32.92)	(30.54)	(42.01)	(39.64)	(-2.24)
OX/X	3781	-6525	-896.9	-1756	-10.73
	(0.17)	(-0.41)	(-0.20)	(-1.31)	(-0.63)
$(OX/X)^2$	-1.801e+04	2.337e+04	-293.7	3021	-1.501
	(-0.29)	(0.54)	(-0.02)	(0.82)	(-0.03)
YR	227.9	155.6	106.8	41.89	0.3776
	(1.99)	(1.95)	(4.70)	(6.23)	(4.21)
YR^2	-6.0253	-3.862	-2.248	-0.8188	-0.004391
	(-2.84)	(-2.61)	(-5.36)	(-6.60)	(-2.72)
lnS	8643	6047	2599	739.9	-1.683
	(14.80)	(14.13)	(21.39)	(20.62)	(-4.31)
$(\ln S)^2$	-1634	-1142	-438.09	-113.6	0.5381
	(-11.54)	(-11.26)	(-15.11)	(-13.37)	(5.22)
$\hat{\sigma}$	1.985e+04	1.355e+04	3907	1122	11.38
	(74.22)	(70.29)	(73.30)	(69.22)	(34.44)
Sample size	2985	2985	2985	2985	2985
Mean of Dep.	591.001	346.5	148.5	44.22	0.8734
Log L	-31388	-27374	-26325	-20746	-3465
Iteration	15	15	13	11	6

Table 4.65: Maximum likehood estimator for censored regression: Lh/X Model for Retail in 1994

Male

Age	20s	30s	40s	50s	60s
Const	-1.573e+06	-8.245e+05	-4.391e+05	-1.169e+05	-3956
	(-7.25)	(-12.22)	(-17.40)	(-12.64)	(-11.78)
lnX	-1.708e+05	-1.186e+05	-7.506e+04	-1.059e+04	-342.02
	(-2.34)	(-5.30)	(-9.16)	(-3.67)	(-3.46)
$(\ln X)^2$	3.849e+05	1.847e+05	7.503e+04	3742	-17.32
	(33.99)	(52.95)	(48.90)	(8.81)	(-1.06)
OX/X	1.558e+04	4.699e+05	5.068e+05	3.066e+05	1125
	(0.01)	(0.51)	(1.52)	(2.53)	(0.28)
$(OX/X)^2$	1.09e+06	-1.582e+06	-1.436e+06	-8.563e+05	-8051
	(0.13)	(-0.62)	(-1.54)	(-2.39)	(-0.69)
YR	2.502e+04	1.818e+04	1.036e+04	1747	103.05
	(1.63)	(3.85)	(5.98)	(2.75)	(4.69)
YR^2	-846.5	-433.1	-206.2	-9.184	-0.9803
	(-2.98)	(-4.96)	(-6.48)	(-0.81)	(-2.54)
lnS	1.023e+06	5.057e+05	2.163e+05	7399	-394.7
	(13.12)	(20.78)	(23.12)	(2.43)	(-4.22)
$(\ln S)^2$	-2.399e+05	-1.155e+05	-4.415e+04	277.7	94.42
	(-12.68)	(-19.48)	(-19.73)	(0.37)	(3.77)
$\hat{\sigma}$	2.609e+06	8.061e+05	2.9e+05	9.276e+04	2537
	(71.29)	(70.23)	(66.98)	(50.39)	(31.64)
Sample size	2985	2985	2985	2985	2985
Mean of Dep.	7.066e+04	3.586e+04	9486	1376	95.77
Log L	-41650	-38137	-32600	-17295	-5775
Iteration	22	20	19	17	12

Female

Age	20s	30s	40s	50s	60s
Const	-1.463e+06	-9.603e+05	-6.549e+05	-2.997e+05	-2679
	(-10.43)	(-11.10)	(-14.29)	(-17.96)	(-10.69)
lnX	-4.042e+05	-1.827e+05	-1.909e+05	-7.025e+04	-507
	(-8.66)	(-6.42)	(-12.71)	(-13.05)	(-6.54)
$(\ln X)^2$	2.573e+05	1.533e+05	9.404e+04	3.993e+04	-27.25
	(35.00)	(34.68)	(35.56)	(42.87)	(-2.21)
OX/X	3.901e+05	-4.771e+05	-1.553e+05	-3.021e+05	-1464
	(0.20)	(-0.40)	(-0.25)	(-1.32)	(-0.46)
$(OX/X)^2$	-1.83e+06	1.668e+06	9.286e+04	5.09e+05	-1880
	(-0.34)	(0.51)	(0.05)	(0.81)	(-0.21)
YR	2.192e+04	1.404e+04	1.308e+04	7449	71.84
	(2.22)	(2.34)	(4.14)	(6.52)	(4.30)
YR^2	-563.7	-341.5	-272.03	-146.7	-0.8573
	(-3.09)	(-3.08)	(-4.66)	(-6.96)	(-2.85)
lnS	8.157e+05	5.139e+05	3.18e+05	1.326e+05	-307.4
	(16.20)	(15.93)	(18.86)	(21.70)	(-4.22)
$(\ln S)^2$	-1.391e+05	-9.526e+04	-4.871e+04	-2.17e+04	98.79
	(-11.41)	(-12.48)	(-12.09)	(-15.02)	(5.15)
$\hat{\sigma}$	1.709e+06	1.017e+06	5.435e+05	1.907e+05	2110
	(74.21)	(70.24)	(73.33)	(69.19)	(34.84)
Sample size	2985	2985	2985	2985	2985
Mean of Dep.	5.982e+04	3.08e+04	1.904e+04	7585	138.9
Log L	-43691	-38033	-39634	-33136	-7049
Iteration	22	21	20	18	11

Table 4.66: Maximum likehood estimator for censored regression: L Model for Wholesale in 1992

Male

Age	20s	30s	40s	50s	60s
Const	6.815	8.881	3.195	-10.86	-20.71
	(1.23)	(1.49)	(0.66)	(-2.42)	(-7.01)
X	0.2304	0.2303	0.2331	0.08624	-0.02361
	(10.35)	(9.53)	(11.90)	(5.11)	(-1.46)
X^2	-8.5e-05	-8.8e-05	-8.5e-05	-2.4e-05	5e-06
	(-8.42)	(-8.03)	(-9.61)	(-3.17)	(0.51)
OX	1.236	0.6466	0.6381	3.541	11.11
	(0.58)	(0.28)	(0.34)	(2.20)	(3.72)
OX^2	-0.04268	-0.02907	-0.02282	-0.08012	-1.7
	(-0.84)	(-0.52)	(-0.51)	(-2.07)	(-2.80)
YR	0.07174	0.1129	0.3246	0.4581	0.4293
	(0.16)	(0.23)	(0.81)	(1.26)	(1.91)
YR^2	-0.001144	-0.002357	-0.002222	-0.002528	-0.005262
	(-0.14)	(-0.27)	(-0.31)	(-0.40)	(-1.35)
$\hat{\sigma}$	45.52	49.33	40.073	34.52	15.82
	(47.31)	(48.60)	(48.41)	(43.18)	(23.39)
Sample size	1268	1268	1268	1268	1268
Mean of Dep.	14.58	15.15	15.32	8.044	0.9292
Log L	-6042	-6390	-6107	-4959	-1628
Iteration	6	6	6	5	8

Female

Age	20s	30s	40s	50s	60s
Const	0.6451	-8.566	-12.21	-26.31	-18.19
	(0.08)	(-2.33)	(-2.90)	(-6.45)	(-6.21)
X	0.2936	0.1025	0.05758	0.01707	-0.1464
	(9.49)	(7.40)	(3.63)	(1.24)	(-1.85)
X^2	-0.000109	-3.7e-05	-2e-05	-3e-06	4.8e-05
	(-7.80)	(-5.96)	(-2.77)	(-0.53)	(1.03)
OX	1.0709	0.243	-0.0124	1.347	6.32
	(0.36)	(0.18)	(-0.01)	(0.88)	(0.99)
OX^2	-0.03742	-0.002339	-0.001214	-0.04093	-3.691
	(-0.53)	(-0.07)	(-0.03)	(-0.96)	(-0.87)
YR	0.2186	0.087	0.258	0.7619	0.244
	(0.34)	(0.29)	(0.75)	(2.38)	(1.16)
YR^2	0.000364	-0.001301	-0.002851	-0.01069	-0.004077
	(0.03)	(-0.24)	(-0.47)	(-1.92)	(-1.09)
$\hat{\sigma}$	63.15	27.83	31.049	25.42	11.57
	(46.32)	(37.39)	(36.77)	(29.00)	(13.41)
Sample size	1268	1268	1268	1268	1268
Mean of Dep.	17.88	4.509	5.0101	2.229	0.3073
Log L	-6197	-3812	-3816	-2507	-676
Iteration	6	5	5	5	29

Table 4.67: Maximum likehood estimator for censored regression: Lh Model for Wholesale in 1992

Male

Age	20s	30s	40s	50s	60s
Const	1403	1775	639.8	-1638	-2919
	(1.52)	(1.72)	(0.78)	(-2.31)	(-6.94)
X	37.52	37.8	36.87	13.43	-3.0687
	(10.08)	(9.00)	(11.26)	(5.02)	(-1.31)
X^2	-0.0136	-0.01444	-0.01354	-0.003792	0.000596
	(-8.05)	(-7.57)	(-9.11)	(-3.12)	(0.36)
OX	242.8	123.7	93.91	581.2	1563
	(0.69)	(0.31)	(0.30)	(2.28)	(3.67)
OX^2	-7.968	-5.28	-3.636	-13.21	-241.09
	(-0.94)	(-0.55)	(-0.49)	(-2.16)	(-2.78)
YR	7.32	11.28	55.36	72.99	60.74
	(0.10)	(0.13)	(0.83)	(1.27)	(1.90)
YR^2	-0.09986	-0.2472	-0.3721	-0.379	-0.741
	(-0.07)	(-0.16)	(-0.31)	(-0.38)	(-1.34)
$\hat{\sigma}$	7610	8578	6701	5471	2259
	(47.28)	(48.59)	(48.40)	(43.10)	(22.99)
Sample size	1268	1268	1268	1268	1268
Mean of Dep.	2647	2757	2661	1379	156.2
Log L	-11848	-12529	-12159	-9805	-3130
Iteration	14	14	13	13	11

Female

Age	20s	30s	40s	50s	60s
Const	330.5	-1310	-1895	-3732	-2453
	(0.27)	(-2.35)	(-3.04)	(-6.43)	(-6.08)
X	44.37	15.01	7.667	1.918	-23.93
	(9.01)	(7.15)	(3.26)	(0.98)	(-2.03)
X^2	-0.0163	-0.005392	-0.002546	-0.000205	0.007947
	(-7.29)	(-5.68)	(-2.37)	(-0.23)	(1.21)
OX	199.3	13.95	-50.13	201.6	811.8
	(0.43)	(0.07)	(-0.22)	(0.92)	(0.92)
OX^2	-6.502	0.2792	0.9313	-6.0964	-486.4
	(-0.58)	(0.06)	(0.17)	(-0.99)	(-0.83)
YR	27.013	16.62	46.79	110.3	30.43
	(0.26)	(0.36)	(0.92)	(2.42)	(1.05)
YR^2	0.2823	-0.2313	-0.5361	-1.55	-0.4906
	(0.16)	(-0.28)	(-0.60)	(-1.95)	(-0.96)
$\hat{\sigma}$	1.005e+04	4219	4600	3619	1594
	(46.24)	(37.33)	(36.70)	(28.86)	(13.24)
Sample size	1268	1268	1268	1268	1268
Mean of Dep.	3048	719.3	768.7	342.7	46.94
Log L	-11705	-7510	-7397	-4776	-1250
Iteration	14	13	13	12	21

Table 4.68: Maximum likehood estimator for censored regression: L/TL Model for Wholesale in 1992

Male

Age	20s	30s	40s	50s	60s
Const	0.2382	0.2356	0.1403	0.005469	-0.1402
	(13.49)	(16.83)	(9.43)	(0.36)	(-6.13)
lnX	0.01042	0.009261	0.0153	0.008448	-0.01179
	(2.50)	(2.81)	(4.38)	(2.43)	(-2.58)
$(\ln X)^2$	-0.001507	-0.002747	-0.001232	-0.000182	-0.00072
	(-1.63)	(-3.73)	(-1.58)	(-0.24)	(-0.60)
OX/X	0.06796	0.1304	0.03887	-0.05159	0.1166
	(0.56)	(1.35)	(0.38)	(-0.51)	(0.92)
$(OX/X)^2$	-0.2002	-0.205	0.2617	0.3655	-0.0711
	(-0.84)	(-1.06)	(1.31)	(1.86)	(-0.29)
lnYR	-0.003421	-0.002657	0.002039	0.003149	0.00378
	(-2.37)	(-2.32)	(1.68)	(2.58)	(2.21)
$(\ln YR)^2$	2.5e-05	2.3e-05	-2.6e-05	-1.8e-05	-4.3e-05
	(0.97)	(1.13)	(-1.19)	(-0.86)	(-1.43)
$\hat{\sigma}$	0.1439	0.1146	0.121	0.1173	0.1233
	(46.33)	(47.86)	(47.65)	(41.39)	(20.94)
Sample size	1264	1264	1264	1264	1264
Mean of Dep.	0.1802	0.1882	0.1886	0.101	0.0186
Log L	438	789	712	411	-191
Iteration	10	10	10	10	10

Female

Age	20s	30s	40s	50s	60s
Const	0.138	0.03686	0.01411	-0.1106	-0.2014
	(7.96)	(2.94)	(0.78)	(-5.10)	(-5.48)
lnX	0.03652	-0.009642	-0.02824	-0.02865	-0.03277
	(8.97)	(-3.36)	(-6.93)	(-6.46)	(-4.81)
$(\ln X)^2$	-0.003916	0.00221	0.003582	0.003817	-0.000444
	(-4.35)	(3.50)	(3.93)	(3.92)	(-0.18)
OX/X	0.06698	-0.05425	-0.1988	-0.00072	-0.05899
	(0.56)	(-0.64)	(-1.60)	(0.00)	(-0.25)
$(OX/X)^2$	-0.1404	0.01452	0.1113	-0.4498	-0.2137
	(-0.57)	(0.09)	(0.45)	(-1.15)	(-0.39)
lnYR	-0.000795	-0.001094	0.001253	0.005158	0.00221
	(-0.56)	(-1.07)	(0.85)	(3.06)	(0.85)
$(\ln YR)^2$	2e-05	1.8e-05	-1e-05	-6.9e-05	-2.9e-05
	(0.80)	(0.97)	(-0.40)	(-2.34)	(-0.63)
$\hat{\sigma}$	0.1394	0.09588	0.1352	0.1367	0.1449
	(45.16)	(34.80)	(34.58)	(26.63)	(12.36)
Sample size	1264	1264	1264	1264	1264
Mean of Dep.	0.1666	0.05012	0.06559	0.0343	0.006903
Log L	417	265	9	-171	-179
Iteration	10	11	10	10	10

Table 4.69: Maximum likehood estimator for censored regression: Lh/TLh Model for Wholesale in 1992

Male

Age	20s	30s	40s	50s	60s
Const	0.2425	0.243	0.1426	0.007143	-0.1361
	(13.50)	(17.03)	(9.51)	(0.46)	(-6.04)
lnX	0.01067	0.008408	0.01406	0.00746	-0.01119
	(2.52)	(2.51)	(3.99)	(2.11)	(-2.48)
$(\ln X)^2$	-0.001337	-0.00265	-0.001234	-0.000207	-0.000754
	(-1.42)	(-3.53)	(-1.57)	(-0.27)	(-0.64)
OX/X	0.05732	0.1456	0.02964	-0.05923	0.07711
	(0.47)	(1.48)	(0.29)	(-0.58)	(0.61)
$(OX/X)^2$	-0.1753	-0.2355	0.2651	0.3666	-0.02468
	(-0.72)	(-1.19)	(1.31)	(1.84)	(-0.10)
lnYR	-0.003363	-0.00278	0.002094	0.002992	0.003543
	(-2.29)	(-2.39)	(1.71)	(2.41)	(2.10)
$(\ln YR)^2$	2.3e-05	2.5e-05	-2.6e-05	-1.4e-05	-3.9e-05
	(0.87)	(1.23)	(-1.22)	(-0.66)	(-1.34)
$\hat{\sigma}$	0.1464	0.1168	0.122	0.1192	0.1214
	(46.32)	(47.85)	(47.65)	(41.37)	(20.81)
Sample size	1264	1264	1264	1264	1264
Mean of Dep.	0.1848	0.1942	0.1902	0.1014	0.0181
Log L	418	765	702	395	-188
Iteration	10	10	10	10	10

Female

Age	20s	30s	40s	50s	60s
Const	0.137	0.02946	0.009719	-0.1064	-0.1888
	(7.87)	(2.50)	(0.57)	(-5.08)	(-5.44)
lnX	0.03694	-0.008492	-0.02673	-0.02889	-0.03042
	(9.04)	(-3.15)	(-7.05)	(-6.75)	(-4.72)
$(\ln X)^2$	-0.003995	0.002116	0.003426	0.003922	-0.000715
	(-4.42)	(3.56)	(4.04)	(4.18)	(-0.30)
OX/X	0.05764	-0.03578	-0.1803	0.01452	-0.05905
	(0.48)	(-0.45)	(-1.57)	(0.09)	(-0.26)
$(OX/X)^2$	-0.1235	-0.01395	0.108	-0.464	-0.1893
	(-0.50)	(-0.09)	(0.47)	(-1.22)	(-0.37)
lnYR	-0.00083	-0.000681	0.001359	0.004895	0.001981
	(-0.59)	(-0.71)	(0.99)	(3.01)	(0.80)
$(\ln YR)^2$	2e-05	1.1e-05	-1.3e-05	-6.6e-05	-2.6e-05
	(0.81)	(0.63)	(-0.52)	(-2.30)	(-0.59)
$\hat{\sigma}$	0.1398	0.09011	0.1258	0.1319	0.1368
	(45.11)	(34.82)	(34.58)	(26.67)	(12.40)
Sample size	1264	1264	1264	1264	1264
Mean of Dep.	0.1651	0.04686	0.0604	0.03247	0.00642
Log L	411	312	61	-153	-171
Iteration	10	11	10	10	10

Table 4.70: Maximum likehood estimator for censored regression: whL/C Model for Wholesale in 1992

Male

Age	20s	30s	40s	50s	60s
Const	0.2027	0.2849	0.1973	0.008619	-0.1338
	(13.15)	(17.86)	(10.83)	(0.42)	(-6.05)
lnX	0.001132	0.00783	0.02489	0.01661	-0.01065
	(0.31)	(2.09)	(5.82)	(3.55)	(-2.40)
$(\ln X)^2$	-0.000707	-0.003033	-0.001791	-0.000333	-0.000867
	(-0.88)	(-3.62)	(-1.88)	(-0.32)	(-0.75)
OX/X	-0.002438	0.1305	0.01534	-0.006575	0.03117
	(-0.02)	(1.19)	(0.12)	(-0.05)	(0.25)
$(OX/X)^2$	-0.1332	-0.2775	0.3396	0.3651	0.02346
	(-0.64)	(-1.26)	(1.39)	(1.39)	(0.10)
lnYR	-0.002953	-0.003599	0.002839	0.004059	0.003449
	(-2.34)	(-2.76)	(1.91)	(2.48)	(2.08)
$(\ln YR)^2$	1.9e-05	3.2e-05	-4e-05	-1.8e-05	-3.7e-05
	(0.87)	(1.37)	(-1.53)	(-0.63)	(-1.28)
$\hat{\sigma}$	0.1256	0.1306	0.1483	0.1572	0.1191
	(46.37)	(47.84)	(47.59)	(41.33)	(21.01)
Sample size	1264	1264	1264	1264	1264
Mean of Dep.	0.1446	0.2175	0.2613	0.1431	0.01739
Log L	595	633	468	129	-179
Iteration	10	10	10	10	10

Female

Age	20s	30s	40s	50s	60s
Const	0.09504	0.02451	0.007152	-0.08982	-0.146
	(7.69)	(2.72)	(0.54)	(-5.09)	(-5.47)
lnX	0.02008	-0.006862	-0.02239	-0.0255	-0.02385
	(6.92)	(-3.33)	(-7.58)	(-7.08)	(-4.80)
$(\ln X)^2$	-0.002701	0.001642	0.002978	0.003514	-0.000467
	(-4.21)	(3.62)	(4.51)	(4.45)	(-0.26)
OX/X	0.05957	-0.02015	-0.1369	0.01895	-0.07212
	(0.70)	(-0.33)	(-1.52)	(0.14)	(-0.41)
$(OX/X)^2$	-0.1398	-0.02471	0.05832	-0.4215	-0.1182
	(-0.80)	(-0.21)	(0.33)	(-1.29)	(-0.29)
lnYR	-0.000897	-0.000739	0.00101	0.004039	0.001585
	(-0.89)	(-1.00)	(0.95)	(2.94)	(0.83)
$(\ln YR)^2$	1.7e-05	1.2e-05	-8e-06	-5.3e-05	-2.1e-05
	(0.93)	(0.89)	(-0.44)	(-2.22)	(-0.62)
$\hat{\sigma}$	0.09939	0.06882	0.09795	0.111	0.1053
	(45.26)	(34.90)	(34.69)	(26.86)	(12.52)
Sample size	1264	1264	1264	1264	1264
Mean of Dep.	0.1037	0.0349	0.04627	0.02645	0.004798
Log L	791	512	244	-69	-140
Iteration	10	11	11	10	11

Table 4.71: Maximum likehood estimator for censored regression: L/X Model for Wholesale in 1992

Male

Age	20s	30s	40s	50s	60s
Const	18.49	23.33	11.079	-7.501	-21.77
	(2.46)	(2.64)	(1.87)	(-1.55)	(-6.40)
lnX	-8.622	-8.376	-9.282	-5.102	-3.484
	(-4.87)	(-4.01)	(-6.71)	(-4.68)	(-5.26)
$(\ln X)^2$	1.703	1.437	1.664	1.125	0.3875
	(4.34)	(3.08)	(5.40)	(4.70)	(2.44)
OX/X	-2.532	26.12	-12.46	13.31	30.63
	(-0.05)	(0.42)	(-0.31)	(0.42)	(1.62)
$(OX/X)^2$	-63.74	-116.2	-32.54	-32.15	-47.94
	(-0.63)	(-0.93)	(-0.41)	(-0.52)	(-1.31)
YR	-0.9591	-1.241	-0.3603	0.01648	0.3308
	(-1.56)	(-1.71)	(-0.75)	(0.04)	(1.28)
YR^2	0.01274	0.01831	0.006783	0.004225	-0.002141
	(1.16)	(1.42)	(0.79)	(0.62)	(-0.48)
$\hat{\sigma}$	60.91	72.17	47.9	36.64	17.98
	(47.34)	(48.57)	(48.30)	(43.17)	(23.75)
Sample size	1264	1264	1264	1264	1264
Mean of Dep.	6.44	6.813	6.497	3.649	0.7698
Log L	-6349	-6816	-6297	-4994	-1647
Iteration	6	7	6	5	6

Female

Age	20s	30s	40s	50s	60s
Const	6.255	-0.8294	-3.31	-13.073	22.83
	(1.65)	(-0.35)	(-0.70)	(-4.85)	(6.56)
lnX	-5.995	-5.172	-11.49	-5.857	-0.4806
	(-6.80)	(-9.74)	(-10.99)	(-10.66)	(-0.64)
$(\ln X)^2$	1.126	1.0665	2.0853	1.0379	1.313
	(5.77)	(9.17)	(9.01)	(8.72)	(3.97)
OX/X	27.29	0.3809	-18.81	28.41	8.0291
	(1.05)	(0.02)	(-0.58)	(1.32)	(0.30)
$(OX/X)^2$	-105.9	-34.17	-50.64	-115.2	-11.019
	(-1.98)	(-1.12)	(-0.79)	(-2.12)	(-0.17)
YR	-0.2814	-0.2811	-0.4158	0.2214	-0.2493
	(-0.91)	(-1.46)	(-1.09)	(1.05)	(-0.89)
YR^2	0.006309	0.005436	0.00848	-0.001493	0.003658
	(1.15)	(1.59)	(1.26)	(-0.40)	(0.74)
$\hat{\sigma}$	30.23	17.5	34.15	16.72	-14.23
	(46.09)	(37.57)	(37.42)	(29.41)	(-75703722.87)
Sample size	1264	1264	1264	1264	1264
Mean of Dep.	5.741	1.93	3.106	1.41	0.3035
Log L	-5388	-3448	-3846	-2293	1844
Iteration	5	4	5	5	201

Table 4.72: Maximum likehood estimator for censored regression: Lh/X Model for Wholesale in 1992

Male

Age	20s	30s	40s	50s	60s
Const	3399	4266	2103	-1274	-3531
	(2.45)	(2.67)	(1.98)	(-1.50)	(-6.46)
lnX	-1701	-1582	-1684	-914.06	-597.5
	(-5.21)	(-4.20)	(-6.79)	(-4.78)	(-5.64)
$(\ln X)^2$	334.9	270.9	299.2	199.5	71.81
	(4.63)	(3.22)	(5.43)	(4.76)	(2.84)
OX/X	-898.2	4601	-2019	2286	5440
	(-0.09)	(0.41)	(-0.28)	(0.41)	(1.79)
$(OX/X)^2$	-1.15e+04	-2.086e+04	-5804	-5061	-8420
	(-0.62)	(-0.93)	(-0.41)	(-0.47)	(-1.44)
YR	-170.6	-222.4	-71.075	1.416	57.95
	(-1.50)	(-1.71)	(-0.82)	(0.02)	(1.39)
YR^2	2.254	3.279	1.32	0.7611	-0.4533
	(1.12)	(1.41)	(0.86)	(0.64)	(-0.63)
$\hat{\sigma}$	1.123e+04	1.3e+04	8578	6422	2889
	(47.33)	(48.57)	(48.29)	(43.14)	(23.55)
Sample size	1264	1264	1264	1264	1264
Mean of Dep.	1216	1273	1189	654.1	132.7
Log L	-12250	-12976	-12409	-9919	-3170
Iteration	14	14	14	13	12

Female

Age	20s	30s	40s	50s	60s
Const	1055	-82.58	-717.7	-2165	-1688
	(1.60)	(-0.29)	(-0.93)	(-4.89)	(-5.92)
lnX	-1017	-663.5	-1660	-974.1	-388.7
	(-6.63)	(-10.29)	(-9.73)	(-10.81)	(-7.44)
$(\ln X)^2$	188.8	132.2	292.7	171.9	43.98
	(5.57)	(9.35)	(7.74)	(8.80)	(3.33)
OX/X	4519	581.7	-2149	5121	1080
	(1.00)	(0.30)	(-0.41)	(1.47)	(0.59)
$(OX/X)^2$	-1.772e+04	-4837	-7725	-1.927e+04	-4668
	(-1.90)	(-1.30)	(-0.74)	(-2.20)	(-1.10)
YR	-45.075	-28.95	-60.77	37.59	21.58
	(-0.84)	(-1.24)	(-0.98)	(1.08)	(1.04)
YR^2	1.0228	0.5859	1.296	-0.2564	-0.3337
	(1.08)	(1.41)	(1.18)	(-0.42)	(-0.91)
$\hat{\sigma}$	5257	2129	5569	2742	1133
	(46.04)	(37.37)	(37.38)	(29.35)	(13.30)
Sample size	1264	1264	1264	1264	1264
Mean of Dep.	1008	296.6	494.5	237.6	43.11
Log L	-10982	-6975	-7485	-4621	-1207
Iteration	13	12	13	12	8

Table 4.73: Maximum likehood estimator for censored regression: L Model for Wholesale in 1993

Male

Age	20s	30s	40s	50s	60s
Const	17.98	17.5	15.61	-2.739	-4.88
	(4.37)	(3.88)	(3.43)	(-0.68)	(-5.15)
X	0.04832	0.08368	0.08556	0.06041	-0.004761
	(10.23)	(16.00)	(16.36)	(13.71)	(-0.75)
X^2	-1e-06	-4e-06	-4e-06	-3e-06	-2e-06
	(-3.24)	(-10.07)	(-9.58)	(-8.24)	(-0.23)
OX	0.3988	-2.319	-2.0449	-1.0967	0.3866
	(0.56)	(-2.94)	(-2.59)	(-1.65)	(2.19)
OX^2	-0.006758	0.01333	0.01546	0.006065	-0.003994
	(-0.85)	(1.52)	(1.76)	(0.82)	(-1.33)
YR	-1.0644	-0.8793	-0.839	-0.3454	-0.08759
	(-2.97)	(-2.24)	(-2.13)	(-1.00)	(-1.15)
YR^2	0.02192	0.01875	0.02045	0.01346	0.002681
	(3.39)	(2.65)	(2.88)	(2.17)	(1.97)
$\hat{\sigma}$	39.49	43.74	43.74	36.81	6.363
	(43.35)	(44.93)	(44.69)	(39.95)	(20.52)
Sample size	1076	1076	1076	1076	1076
Mean of Dep.	17.65	18.25	19.85	11.56	0.6946
Log L	-4966	-5333	-5288	-4290	-1180
Iteration	6	6	6	5	9

Female

Age	20s	30s	40s	50s	60s
Const	18.41	-3.2	-6.141	-10.36	-11.54
	(3.50)	(-1.38)	(-2.15)	(-5.77)	(-6.80)
X	0.06969	0.02897	0.02055	0.01119	-0.02425
	(11.53)	(11.49)	(6.70)	(6.30)	(-1.83)
X^2	-2e-06	-1e-06	-1e-06	-1e-06	4e-06
	(-4.73)	(-6.63)	(-4.27)	(-4.98)	(0.44)
OX	0.2778	0.9113	0.00333	-0.3198	6.912
	(0.30)	(1.28)	(0.01)	(-0.73)	(1.12)
OX^2	0.005799	-0.05603	-0.0171	-0.007105	-7.242
	(0.57)	(-2.56)	(-1.50)	(-0.74)	(-1.19)
YR	-1.139	-0.1429	-0.05033	0.2549	0.2007
	(-2.49)	(-0.72)	(-0.21)	(1.74)	(1.79)
YR^2	0.02615	0.003234	0.002736	-0.003206	-0.002436
	(3.17)	(0.90)	(0.63)	(-1.23)	(-1.25)
$\hat{\sigma}$	50.55	20.13	24.62	13.4	6.624
	(43.40)	(33.23)	(34.10)	(26.15)	(12.31)
Sample size	1076	1076	1076	1076	1076
Mean of Dep.	22.6	5.543	5.273	2.268	0.2537
Log L	-5206	-2952	-3156	-1947	-549
Iteration	6	5	5	7	22

Table 4.74: Maximum likehood estimator for censored regression: Lh Model for Wholesale in 1993

Male

Age	20s	30s	40s	50s	60s
Const	2892	2756	2360	-393.9	-830.6
	(4.14)	(3.55)	(3.16)	(-0.60)	(-5.22)
X	7.785	14.81	12.92	8.98	-0.8524
	(9.71)	(16.45)	(15.06)	(12.48)	(-0.78)
X^2	-0.000122	-0.000733	-0.000586	-0.000421	-0.000276
	(-1.92)	(-10.31)	(-8.66)	(-7.42)	(-0.22)
OX	26.89	-448.5	-341.2	-181.06	59.34
	(0.22)	(-3.30)	(-2.64)	(-1.66)	(2.01)
OX^2	-0.7828	2.651	2.671	1.0875	-0.6098
	(-0.58)	(1.76)	(1.86)	(0.90)	(-1.27)
YR	-160	-129.5	-122.4	-62.22	-13.84
	(-2.63)	(-1.92)	(-1.90)	(-1.10)	(-1.08)
YR^2	3.343	2.835	3.138	2.333	0.4395
	(3.05)	(2.32)	(2.70)	(2.30)	(1.93)
$\hat{\sigma}$	6700	7530	7173	6015	1067
	(43.34)	(44.94)	(44.66)	(39.95)	(20.54)
Sample size	1076	1076	1076	1076	1076
Mean of Dep.	3046	3117	3190	1852	115.7
Log L	-9874	-10569	-10414	-8464	-2531
Iteration	13	14	14	13	17

Female

Age	20s	30s	40s	50s	60s
Const	2878	-625.7	-873	-1651	-1745
	(3.34)	(-1.68)	(-2.23)	(-5.83)	(-6.81)
X	11.099	4.363	3.18	1.695	-3.532
	(11.23)	(10.76)	(7.56)	(6.05)	(-1.80)
X^2	-0.000336	-0.000186	-0.000151	-0.000109	0.00052
	(-4.30)	(-5.81)	(-4.60)	(-4.78)	(0.32)
OX	13.37	151.1	-9.073	-50.079	1096
	(0.09)	(1.31)	(-0.10)	(-0.73)	(1.17)
OX^2	1.451	-9.185	-2.65	-1.0591	-1141
	(0.87)	(-2.55)	(-1.69)	(-0.71)	(-1.23)
YR	-174.5	-17.24	-1.73	41.65	30.46
	(-2.33)	(-0.54)	(-0.05)	(1.80)	(1.81)
YR^2	4.0531	0.4172	0.3076	-0.5343	-0.3631
	(3.00)	(0.72)	(0.52)	(-1.30)	(-1.24)
$\hat{\sigma}$	8266	3236	3378	2109	996.4
	(43.40)	(33.17)	(34.03)	(26.19)	(12.24)
Sample size	1076	1076	1076	1076	1076
Mean of Dep.	3662	848.8	783.03	349.6	39.42
Log L	-10083	-5966	-6219	-3969	-1076
Iteration	14	12	12	11	31

Table 4.75: Maximum likehood estimator for censored regression: L/TL Model for Wholesale in 1993

Male

Age	20s	30s	40s	50s	60s
Const	0.197	0.1926	0.1538	0.04779	-0.08863
	(12.78)	(16.27)	(12.68)	(3.60)	(-4.78)
lnX	-0.004303	0.002679	0.01385	0.01304	-0.0074
	(-1.40)	(1.13)	(5.70)	(4.03)	(-1.77)
$(\ln X)^2$	0.001006	-0.000318	-0.0009	-0.001003	-0.001905
	(1.92)	(-0.79)	(-2.18)	(-1.80)	(-2.05)
OX/X	0.3418	0.02709	-0.001181	0.2634	-0.02586
	(2.21)	(0.23)	(-0.01)	(2.02)	(-0.15)
$(OX/X)^2$	-0.2188	0.04937	-0.004279	-0.3844	0.1375
	(-0.63)	(0.19)	(-0.02)	(-1.32)	(0.38)
lnYR	-0.001786	-0.000375	0.001322	0.00054	-0.000291
	(-1.35)	(-0.37)	(1.27)	(0.48)	(-0.20)
$(\ln YR)^2$	1.6e-05	-6e-06	-2.1e-05	9e-06	3e-05
	(0.68)	(-0.34)	(-1.10)	(0.44)	(1.15)
$\hat{\sigma}$	0.1459	0.1127	0.115	0.1205	0.1235
	(42.48)	(44.40)	(44.11)	(38.38)	(19.53)
Sample size	1076	1076	1076	1076	1076
Mean of Dep.	0.1798	0.1819	0.1838	0.1011	0.0191
Log L	347	702	665	336	-159
Iteration	10	10	10	10	10

Female

Age	20s	30s	40s	50s	60s
Const	0.1757	0.01187	0.02465	-0.08361	-0.2388
	(11.78)	(1.01)	(1.56)	(-4.36)	(-6.31)
lnX	0.01366	-0.000843	-0.01274	-0.01117	-0.01008
	(4.57)	(-0.37)	(-4.13)	(-3.14)	(-1.32)
$(\ln X)^2$	-0.000484	0.000532	0.000752	0.0001	-0.004272
	(-0.96)	(1.40)	(1.45)	(0.16)	(-1.80)
OX/X	-0.2282	-0.1706	-0.195	-0.3211	-0.2525
	(-1.52)	(-1.45)	(-1.12)	(-1.71)	(-0.85)
$(OX/X)^2$	0.3123	0.2035	-0.1135	0.4564	0.333
	(0.93)	(0.78)	(-0.27)	(1.10)	(0.50)
lnYR	-0.002224	0.00079	0.00106	0.003893	0.004491
	(-1.73)	(0.79)	(0.79)	(2.50)	(1.80)
$(\ln YR)^2$	4.1e-05	-1.7e-05	-1.4e-05	-5.6e-05	-4.9e-05
	(1.78)	(-0.96)	(-0.60)	(-2.00)	(-1.14)
$\hat{\sigma}$	0.1412	0.1024	0.1375	0.1437	0.1469
	(42.59)	(31.37)	(32.30)	(24.87)	(11.80)
Sample size	1076	1076	1076	1076	1076
Mean of Dep.	0.173	0.05004	0.06731	0.03665	0.007333
Log L	385	159	9	-167	-156
Iteration	10	11	10	10	10

Table 4.76: Maximum likehood estimator for censored regression: Lh/TLh Model for Wholesale in 1993

Male

Age	20s	30s	40s	50s	60s
Const	0.2003	0.1968	0.155	0.04861	-0.08643
	(12.77)	(16.31)	(12.61)	(3.63)	(-4.83)
lnX	-0.003983	0.002515	0.01301	0.01212	-0.006928
	(-1.27)	(1.04)	(5.28)	(3.74)	(-1.71)
$(\ln X)^2$	0.001126	-0.000274	-0.000996	-0.001016	-0.001845
	(2.12)	(-0.67)	(-2.38)	(-1.82)	(-2.05)
OX/X	0.3552	0.01156	-0.02041	0.2648	-0.02171
	(2.25)	(0.09)	(-0.17)	(2.02)	(-0.13)
$(OX/X)^2$	-0.2451	0.08403	0.01864	-0.3875	0.129
	(-0.70)	(0.31)	(0.07)	(-1.32)	(0.37)
lnYR	-0.001655	-0.000158	0.001507	0.00064	-0.000196
	(-1.23)	(-0.15)	(1.43)	(0.56)	(-0.14)
$(\ln YR)^2$	1.3e-05	-1.1e-05	-2.4e-05	7e-06	2.8e-05
	(0.54)	(-0.58)	(-1.25)	(0.34)	(1.09)
$\hat{\sigma}$	0.1485	0.1149	0.1166	0.1215	0.1191
	(42.47)	(44.40)	(44.07)	(38.36)	(19.50)
Sample size	1076	1076	1076	1076	1076
Mean of Dep.	0.185	0.1876	0.1854	0.1017	0.01853
Log L	330	682	649	329	-150
Iteration	10	10	10	10	10

Female

Age	20s	30s	40s	50s	60s
Const	0.1755	0.01244	0.02293	-0.07852	-0.2237
	(11.64)	(1.11)	(1.56)	(-4.36)	(-6.32)
lnX	0.01381	-0.000573	-0.01212	-0.0105	-0.009775
	(4.57)	(-0.27)	(-4.22)	(-3.15)	(-1.37)
$(\ln X)^2$	-0.00051	0.000508	0.000743	9.6e-05	-0.00395
	(-1.00)	(1.41)	(1.54)	(0.17)	(-1.78)
OX/X	-0.2299	-0.1571	-0.1838	-0.3006	-0.2398
	(-1.51)	(-1.40)	(-1.13)	(-1.71)	(-0.86)
$(OX/X)^2$	0.307	0.2047	-0.1443	0.4271	0.3127
	(0.91)	(0.82)	(-0.36)	(1.09)	(0.50)
lnYR	-0.002382	0.000484	0.000917	0.003586	0.004162
	(-1.84)	(0.51)	(0.74)	(2.45)	(1.79)
$(\ln YR)^2$	4.5e-05	-1.2e-05	-1.1e-05	-5.1e-05	-4.4e-05
	(1.90)	(-0.70)	(-0.51)	(-1.93)	(-1.10)
$\hat{\sigma}$	0.1428	0.09736	0.1279	0.1348	0.1373
	(42.61)	(31.27)	(32.32)	(24.89)	(11.84)
Sample size	1076	1076	1076	1076	1076
Mean of Dep.	0.1716	0.04677	0.06236	0.03416	0.006785
Log L	375	186	55	-140	-148
Iteration	10	11	10	10	10

Table 4.77: Maximum likehood estimator for censored regression: whL/C Model for Wholesale in 1993

Male

Age	20s	30s	40s	50s	60s
Const	0.1582	0.2212	0.223	0.07922	-0.09446
	(11.92)	(16.77)	(14.83)	(4.52)	(-4.98)
lnX	-0.009539	-0.001886	0.02041	0.02295	-0.007646
	(-3.60)	(-0.72)	(6.78)	(5.21)	(-1.79)
$(\ln X)^2$	0.001097	3.5e-05	-0.001124	-0.001638	-0.001929
	(2.44)	(0.08)	(-2.20)	(-2.15)	(-2.03)
OX/X	0.2437	-0.03839	-0.06763	0.3512	-0.04173
	(1.83)	(-0.29)	(-0.45)	(2.04)	(-0.24)
$(OX/X)^2$	-0.1908	0.1692	0.1027	-0.466	0.1666
	(-0.64)	(0.57)	(0.30)	(-1.21)	(0.45)
lnYR	-0.000853	0.00027	0.001364	-0.000289	-8.5e-05
	(-0.75)	(0.24)	(1.06)	(-0.19)	(-0.06)
$(\ln YR)^2$	1e-06	-2.3e-05	-2.4e-05	3.3e-05	2.8e-05
	(0.04)	(-1.12)	(-1.02)	(1.22)	(1.04)
$\hat{\sigma}$	0.1256	0.1256	0.1427	0.1592	0.1257
	(42.52)	(44.38)	(44.04)	(38.26)	(19.72)
Sample size	1076	1076	1076	1076	1076
Mean of Dep.	0.143	0.2085	0.2574	0.1471	0.01852
Log L	492	590	444	103	-159
Iteration	10	10	10	10	10

Female

Age	20s	30s	40s	50s	60s
Const	0.1193	0.009768	0.01796	-0.06484	-0.1647
	(10.46)	(1.11)	(1.52)	(-4.43)	(-6.39)
lnX	0.005341	-0.000643	-0.00961	-0.008659	-0.007727
	(2.34)	(-0.38)	(-4.16)	(-3.20)	(-1.49)
$(\ln X)^2$	-0.000428	0.000391	0.000622	0.000114	-0.002821
	(-1.11)	(1.38)	(1.61)	(0.25)	(-1.74)
OX/X	-0.1781	-0.1332	-0.1451	-0.2272	-0.1779
	(-1.55)	(-1.51)	(-1.11)	(-1.59)	(-0.87)
$(OX/X)^2$	0.2252	0.18	-0.1089	0.3096	0.2281
	(0.88)	(0.92)	(-0.34)	(0.97)	(0.50)
lnYR	-0.001759	0.000257	0.000578	0.002906	0.00315
	(-1.79)	(0.34)	(0.58)	(2.44)	(1.85)
$(\ln YR)^2$	3.1e-05	-7e-06	-6e-06	-4e-05	-3.4e-05
	(1.76)	(-0.53)	(-0.34)	(-1.90)	(-1.16)
$\hat{\sigma}$	0.1079	0.0764	0.103	0.1094	0.1
	(42.72)	(31.55)	(32.39)	(24.94)	(11.98)
Sample size	1076	1076	1076	1076	1076
Mean of Dep.	0.1094	0.03515	0.04898	0.02735	0.004747
Log L	649	342	192	-56	-113
Iteration	10	11	10	10	11

Table 4.78: Maximum likehood estimator for censored regression: L/X Model for Wholesale in 1993

Male

Age	20s	30s	40s	50s	60s
Const	2.448e+04	1.317e+04	834.2	-2.941	-4.211
	(0.56)	(0.80)	(0.27)	(-1.68)	(-5.69)
lnX	-1.931e+05	-7.695e+04	-1.385e+04	-0.3883	-0.7013
	(-22.11)	(-23.40)	(-22.88)	(-1.07)	(-5.38)
$(\ln X)^2$	3.759e+04	1.482e+04	2671	0.03765	-0.005455
	(25.44)	(26.51)	(25.99)	(0.62)	(-0.21)
OX/X	-6714	-5.674e+04	-6498	1.333	-3.0448
	(-0.02)	(-0.34)	(-0.21)	(0.08)	(-0.45)
$(OX/X)^2$	-1.124e+06	-3.451e+05	-7.381e+04	2.776	6.0209
	(-1.15)	(-0.93)	(-1.08)	(0.07)	(0.42)
YR	-1391	84.57	74.66	-0.01173	0.036
	(-0.37)	(0.06)	(0.29)	(-0.08)	(0.61)
YR^2	10.6	-7.983	-1.61	0.002572	0.000156
	(0.15)	(-0.31)	(-0.34)	(0.96)	(0.15)
$\hat{\sigma}$	4.119e+05	1.564e+05	2.87e+04	15.6	4.863
	(43.51)	(45.03)	(44.66)	(39.97)	(21.08)
Sample size	1076	1076	1076	1076	1076
Mean of Dep.	1.567e+04	6157	1122	2.00358	0.4378
Log L	-13804	-13649	-11822	-3581	-1098
Iteration	20	18	16	4	6

Female

Age	20s	30s	40s	50s	60s
Const	5958	-7057	-2.554	-5.586	-8.838
	(0.35)	(-3.30)	(-1.77)	(-5.41)	(-6.65)
lnX	-7.511e+04	-7557	-4.19	-1.179	-0.6452
	(-21.86)	(-19.01)	(-12.01)	(-6.46)	(-2.73)
$(\ln X)^2$	1.475e+04	1517	0.5798	0.08314	-0.08318
	(25.38)	(22.93)	(9.63)	(2.69)	(-1.24)
OX/X	-1639	-2.048e+04	-15.2	-17.14	-11.33
	(-0.01)	(-0.95)	(-0.95)	(-1.69)	(-1.07)
$(OX/X)^2$	-4.446e+05	-1.905e+04	-27.47	22.48	15.27
	(-1.15)	(-0.40)	(-0.71)	(1.01)	(0.66)
YR	-265.3	82.5	0.1446	0.2095	0.1819
	(-0.18)	(0.45)	(1.18)	(2.49)	(2.04)
YR^2	-0.3419	-2.0162	-0.001904	-0.002802	-0.002129
	(-0.01)	(-0.61)	(-0.87)	(-1.86)	(-1.38)
$\hat{\sigma}$	1.621e+05	1.792e+04	12.27	7.604	5.18
	(43.49)	(34.67)	(34.48)	(26.44)	(12.56)
Sample size	1076	1076	1076	1076	1076
Mean of Dep.	6159	560.7	2.0857	1.124	0.1971
Log L	-12927	-6986	-2709	-1713	-521
Iteration	18	15	5	5	8

Table 4.79: Maximum likehood estimator for censored regression: Lh/X Model for Wholesale in 1993

Male

Age	20s	30s	40s	50s	60s
Const	3.983e+06	2.022e+06	1.281e+05	-472.9	-723.2
	(0.56)	(0.80)	(0.27)	(-1.66)	(-5.80)
lnX	-3.141e+07	-1.182e+07	-2.144e+06	-83.77	-119.4
	(-22.11)	(-23.40)	(-22.82)	(-1.43)	(-5.45)
$(\ln X)^2$	6.115e+06	2.275e+06	4.137e+05	7.966	-0.6946
	(25.44)	(26.51)	(25.96)	(0.81)	(-0.16)
OX/X	-1.092e+06	-8.712e+06	-9.795e+05	390.7	-429.9
	(-0.02)	(-0.34)	(-0.21)	(0.14)	(-0.38)
$(OX/X)^2$	-1.829e+08	-5.298e+07	-1.147e+07	23	836.4
	(-1.15)	(-0.93)	(-1.09)	(0.00)	(0.35)
YR	-2.264e+05	1.298e+04	1.16e+04	1.773	7.447
	(-0.37)	(0.06)	(0.29)	(0.07)	(0.75)
YR^2	1725	-1226	-254.3	0.3546	0.002703
	(0.15)	(-0.31)	(-0.35)	(0.81)	(0.02)
$\hat{\sigma}$	6.701e+07	2.401e+07	4.453e+06	2546	818.3
	(43.51)	(45.03)	(44.63)	(39.92)	(21.06)
Sample size	1076	1076	1076	1076	1076
Mean of Dep.	2.549e+06	9.455e+05	1.741e+05	355.2	74.16
Log L	-18672	-18769	-16886	-7755	-2451
Iteration	27	26	23	12	9

Female

Age	20s	30s	40s	50s	60s
Const	8.974e+05	-1.116e+06	-503.6	-799.3	-1405
	(0.35)	(-3.32)	(-2.33)	(-5.24)	(-6.63)
lnX	-1.131e+07	-1.193e+06	-366.1	-176.9	-101.4
	(-21.86)	(-19.07)	(-8.92)	(-6.56)	(-2.65)
$(\ln X)^2$	2.22e+06	2.391e+05	38.7	11.92	-13.71
	(25.39)	(22.97)	(5.67)	(2.61)	(-1.25)
OX/X	-2.473e+05	-3.239e+06	-2146	-2466	-1814
	(-0.01)	(-0.95)	(-0.89)	(-1.64)	(-1.07)
$(OX/X)^2$	-6.694e+07	-2.93e+06	-2877	3030	2424
	(-1.15)	(-0.39)	(-0.49)	(0.91)	(0.65)
YR	-3.996e+04	1.309e+04	26.93	28.78	28.096
	(-0.18)	(0.46)	(1.48)	(2.31)	(1.97)
YR^2	-51.16	-328.4	-0.3475	-0.3634	-0.3195
	(-0.01)	(-0.63)	(-1.06)	(-1.64)	(-1.29)
$\hat{\sigma}$	2.44e+07	2.818e+06	1832	1124	826.07
	(43.49)	(34.57)	(34.34)	(26.35)	(12.61)
Sample size	1076	1076	1076	1076	1076
Mean of Dep.	9.272e+05	8.803e+04	314.9	173.4	30.82
Log L	-17726	-9961	-5828	-3714	-1053
Iteration	26	22	11	10	9

Table 4.80: Maximum likehood estimator for censored regression: L Model for Wholesale in 1994

Male

Age	20s	30s	40s	50s	60s
Const	13.99	14.33	14.88	-0.3467	-3.514
	(3.22)	(3.15)	(3.42)	(-0.10)	(-4.94)
X	0.04688	0.06142	0.05907	0.03364	-0.00241
	(10.52)	(13.08)	(13.16)	(10.20)	(-0.30)
X^2	-1e-06	-3e-06	-2e-06	-1e-06	-9e-06
	(-2.88)	(-7.22)	(-5.45)	(-4.64)	(-0.49)
OX	0.5641	-0.5457	0.4457	0.05341	0.06272
	(0.89)	(-0.82)	(0.70)	(0.11)	(0.46)
OX^2	-0.005122	-0.003378	-0.001423	-0.001737	-0.000605
	(-0.71)	(-0.44)	(-0.20)	(-0.33)	(-0.23)
YR	-0.6841	-0.5827	-0.8847	-0.401	0.001722
	(-1.90)	(-1.54)	(-2.45)	(-1.46)	(0.03)
YR^2	0.01308	0.01161	0.01969	0.01345	0.000438
	(2.08)	(1.76)	(3.12)	(2.82)	(0.46)
$\hat{\sigma}$	36.65	38.63	36.93	27.079	4.236
	(41.52)	(43.03)	(42.73)	(38.29)	(18.68)
Sample size	983	983	983	983	983
Mean of Dep.	15.77	15.58	17.12	9.712	0.5229
Log L	-4482	-4769	-4675	-3722	-963
Iteration	6	6	6	201	10

Female

Age	20s	30s	40s	50s	60s
Const	15.1	-3.0296	-4.899	-10.59	-9.282
	(2.95)	(-1.34)	(-2.18)	(-5.63)	(-5.89)
X	0.06523	0.02423	0.006034	0.008452	0.008048
	(12.38)	(11.30)	(2.83)	(5.09)	(0.36)
X^2	-2e-06	-1e-06	0	-1e-06	-6.2e-05
	(-3.88)	(-7.29)	(-0.82)	(-3.80)	(-0.72)
OX	0.3216	-0.8167	-0.2232	-0.1762	1.744
	(0.43)	(-2.63)	(-0.73)	(-0.48)	(1.13)
OX^2	0.001404	0.005721	0.002621	-0.003208	-0.313
	(0.16)	(1.62)	(0.75)	(-0.51)	(-1.03)
YR	-0.7372	-0.01287	0.03298	0.3317	0.032
	(-1.73)	(-0.07)	(0.18)	(2.24)	(0.30)
YR^2	0.01583	0.000832	0.001119	-0.004408	0.000459
	(2.13)	(0.26)	(0.35)	(-1.73)	(0.25)
$\hat{\sigma}$	43.33	17.5	17.1	12.52	5.992
	(41.38)	(32.67)	(31.90)	(26.06)	(11.78)
Sample size	983	983	983	983	983
Mean of Dep.	20.53	5.0221	4.0817	2.101	0.2186
Log L	-4607	-2731	-2629	-1842	-495
Iteration	6	4	5	6	14

Table 4.81: Maximum likehood estimator for censored regression: Lh Model for Wholesale in 1994

Male

Age	20s	30s	40s	50s	60s
Const	2272	2290	2327	-145.3	-647.6
	(3.17)	(2.95)	(3.16)	(-0.24)	(-5.04)
X	8.215	10.66	9.402	5.455	-0.08832
	(11.15)	(13.30)	(12.38)	(8.96)	(-0.06)
X^2	-0.000147	-0.000453	-0.000305	-0.000203	-0.001965
	(-2.53)	(-7.18)	(-5.10)	(-4.24)	(-0.61)
OX	114.6	-98.9	41.094	-0.4911	4.494
	(1.10)	(-0.87)	(0.38)	(-0.01)	(0.18)
OX^2	-1.149	-0.5948	0.01356	-0.2445	-0.04785
	(-0.96)	(-0.46)	(0.01)	(-0.25)	(-0.11)
YR	-100.4	-83.43	-132.9	-69.44	0.2593
	(-1.68)	(-1.29)	(-2.17)	(-1.37)	(0.03)
YR^2	1.99	1.755	3.0809	2.347	0.08495
	(1.91)	(1.56)	(2.89)	(2.67)	(0.49)
$\hat{\sigma}$	6060	6598	6247	4998	763.8
	(41.49)	(42.99)	(42.72)	(38.29)	(18.79)
Sample size	983	983	983	983	983
Mean of Dep.	2823	2748	2855	1639	90.53
Log L	-8958	-9551	-9396	-7651	-2172
Iteration	13	13	13	201	21

Female

Age	20s	30s	40s	50s	60s
Const	2359	-591.005	-703.9	-1539	-1589
	(2.79)	(-1.65)	(-2.22)	(-5.64)	(-5.92)
X	10.99	3.969	0.9967	1.388	1.264
	(12.66)	(11.70)	(3.31)	(5.77)	(0.33)
X^2	-0.00026	-0.000197	-1.8e-05	-8.2e-05	-0.01041
	(-3.80)	(-7.39)	(-0.76)	(-4.32)	(-0.71)
OX	30.27	-136.6	-39.71	-30.39	297.7
	(0.25)	(-2.78)	(-0.91)	(-0.56)	(1.13)
OX^2	0.4272	0.9497	0.4369	-0.5532	-53.32
	(0.30)	(1.70)	(0.89)	(-0.60)	(-1.03)
YR	-107.4	6.817	10.79	51.67	6.396
	(-1.53)	(0.23)	(0.42)	(2.40)	(0.35)
YR^2	2.381	-0.00178	0.0421	-0.7161	0.06428
	(1.94)	(0.00)	(0.09)	(-1.94)	(0.21)
$\hat{\sigma}$	7145	2768	2420	1819	1018
	(41.38)	(32.63)	(31.75)	(25.94)	(11.80)
Sample size	983	983	983	983	983
Mean of Dep.	3442	808.6	631.3	326.3	37.043
Log L	-9054	-5644	-5368	-3782	-987
Iteration	14	12	12	11	28

Table 4.82: Maximum likehood estimator for censored regression: L/TL Model for Wholesale in 1994

Male

Age	20s	30s	40s	50s	60s
Const	0.1815	0.1918	0.1693	0.05916	-0.0898
	(10.64)	(13.83)	(12.40)	(4.04)	(-3.84)
lnX	0.000542	0.006047	0.01664	0.01153	-0.01274
	(0.14)	(1.96)	(5.43)	(3.51)	(-2.56)
$(\ln X)^2$	0.000384	-0.000891	-0.001475	-0.00103	-0.002003
	(0.58)	(-1.65)	(-2.76)	(-1.82)	(-1.64)
OX/X	0.3038	0.07779	0.01091	0.4892	0.2848
	(1.85)	(0.58)	(0.08)	(3.30)	(1.23)
$(OX/X)^2$	-0.2456	0.01984	0.2036	-1.0674	-0.9602
	(-0.63)	(0.06)	(0.65)	(-2.88)	(-1.58)
lnYR	0.000615	7e-05	-0.000682	-0.000299	-0.000876
	(0.44)	(0.06)	(-0.61)	(-0.25)	(-0.48)
$(\ln YR)^2$	-3.6e-05	-1.6e-05	1.5e-05	2.6e-05	3.4e-05
	(-1.46)	(-0.81)	(0.74)	(1.22)	(1.07)
$\hat{\sigma}$	0.1424	0.1162	0.1142	0.1186	0.1401
	(40.72)	(42.56)	(42.17)	(36.86)	(18.43)
Sample size	983	983	983	983	983
Mean of Dep.	0.1788	0.1843	0.18	0.1041	0.02023
Log L	343	619	615	326	-173
Iteration	10	10	10	10	10

Female

Age	20s	30s	40s	50s	60s
Const	0.1659	0.01653	0.01232	-0.06493	-0.2039
	(9.62)	(1.22)	(0.75)	(-3.34)	(-5.48)
lnX	0.01981	-0.002677	-0.01855	-0.02025	-0.02875
	(5.07)	(-0.90)	(-5.21)	(-5.11)	(-4.76)
$(\ln X)^2$	-0.001363	0.000731	0.001808	0.001851	0.000826
	(-2.01)	(1.44)	(2.93)	(2.68)	(0.61)
OX/X	-0.2113	-0.09388	-0.3321	-0.4776	0.06302
	(-1.27)	(-0.70)	(-1.91)	(-2.40)	(0.20)
$(OX/X)^2$	0.4496	0.04904	0.1704	0.5854	-0.4656
	(1.14)	(0.15)	(0.39)	(1.26)	(-0.57)
lnYR	-0.001638	0.000725	0.001718	0.002925	0.000591
	(-1.15)	(0.66)	(1.29)	(1.91)	(0.24)
$(\ln YR)^2$	3.1e-05	-1.5e-05	-2.3e-05	-3.2e-05	2.3e-05
	(1.23)	(-0.77)	(-0.98)	(-1.22)	(0.54)
$\hat{\sigma}$	0.1438	0.1049	0.1257	0.1314	0.1408
	(40.62)	(31.04)	(30.33)	(24.60)	(11.37)
Sample size	983	983	983	983	983
Mean of Dep.	0.172	0.05286	0.06204	0.03853	0.007202
Log L	332	169	43	-104	-135
Iteration	10	10	10	10	10

Table 4.83: Maximum likehood estimator for censored regression: Lh/TLh Model for Wholesale in 1994

Male

Age	20s	30s	40s	50s	60s
Const	0.1843	0.1988	0.1717	0.06117	-0.08654
	(10.58)	(14.10)	(12.52)	(4.13)	(-3.75)
lnX	0.000469	0.005391	0.01591	0.01135	-0.0122
	(0.12)	(1.72)	(5.17)	(3.42)	(-2.48)
$(\ln X)^2$	0.000515	-0.000802	-0.00161	-0.001129	-0.002038
	(0.76)	(-1.46)	(-3.00)	(-1.97)	(-1.69)
OX/X	0.3239	0.07008	-0.01206	0.4545	0.2978
	(1.93)	(0.51)	(-0.09)	(3.04)	(1.29)
$(OX/X)^2$	-0.2729	0.06293	0.2357	-0.9921	-1.0104
	(-0.68)	(0.19)	(0.75)	(-2.67)	(-1.66)
lnYR	0.000704	-6.1e-05	-0.000671	-0.000433	-0.001052
	(0.49)	(-0.05)	(-0.60)	(-0.36)	(-0.59)
$(\ln YR)^2$	-3.7e-05	-1.4e-05	1.5e-05	2.8e-05	3.6e-05
	(-1.47)	(-0.70)	(0.76)	(1.33)	(1.16)
$\hat{\sigma}$	0.1454	0.1181	0.1147	0.1198	0.1384
	(40.71)	(42.52)	(42.16)	(36.83)	(18.45)
Sample size	983	983	983	983	983
Mean of Dep.	0.1839	0.1896	0.1812	0.1043	0.01985
Log L	325	602	610	316	-170
Iteration	10	10	10	10	10

Female

Age	20s	30s	40s	50s	60s
Const	0.164	0.01346	0.00723	-0.06075	-0.1933
	(9.44)	(1.05)	(0.48)	(-3.33)	(-5.48)
lnX	0.0201	-0.002054	-0.0179	-0.01953	-0.02763
	(5.10)	(-0.73)	(-5.47)	(-5.25)	(-4.83)
$(\ln X)^2$	-0.001411	0.000714	0.001842	0.001794	0.000862
	(-2.06)	(1.48)	(3.24)	(2.77)	(0.67)
OX/X	-0.2066	-0.1114	-0.2838	-0.4451	0.04971
	(-1.24)	(-0.88)	(-1.76)	(-2.38)	(0.17)
$(OX/X)^2$	0.4108	0.1089	0.07339	0.5261	-0.4305
	(1.04)	(0.35)	(0.18)	(1.20)	(-0.55)
lnYR	-0.001612	0.000825	0.001998	0.002733	0.000564
	(-1.13)	(0.79)	(1.63)	(1.91)	(0.24)
$(\ln YR)^2$	3.1e-05	-1.7e-05	-2.8e-05	-3e-05	2.2e-05
	(1.23)	(-0.91)	(-1.31)	(-1.20)	(0.54)
$\hat{\sigma}$	0.145	0.09938	0.1157	0.1233	0.1336
	(40.63)	(31.02)	(30.27)	(24.62)	(11.39)
Sample size	983	983	983	983	983
Mean of Dep.	0.171	0.04982	0.05757	0.03605	0.00681
Log L	325	199	88	-79	-130
Iteration	10	11	10	10	10

Table 4.84: Maximum likehood estimator for censored regression: whL/C Model for Wholesale in 1994

Male

Age	20s	30s	40s	50s	60s
Const	0.1456	0.2159	0.2415	0.08883	-0.09731
	(9.85)	(14.14)	(14.35)	(4.61)	(-3.96)
lnX	-0.005794	0.000962	0.02238	0.02005	-0.01336
	(-1.75)	(0.28)	(5.93)	(4.64)	(-2.55)
$(\ln X)^2$	0.000652	-0.00031	-0.001638	-0.001616	-0.002056
	(1.13)	(-0.52)	(-2.49)	(-2.17)	(-1.61)
OX/X	0.1442	0.01228	-0.1504	0.6934	0.3299
	(1.01)	(0.08)	(-0.93)	(3.55)	(1.35)
$(OX/X)^2$	-0.07985	0.1491	0.6359	-1.496	-1.0907
	(-0.24)	(0.43)	(1.65)	(-3.06)	(-1.69)
lnYR	0.000969	0.000721	-0.001205	-0.000824	-0.000812
	(0.80)	(0.57)	(-0.87)	(-0.52)	(-0.42)
$(\ln YR)^2$	-3.7e-05	-3.1e-05	2.1e-05	4.4e-05	3.4e-05
	(-1.71)	(-1.40)	(0.87)	(1.59)	(1.01)
$\hat{\sigma}$	0.1233	0.1279	0.1408	0.156	0.1472
	(40.76)	(42.54)	(42.11)	(36.75)	(18.57)
Sample size	983	983	983	983	983
Mean of Dep.	0.1431	0.209	0.2494	0.1499	0.02039
Log L	472	529	418	114	-182
Iteration	10	10	10	10	10

Female

Age	20s	30s	40s	50s	60s
Const	0.1105	0.009069	0.005346	-0.04957	-0.1455
	(8.25)	(0.83)	(0.42)	(-3.38)	(-5.46)
lnX	0.01075	-0.001611	-0.0143	-0.0155	-0.0219
	(3.54)	(-0.68)	(-5.22)	(-5.17)	(-5.04)
$(\ln X)^2$	-0.001103	0.000554	0.0015	0.001423	0.000775
	(-2.09)	(1.36)	(3.16)	(2.73)	(0.79)
OX/X	-0.1681	-0.08051	-0.1917	-0.3445	0.0266
	(-1.30)	(-0.74)	(-1.40)	(-2.29)	(0.12)
$(OX/X)^2$	0.2923	0.05827	-0.03535	0.4036	-0.3112
	(0.96)	(0.22)	(-0.10)	(1.15)	(-0.52)
lnYR	-0.001058	0.000616	0.001475	0.002131	0.000335
	(-0.96)	(0.69)	(1.44)	(1.84)	(0.19)
$(\ln YR)^2$	1.8e-05	-1.3e-05	-2.1e-05	-2.2e-05	1.7e-05
	(0.93)	(-0.86)	(-1.15)	(-1.12)	(0.57)
$\hat{\sigma}$	0.1117	0.08413	0.09666	0.09929	0.1014
	(40.75)	(31.29)	(30.43)	(24.67)	(11.52)
Sample size	983	983	983	983	983
Mean of Dep.	0.1101	0.03866	0.046	0.02853	0.004977
Log L	559	305	192	7	-101
Iteration	10	11	11	11	11

Table 4.85: Maximum likehood estimator for censored regression: L/X Model for Wholesale in 1994

Male

Age	20s	30s	40s	50s	60s
Const	11.56	-4.453	-0.6123	-29.5	-31.93
	(3.23)	(-0.33)	(-0.08)	(-2.58)	(-5.30)
lnX	-9.61	-25.48	-16.22	-14.45	-8.622
	(-12.07)	(-8.51)	(-8.97)	(-5.71)	(-7.14)
$(\ln X)^2$	1.468	4.23	2.591	2.723	0.8351
	(10.59)	(8.09)	(8.23)	(6.26)	(3.63)
OX/X	-1.141	-86.016	-49.61	72.89	15.95
	(-0.03)	(-0.66)	(-0.64)	(0.63)	(0.26)
$(OX/X)^2$	-11.048	71.49	37.36	-287.5	-133.6
	(-0.14)	(0.23)	(0.20)	(-0.99)	(-0.86)
YR	-0.4185	1.56	0.5564	1.157	0.06533
	(-1.42)	(1.41)	(0.84)	(1.24)	(0.14)
YR^2	0.005609	-0.02878	-0.007051	-0.01387	0.002471
	(1.09)	(-1.48)	(-0.61)	(-0.85)	(0.30)
$\hat{\sigma}$	29.63	112.2	67.34	91.0032	35.16
	(41.54)	(43.09)	(42.71)	(38.47)	(20.98)
Sample size	983	983	983	983	983
Mean of Dep.	5.124	7.967	6.135	5.0929	1.153
Log L	-4295	-5760	-5228	-4625	-1411
Iteration	5	7	6	7	7

Female

Age	20s	30s	40s	50s	60s
Const	-9.732	-10.51	-9.923	-26.14	-35.0017
	(-0.48)	(-3.04)	(-2.90)	(-5.46)	(-6.16)
lnX	-27.21	-6.842	-8.51	-11.48	-7.814
	(-6.00)	(-9.28)	(-11.72)	(-12.04)	(-8.63)
$(\ln X)^2$	4.877	1.194	1.258	1.665	0.8462
	(6.21)	(9.45)	(10.12)	(10.33)	(5.40)
OX/X	-29.16	-8.552	-36.47	-124.8	-9.271
	(-0.15)	(-0.24)	(-0.97)	(-2.46)	(-0.19)
$(OX/X)^2$	-4.377	-32.69	-18.63	146.8	-36.48
	(-0.01)	(-0.37)	(-0.19)	(1.25)	(-0.29)
YR	1.0856	0.3731	0.2291	0.8352	0.1715
	(0.65)	(1.32)	(0.83)	(2.21)	(0.43)
YR^2	-0.02157	-0.005919	-0.001121	-0.01042	0.002725
	(-0.74)	(-1.20)	(-0.23)	(-1.59)	(0.40)
$\hat{\sigma}$	167.1	26.004	25.28	31.032	21.34
	(41.53)	(33.42)	(32.97)	(27.57)	(13.34)
Sample size	983	983	983	983	983
Mean of Dep.	9.488	2.383	2.499	2.0966	0.541
Log L	-5774	-2933	-2809	-2152	-593
Iteration	8	5	5	5	6

Table 4.86: Maximum likehood estimator for censored regression: Lh/X Model for Wholesale in 1994

Male

Age	20s	30s	40s	50s	60s
Const	2023	-1158	-71.56	-5342	-5628
	(3.16)	(-0.43)	(-0.05)	(-2.61)	(-5.31)
lnX	-1779	-4870	-2818	-2596	-1513
	(-12.47)	(-8.23)	(-9.37)	(-5.73)	(-7.12)
$(\ln X)^2$	271.5	813.3	449.3	489.7	146.4
	(10.94)	(7.87)	(8.57)	(6.29)	(3.61)
OX/X	24.14	-1.648e+04	-8378	1.319e+04	2996
	(0.00)	(-0.64)	(-0.65)	(0.64)	(0.28)
$(OX/X)^2$	-2773	1.374e+04	5888	-5.188e+04	-2.41e+04
	(-0.19)	(0.23)	(0.19)	(-1.00)	(-0.88)
YR	-67.42	322.4	97.93	210.2	11.96
	(-1.28)	(1.47)	(0.88)	(1.26)	(0.14)
YR^2	0.8837	-5.971	-1.261	-2.526	0.4258
	(0.96)	(-1.55)	(-0.65)	(-0.87)	(0.29)
$\hat{\sigma}$	5308	2.219e+04	1.121e+04	1.629e+04	6187
	(41.53)	(43.07)	(42.70)	(38.44)	(20.98)
Sample size	983	983	983	983	983
Mean of Dep.	941.4	1500	1072	913.2	200.9
Log L	-8840	-10676	-9934	-8531	-2616
Iteration	13	15	14	15	12

Female

Age	20s	30s	40s	50s	60s
Const	-2101	-2390	-1800	-5210	-7057
	(-0.55)	(-3.29)	(-3.05)	(-5.55)	(-6.17)
lnX	-5073	-1356	-1486	-2141	-1569
	(-5.90)	(-8.75)	(-11.87)	(-11.46)	(-8.60)
$(\ln X)^2$	914.03	241.6	219.9	311.8	170.5
	(6.14)	(9.11)	(10.26)	(9.86)	(5.41)
OX/X	-5181	-2498	-5824	-2.356e+04	-1772
	(-0.14)	(-0.34)	(-0.90)	(-2.37)	(-0.18)
$(OX/X)^2$	-1248	-4718	-4395	2.729e+04	-7518
	(-0.01)	(-0.26)	(-0.27)	(1.18)	(-0.30)
YR	217.9	85.27	44.94	169	32.74
	(0.69)	(1.44)	(0.94)	(2.28)	(0.41)
YR^2	-4.297	-1.385	-0.2775	-2.192	0.5853
	(-0.78)	(-1.34)	(-0.33)	(-1.71)	(0.43)
$\hat{\sigma}$	3.168e+04	5457	4356	6081	4296
	(41.53)	(33.46)	(32.97)	(27.61)	(13.41)
Sample size	983	983	983	983	983
Mean of Dep.	1718	426.8	417.7	373.3	102.6
Log L	-10342	-6006	-5651	-4204	-1101
Iteration	16	13	13	13	11

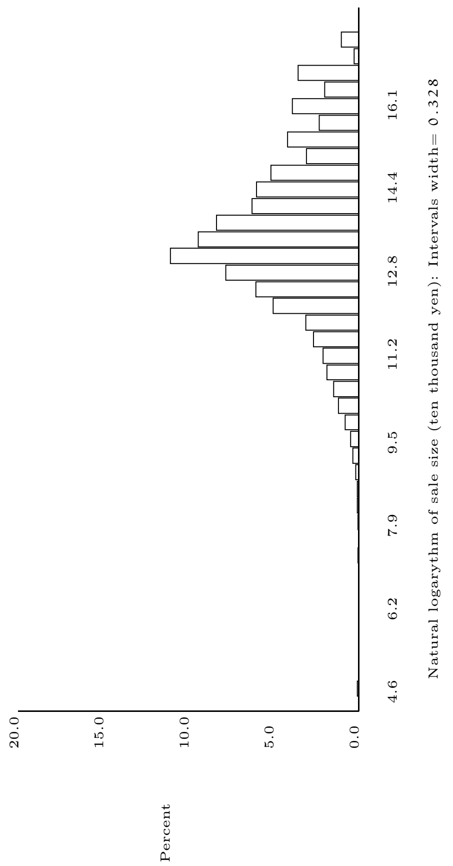


Figure 4.33: Sale size distribution of employees: Retail 1993

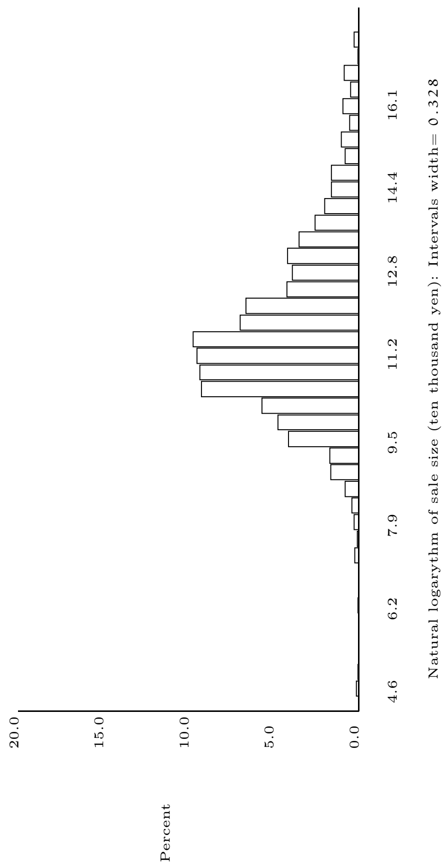


Figure 4.34: Sale size distribution of the weighted number of employees: Retail 1993

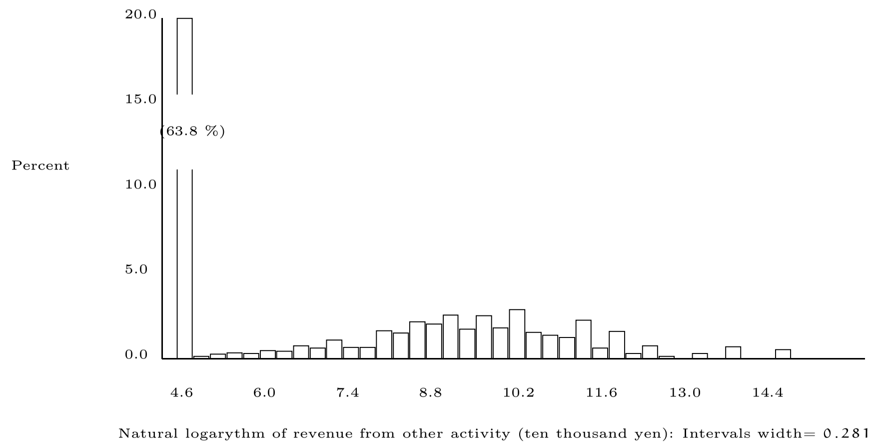


Figure 4.35: Distribution of employees by size of other activity: Retail 1993

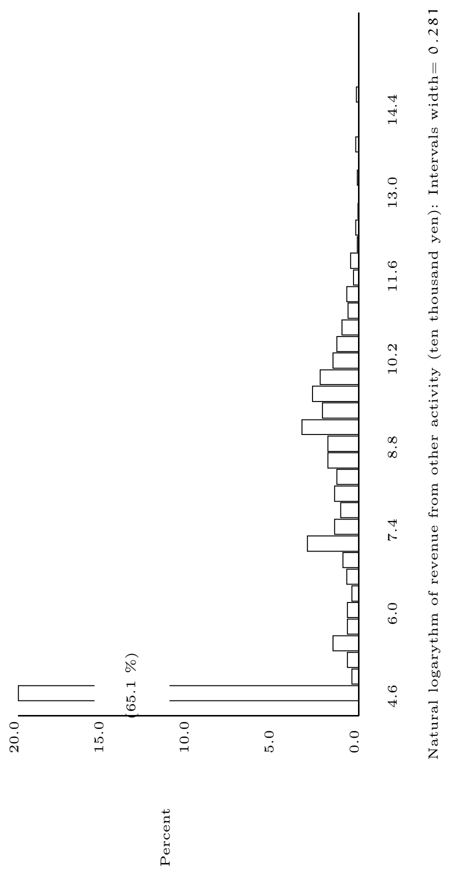


Figure 4.36: Distribution of the weighted number of employees by size of other activity: Retail 1993

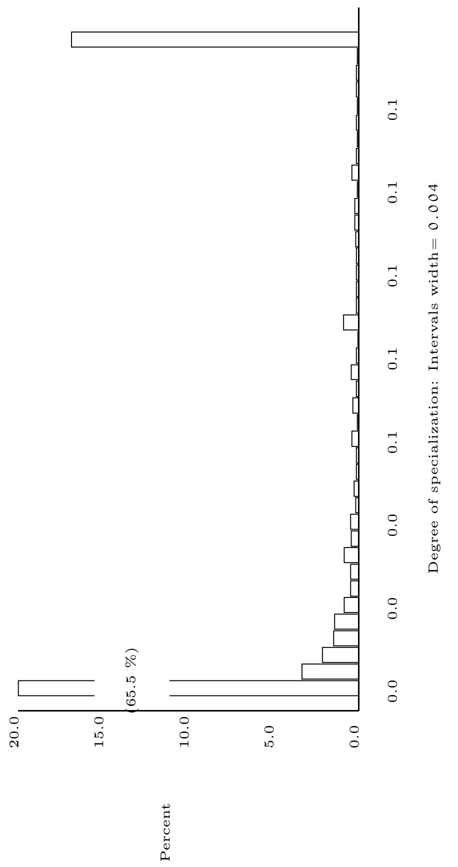


Figure 4.37: Distribution of employees by degree of specialization: Retail 1993

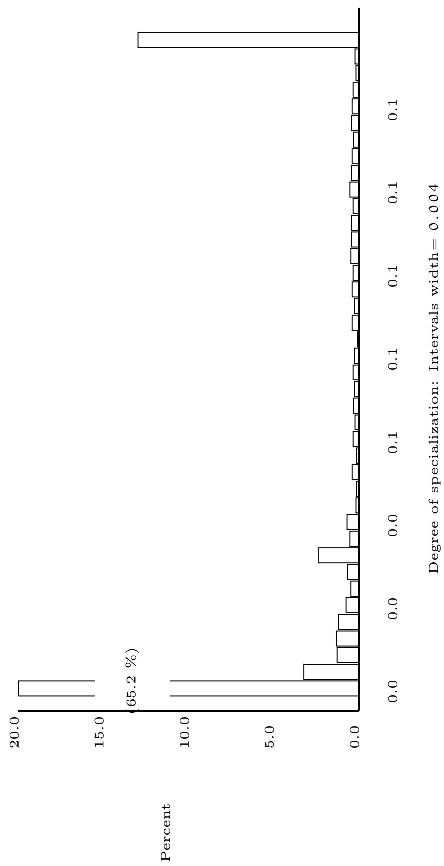


Figure 4.38: Distribution of the weighted number of employees by degree of specialization: Retail 1993

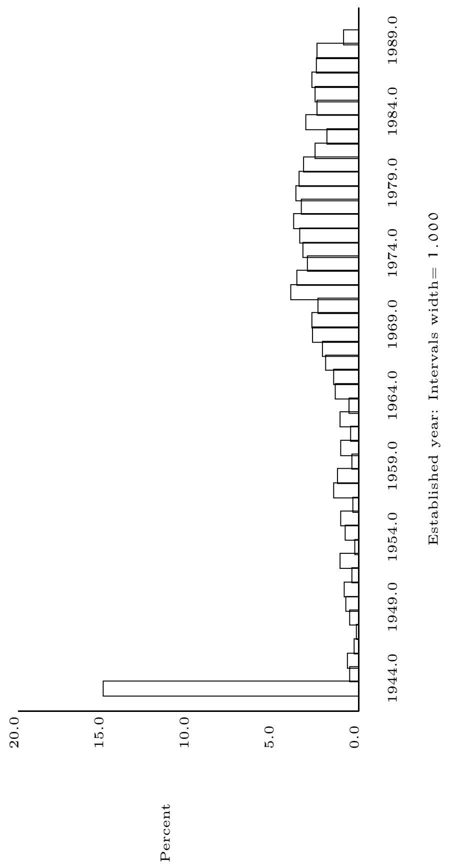


Figure 4.39: Distribution of employees by age of establishment: Retail 1993

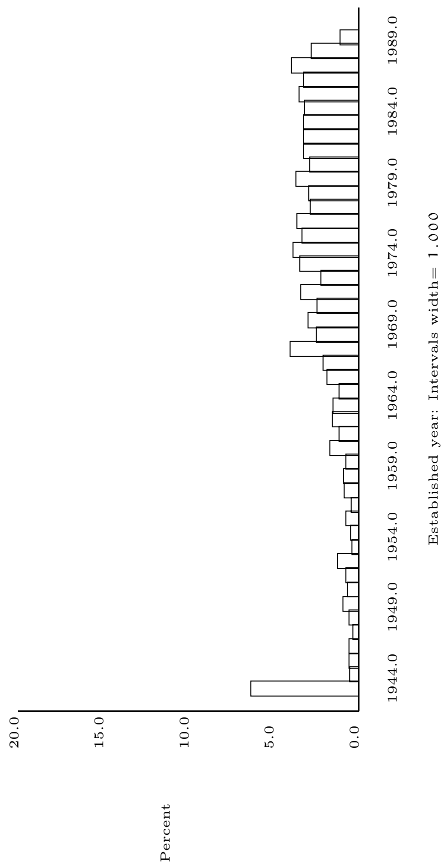


Figure 4.40: Distribution of the weighted number of employees by age of establishment: Retail 1993

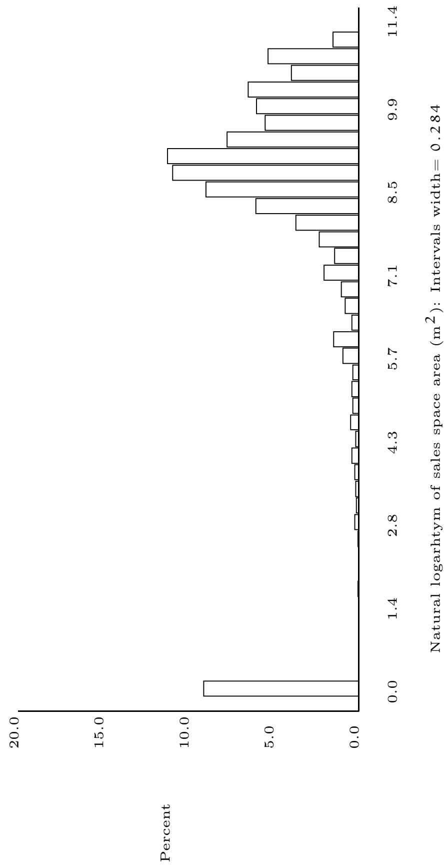


Figure 4.41: Sales space area distribution of employees: Retail 1993

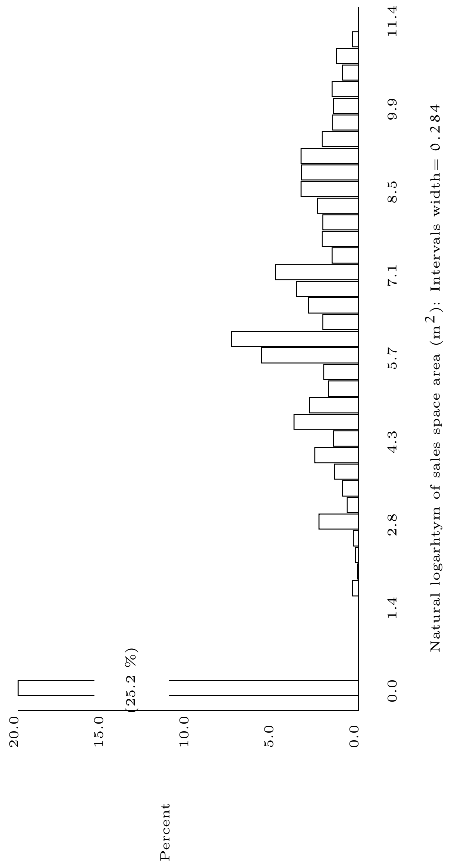


Figure 4.42: Sales space area distribution of the weighted number of employees: Retail 1993

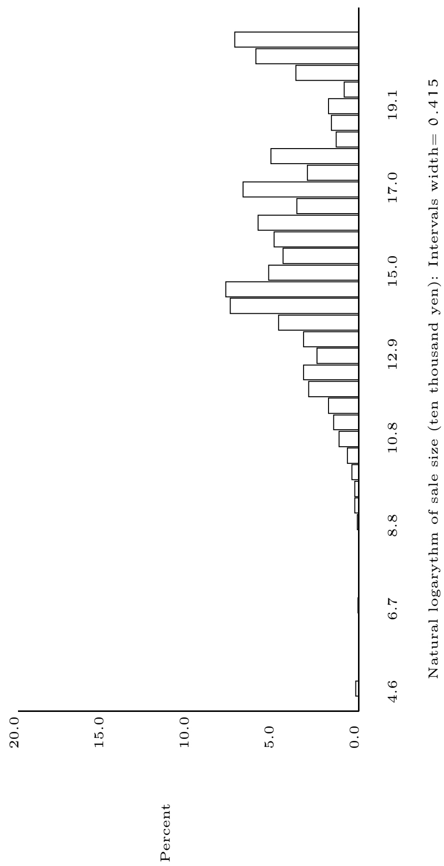


Figure 4.43: Sale size distribution of employees: Wholesale 1993

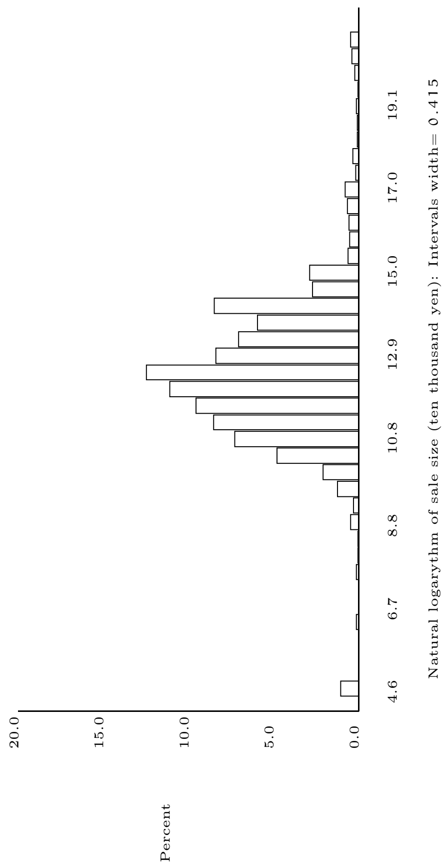


Figure 4.44: Sale size distribution of the weighted number of employees: Wholesale 1993

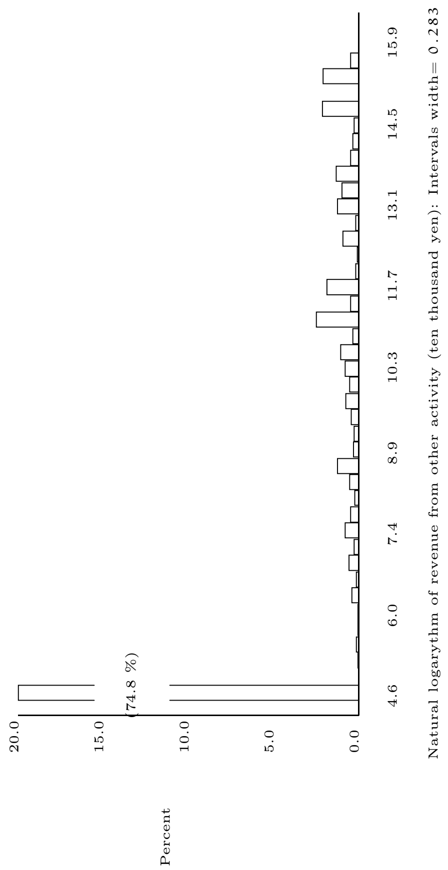


Figure 4.45: Distribution of employees by size of other activity: Wholesale 1993

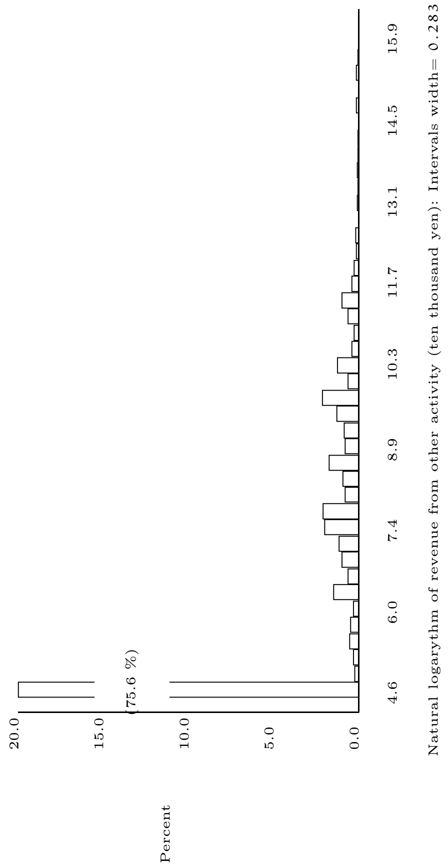


Figure 4.46: Distribution of the weighted number of employees by size of other activity: Wholesale 1993

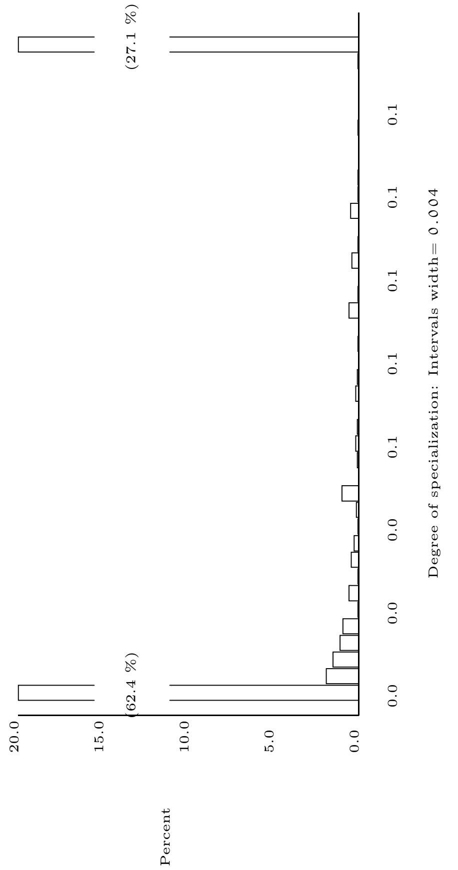


Figure 4.47: Distribution of employees by degree of specialization: Wholesale 1993

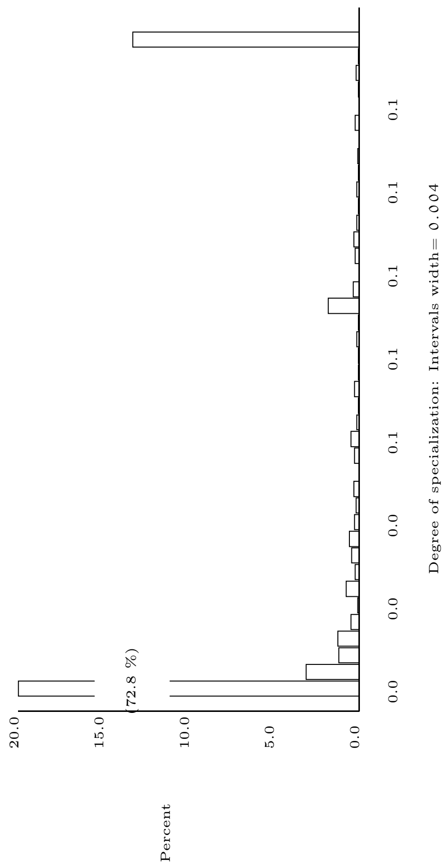


Figure 4.48: Distribution of the weighted number of employees by degree of specialization: Wholesale 1993

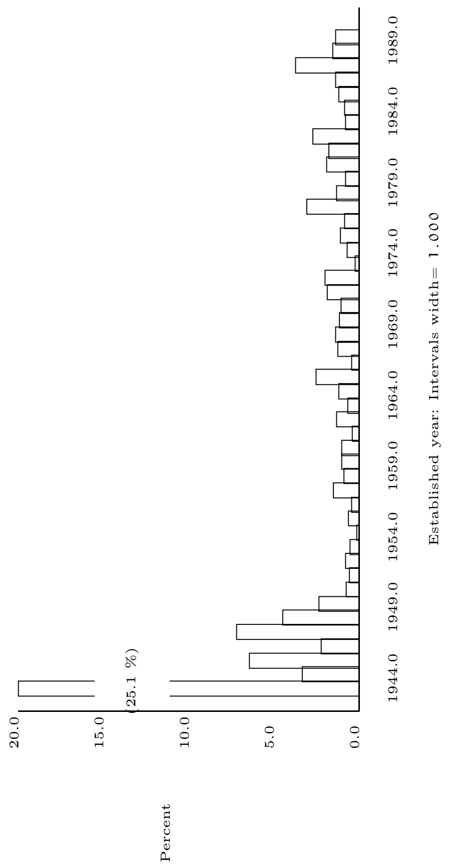


Figure 4.49: Distribution of employees by age of establishment: Wholesale 1993

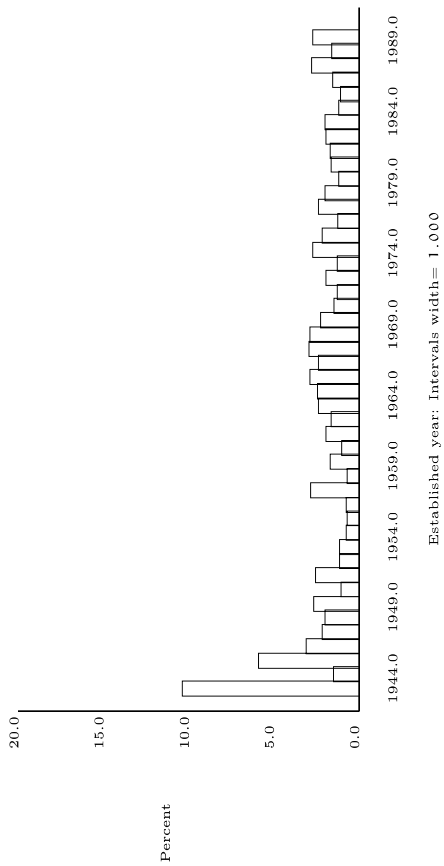


Figure 4.50: Distribution of the weighted number of employees by age of establishment: Wholesale 1993

References

[1] Bertin, Amy L., Timothy F. Bresnahan, and Daniel M. G. Raff. Localized competition and the aggregation of plant-level increasing returns: Blast furnaces, 1929–1935. Journal of Political Economy, 104:241–266, 1996.

[2] Chenery, Holis B. Engineering production functions. Quarterly Journal of Economics, 58:507–531, 1949.

[3] Chenery, Holis B. Process and production functions from engineering data. In W. Leointief et al., editor, Studies in the Structure of the American Economy, pages 297–325. Oxford University Press, New York, 1953.

[4] Davis, Steven J., and John C. Haltiwanger. Gross job creation, gross job destruction, and employment reallocation. Quarterly Journal of Economics, 107:819–63, 1992.

[5] Davis, Steven J., John C. Haltiwanger, and Scott Schuh. Job Creation and Destruction. MIT Press, Cambridge, MA, 1996.

[6] Gilks, Walter R., Sylvia Richardson, and David J. Spiegelhalter, editor. Markov Chain Monte Carlo in Practice. Chapman & Hall, London, 1996.

[7] Hajivassiliou, Vassilis A., and Paul A. Ruud. Classical estimation methods for ldv models using simulation. In R. F. Engle, and D. L. MacFadden, editor, Handbook of Econometrics, Volume IV, pages 2383–2441. Elsevier, 1994.

[8] Hamermesh, Daniel S. Labor Demand. Princeton University Press, New Jersey, 1993.

[9] Hayami, Hitoshi, and Masahiro Abe. Labor demand by age and gender in japan: Evidences from linked microdata. Technical report, paper presented at the International Symposium on Employer-Employees Linked Data, Bureau of the Census et al., May 1998.

[10] Hayami, Hitoshi, and Masato Nakajima. Labor demand by age and gender in commercial industries: Evidences from using microdata of labor and production in japan. Discussion Paper 77, 1997.

[11] Hayami, Hitoshi, and Masato Nakajima. Labor demand by age and gender in manufacturing industries: Evidences from microdata of labor and production in japan. Discussion Paper 79, Economic Research Institute, Economic Planning Agency, 1997.

[12] Higuchi, Yoshio, and Kazushige Shimpo. Recent trends of unemployment rate and the gross job creation and destruction. Mita Shogaku Kenkyu, 40, 1997.

[13] Komiya, Ryutaro. Technological progress and the production function in the united states steam power industry. Review of Economics and Statistics, 44:156–66, 1962.

[14] Lau, Laurence, and Shuji Tamura. Economies of scale, technological progress and the nonhomothetic leontief production function. Journal of Political Economy, 80:1167–1187, 1972.

[15] Leontief, Wasily. Structure of American Economy, 1919-29. Oxford University Press, New York, 2 edition, 1951.

[16] Shinichiro Nakamura. A nonhomothetic generalized leontief cost function based on pooled data. Review of Economics and Statistics, 72:649–56, 1990.

[17] Obi, Keiichiro. Rodo Shijo no Model: Chingin Kakusa no Hassei to Hendo-kikou no Riron (the model of labor market: A theory of generation and fluctuation mechanism of wage differentials). Mita Gakkai Zasshi, 71(4):1–31, 1978.

[18] Obi, Keiichiro. An equilibrium model of continually heterogeneous labor market. Keio Economic Observatory Review, 8:1–28, 1996.

[19] Obi, Keiichiro, Tamaki Miyauchi. Rodo Shijo no Juni Kinko. Toyokeizai-shinpou-sha, Tokyo, 1998.

[20] Ozaki, Iwao. Kibo no keizaisei to leontief tonyu-keisu no henka (economies of scale and changes in the leontief input-coefficients). Mita Gakkai Zasshi, 59:42–83, 1966.

[21] Ozaki, Iwao. Economies of scale and input-output coefficients. In Carter, P. A., and A. Brody, editor, Application of Input-Output Analysis, Vol. 2, pages 280–302. North-Holland, Amsterdam, 1970.