



Statistical methods for investigating the determinants of growth, exports and employment in China

Donghong Piao

► To cite this version:

Donghong Piao. Statistical methods for investigating the determinants of growth, exports and employment in China. Methodology [stat.ME]. 2010. dumas-00516270

HAL Id: dumas-00516270

<https://dumas.ccsd.cnrs.fr/dumas-00516270>

Submitted on 9 Sep 2010

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Statistical methods for investigating the determinants of growth, exports and employment in China

UFR de Mathématique et d'Informatique

Master 1 Statistique 2009-2010

PIAO Donghong

Supervisor: Professor Bertrand KOEBEL

Abstract

This paper examines the effects of employment and exports on China's economic growth. Based on export-augmented Cobb-Douglas production function, a set of panel data is used to estimate the contribution of economic growth from exports and employment. We find that both the impacts of exports and employment are positive in the China's economic growth. Besides, we also analyse these effects in different regions in China. The result reveals that the relationship between exports and GDP in the east coastal region is stronger than that in the other regions; the similar situation happens to employment.

Key words: Economic growth, export, employment, panel data.

Acknowledgement

This paper could not be finished without the help and support of many people who are gratefully acknowledged here.

First of all, I would like to show my deepest gratitude to my supervisor, Professor Bertrand KOEBEL, who has led me to doing a research and offered me valuable ideas, suggestions and criticisms with his profound knowledge and rich research experience.

What's more, I wish to extend my thanks to *UFR de Mathématique et d'Informatique*. I owe special thanks to my professor, Armelle Guillou, for her help in the last year.

Thanks are also due to my friends, who never failed to give me great encouragement and suggestions. Special thanks should go to Miss. Li Yuanyuan for her brainstorming with me when I failed coming up with ideas.

At last but not least, I would like to thank my family for their support all the way, I am thankful to all my family members for their thoughtfulness and encouragement.

Table of contents

Abstract.....	i
Acknowledgement.....	ii
1. Introduction.....	1
2. Empirical method.....	4
2.1 Introduction of panel data models.....	4
2.2 Static panel data models.....	4
2.3 Dynamic panel data models.....	5
3. Empirical model & Data selection.....	10
3.1 Empirical model.....	10
3.2 Data selection.....	11
4. Results.....	13
4.1 Static panel data models in the whole country.....	13
4.2 Dynamic panel data models in the whole country.....	15
4.3 Analysis of the static models in three geographical regions.....	17
4.4 Analysis of the dynamic models in three geographical regions.....	23
5. Conclusion.....	27
References.....	29
Appendix A. Program SAS.....	31
Appendix B. Data.....	36
1. GDP (100 million yuan).....	36
2. Employment (10 000 persons).....	39
3. Capital Stock (100 million yuan).....	42
4. Export (100 million yuan).....	45

1. Introduction

In the ranking of the largest economies of the world measured by the gross domestic products (GDP), China stood at the 15th position in 1978, but in 2008 the ranking placed it at the 3th position and this year it will be at the 2nd position instead of Japan. In the recent 30 years, exports and GDP have increased rapidly (Figure 1) in China. Exports have grown from 164 19 million yuan to 9 936 306 million yuan, while GDP has risen from 364 500 million yuan to 30 285 300 million yuan with an average growth rate over 9%¹. China has also experienced a process of rapid expansion in employment (Figure 2) during this period - 402 million persons were employed in 1978, compared to 775 million persons in 2008, which has played a very important role in China's economic development.

The relationship between foreign trades and economic growth has been investigated in China. Although most of the empirical work supports that the exports led economic growth in China, there is no overall consensus on this issue. Yongjun Li and Justin Yifu Lin (2003) think, according their estimation, a 10% increase in exports will lead to a 1% increase of GDP on average. Shen Lisheng and Wu Zhenyu (2003) gave a method for measuring the contribution to GDP from exports through the I/O table analysis. They found that the rate of contribution from per unit export decreased from 1997 to 2001.

Additional, researches based on provincial data have also been carried on these years. Christer Ljungwall (2006) analyzed the relationship between GDP and export at the provincial level, and he found that the export-led growth (ELG) hypothesis is validated in 13 of the 27 provinces in the sample. He Dong and Zhang Wenlang (2010) using input-output analysis showed that the relationship between GDP and exports is stronger in the more developed coastal areas than in the less developed inland areas.

¹ All data, unless otherwise noted, do not include Hong Kong, Macao and Taiwan.

Figure 1. GDP and Export 1978-2008(Unit: 100 million yuan)

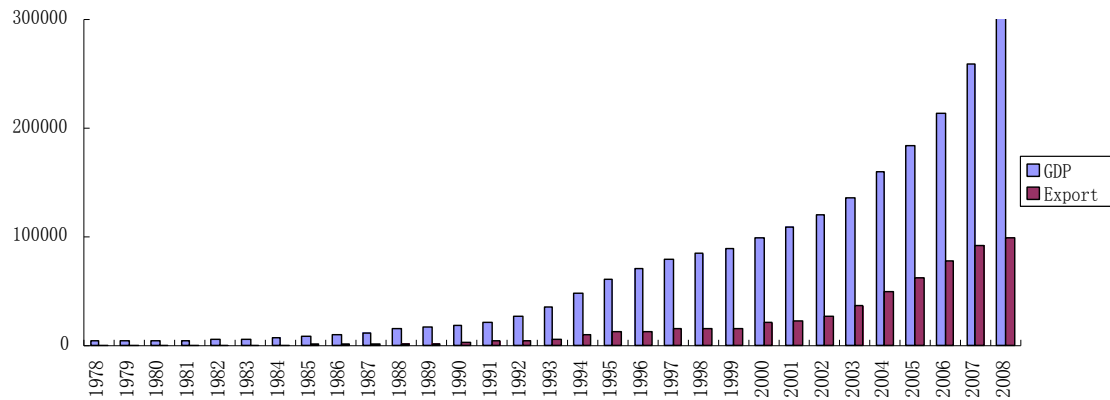
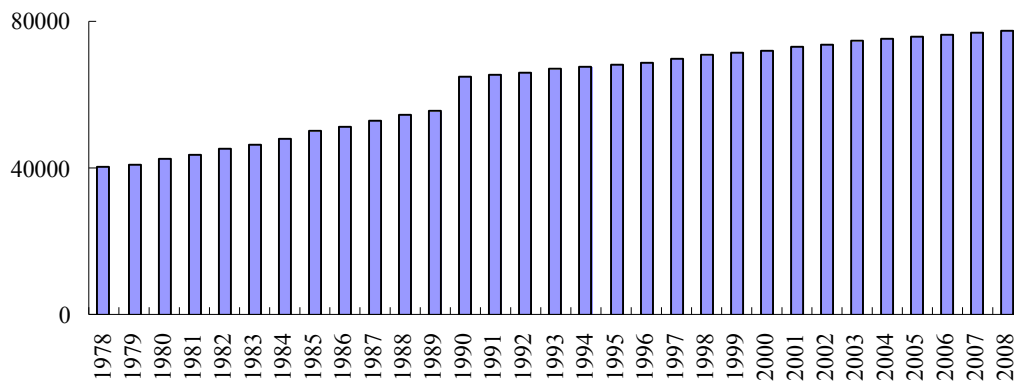


Figure 2. Employment 1978-2008 (Unit: 10 000 persons)



Source: *Comprehensive Statistical Data and Materials on 60 Years of New China*

This paper uses a panel data set of 30 provinces, municipalities and autonomous regions in China from 1978 to 2008 to analyse the determinants of China's economic growth and tries to find the contribution of China's economic growth from employment and exports. Besides using static panel data models, dynamic panel data model is also introduced to

analyse the effects of exports and employment to economic growth. Furthermore, we examine these effects in different regions.

This paper is divided into 5 parts. Part 1 is the introduction. The next part presents the empirical method, in which we will mainly introduce panel data models and the correspondent estimations. The third part introduces our empirical model and the data we choose. The fourth part is the key part, where we will report and analyse the results of the estimation. And finally summaries and conclusions are provided.

2. Empirical method

2.1 Introduction of panel data models

In recent years, panel data estimation approaches have become widely used. Panel (or longitudinal) data are both cross-sectional and time-series. There are multiple entities, each of which has repeated measurements at different time periods. Therefore, the variables in panel data models have double subscripts with i denoting individuals and t denoting time. As for our study, a panel data set is used for GDP, capital stock, employment and exports in each province of China from 1978 to 2008.

2.2 Static panel data models

Static panel data models is that independent variables do not include lagged dependent variables. Generally, the panel model is given by:

$$Y_{it} = \alpha_{it} + X_{it}' \beta_{it} + \mu_i + \varepsilon_{it} \quad i = 1, \dots, N; t = 1, \dots, T \quad (2-1)$$

where Y_{it} (1×1) is the dependent variable, $X_{it} = (X_{it1}, \dots, X_{itk})'$ ($1 \times k$) are dependent variables, α_{it} (1×1) and $(\beta_{it1}, \dots, \beta_{itk})'$ ($1 \times k$) are the parameters to estimate and μ_i and ε_{it} are the unobserved effects. This model is under a set of assumptions:

$$H_1: \mu_i \sim IDD(0, \sigma_\mu)$$

$$H_2: \varepsilon_{it} \sim IDD(0, \sigma_\varepsilon)$$

$$H_3: \mu_i \text{ is independent of } \varepsilon_{it}.$$

There are three situations of panel data models:

- 1) $\alpha_i = \alpha_j, \beta_i = \beta_j$: Using ordinary least squares (OLS) method will provide unbiased, efficient, and consistent estimations.
- 2) $\alpha_i \neq \alpha_j, \beta_i = \beta_j$: Including fixed effects and the random effects, estimation using separately the least squares dummy variable model (LSDV), the generalized least squares (GLS) and the feasible generalized least squares (FGLS).
- 3) $\alpha_i \neq \alpha_j, \beta_i \neq \beta_j$: This model is more complex.

There are two important regressions: the fixed effects regression and the random effects regression. Fixed effects regression is the model to use when we want to control for omitted variables that differ between cases but are constant over time. It lets us use the changes in the variables over time to estimate the effects of the independent variables on our dependent variable, and is the main technique used for analysis of panel data. Statistically, fixed effects are always a reasonable thing to do with panel data (they always give consistent results) but they may not be the most efficient model to run. Random effects will give you better P-values as they are a more efficient estimator. We can utilize the Hausman test to determine which model to be used.

2.3 Dynamic panel data models

In many economic issues, the future is often correlated with the past. This is to say that y_{it} is related to its past realizations y_{it-1} . The dynamic nature of the model reflects the real relationship between the independent and dependent variables more accurately. Thus, the dynamic panel data model is specified as below.

$$y_{it} = \alpha_{it} + \gamma y_{it-1} + x_{it}' \beta_{it} + \mu_i + \varepsilon_{it} \quad i = 1, \dots, N; t = 1, \dots, T \quad (2-2)$$

Under a set of assumptions:

$$H_1: \mu_i \sim IDD(0, \sigma_\mu),$$

$$H_2: \varepsilon_{it} \sim IDD(0, \sigma_\varepsilon).$$

$$H_3: \mu_i \text{ is independent of } \varepsilon_{it}.$$

However, the introduction of the lagged dependent variable can pose a variety of problems. For example, the dependent variables Y_{it} and Y_{it-1} are functions of μ_i , and estimation using OLS will result in biased, inefficient, and inconsistent estimates. Arellano and Bond(1991) used Generalized method of moments (GMM) to estimate dynamic panel data models.

Taking the first difference of the model and we can get:

$$y_{it} - y_{it-1} = \gamma(y_{it-1} - y_{it-2}) + (x'_{it} - x'_{it-1})\beta + \varepsilon_{it} - \varepsilon_{it-1} \quad (2-3)$$

Then we have:

$$\Delta Y_t = (\Delta Y_{t-1} \quad \Delta X_t) \begin{pmatrix} \gamma \\ \beta \end{pmatrix} + \Delta \varepsilon_t \quad (2-4)$$

where $\Delta Y_i = (y_{i1}, \dots, y_{iT})'$, $\Delta X_i = (x_{i1}, \dots, x_{iT})'$, and $\Delta \varepsilon_i = (\varepsilon_{i1}, \dots, \varepsilon_{iT})'$.

We can find y_{i0} is highly correlated with $y_{i1} - y_{i0}$ and is uncorrelated to $\varepsilon_{i2} - \varepsilon_{i1}$.

Assuming that the explanatory variables are strictly exogenous, we can use all of them as additional instruments for estimating the parameters. That is, the instrumental variables matrix Z_i is given by

$$Z_i = \begin{pmatrix} (y_{i0}, x'_{i0}, \dots, x'_{iT}) & 0 & \dots & 0 \\ 0 & (y_{i0}, y_{i1}, x'_{i0}, \dots, x'_{iT}) & \dots & 0 \\ \vdots & 0 & \ddots & 0 \\ 0 & 0 & \dots & (y_{i0}, y_{i1}, \dots, y_{iT-2}, x'_{i0}, \dots, x'_{iT}) \end{pmatrix} \quad (2-5)$$

It is orthogonal if

$$E(Z_i' \Delta \varepsilon_i) = 0 \quad (2-6)$$

And the sample moment conditions are given by:

$$\frac{1}{n} \sum_{i=1}^N Z_i' \Delta \varepsilon_i = 0 \quad (2-7)$$

We can get the criterion function as below:

$$q = \left(\frac{1}{n} \sum_{i=1}^N \Delta \varepsilon_i' Z_i \right) \hat{\Phi}^{-1} \left(\frac{1}{n} \sum_{i=1}^N Z_i' \Delta \varepsilon_i \right) \quad (2-8)$$

Where,

$$\begin{aligned} \Phi &= \text{var} \left(\frac{1}{\sqrt{N}} \sum_{i=1}^N Z_i' \Delta \varepsilon_i \right) \\ &= \frac{1}{N} E \left(\sum_{i=1}^N Z_i' \Delta \varepsilon_i \Delta \varepsilon_i' Z_i \right) \\ &= \frac{1}{N} \sum_{i=1}^N Z_i' E(\Delta \varepsilon_i \Delta \varepsilon_i') Z_i \end{aligned} \quad (2-9)$$

In fact,

$$E(\Delta \varepsilon_i \Delta \varepsilon_i') = \sigma_\varepsilon^2 (I_N \otimes G) \quad (2-10)$$

Where,

$$G = \begin{pmatrix} 2 & -1 & 0 & \cdots & 0 & 0 & 0 \\ -1 & 2 & -1 & \cdots & 0 & 0 & 0 \\ \vdots & \vdots & 0 & \ddots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & \cdots & -1 & 2 & -1 \end{pmatrix} \quad (2-11)$$

From (2-9) and (2-10) we can get:

$$\Phi = \frac{1}{N} \sigma_\varepsilon^2 \sum_{i=1}^N Z_i' G Z_i \quad (2-12)$$

Taking the derivative of the criterion function:

$$\frac{\partial q}{\partial \begin{pmatrix} \gamma \\ \beta \end{pmatrix}} = \left(\frac{1}{N} \sum_{i=1}^N (\Delta Y_{i-1}, \Delta X_i)' Z_i \right) \left(\frac{1}{N} \sum_{i=1}^N Z_i' G Z_i \right)^{-1} \left(\frac{1}{N} \sum_{i=1}^N Z_i \left[\Delta Y_i - (\Delta Y_{i-1}, \Delta X_i) \begin{pmatrix} \gamma \\ \beta \end{pmatrix} \right] \right) \quad (2-13)$$

Take $\frac{\partial q}{\partial \begin{pmatrix} \gamma \\ \beta \end{pmatrix}} = 0$, then we can get the estimates using the GMM:

$$\begin{pmatrix} \gamma \\ \beta \end{pmatrix}_{GMM} = \left\{ \left(\frac{1}{N} \sum_{i=1}^N (\Delta Y_{i-1}, \Delta X_i)' Z_i \right) \left(\frac{1}{N} \sum_{i=1}^N Z_i' G Z_i \right)^{-1} \left(\frac{1}{N} \sum_{i=1}^N Z_i' (\Delta Y_{i-1}, \Delta X_i) \right) \right\}^{-1} \quad (2-14)$$

$$- \left\{ \left(\frac{1}{N} \sum_{i=1}^N (\Delta Y_{i-1}, \Delta X_i)' Z_i \right) \left(\frac{1}{N} \sum_{i=1}^N Z_i' G Z_i \right)^{-1} \left(\frac{1}{N} \sum_{i=1}^N Z_i' Y_i \right) \right\}$$

When independent variables x_{it} are predetermined variables, when $s < t$, $E(x_{it}\varepsilon_{it}) \neq 0$, when $s \geq t$, $E(x_{it}\varepsilon_{it}) = 0$. Therefore, only $(y_{i0}, x'_{i0}, \dots, x'_{i,s-1})$ is instrumental variables of the model (2-3) at the time s . In this situation, the instrumental variables of estimation GMM is as below:

$$Z_i = \begin{pmatrix} (y_{i0}, x'_{i0}, x'_{i1}) & 0 & \dots & 0 \\ 0 & (y_{i0}, y_{i1}, x'_{i0}, x'_{i1}, x'_{i2}) & \dots & 0 \\ 0 & 0 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \dots & (y_{i0}, y_{i1}, \dots, y_{i,T-2}, x'_{i0}, x'_{i1}, \dots, x'_{i,T-1}) \end{pmatrix} \quad (2-15)$$

Thus, we can get the estimations using GMM when x_{it} are predetermined variables according to (2-14) and (2-15).

From (2-5) and (2-15), we can know that there may be too many instrumental variables (IV) in the model, which is not reasonable. Generally, we just use the IV that is useful and adjust the matrix of instruments accordingly.

In addition, Arellano and Bond (1991) also proposed the test for over-identifying restrictions, and the statistic of Sargan is given as below:

$$m = \Delta \hat{\varepsilon}' Z \left[\sum_{i=1}^n Z_i' (\Delta \hat{\varepsilon}_i) (\Delta \hat{\varepsilon}_i)' Z_i \right]^{-1} Z' (\Delta \hat{\varepsilon})$$

Under the null hypothesis of Sargan test,

$$m \sim \chi^2(L - K)$$

where L is the rank of the instrumental variables matrix and K is number of parameters.

3. Empirical model & Data selection

3.1 Empirical model

This approach is based on a Cobb-Douglas production function; that is, output is a function of capital, labor, and a term for total factor productivity. And in order to analyse the contribution of exports we consider the export-augmented Cobb-Douglas production function:

$$Y = A K^\alpha L^\beta E^\gamma \quad (3-1)$$

where Y denotes the aggregate output; A denotes the efficiency parameter; K denotes the capital stock; L denotes the labor input; and E denotes the exports. Taking logarithmic transformation to linearize (3-1) we have:

$$\ln Y = \ln A + \alpha \ln K + \beta \ln L + \gamma \ln E \quad (3-2)^2$$

Therefore, we can get the model as below:

$$\ln Y_{it} = \beta_0 + \beta_1 \ln K_{it} + \beta_2 \ln L_{it} + \beta_3 \ln E_{it} + \mu_i + \varepsilon_{it} \quad (3-3)$$

where $\beta_0, \beta_1, \beta_2, \beta_3$ are the parameters to be estimated.

$\ln Y_{it}$ denotes the natural logarithm of aggregate output in the i^{th} province in the t^{th} year.

$\ln K_{it}$ denotes the natural logarithm of capital stock in the i^{th} province in the t^{th} year.

² Using the neoclassical trade theory (NTT) we will have the same model. NTT will be evaluated in a neoclassical production function framework incorporating an additional factor of production (exports) into the production function because the exports must have a positive effect on aggregate output. The augmented neoclassical production function is specified as follows:

$$Y = f(K, L, E)$$

The econometric specification of this relationship will be captured in various bivariate (aggregate output and exports) models without exogenous variables and various bi-variate models with exogenous variables, all expressed in logarithmic form. Below is a representation of an econometric model of bi-variate form with exogenous variables:

$$\ln Y = \beta_0 + \beta_1 \ln K + \beta_2 \ln L + \beta_3 \ln E$$

Which is the same as the export-augmented Cobb-Douglas production function.

$\text{Ln}L_{it}$ denotes the natural logarithm of labor input in the i^{th} province in the t^{th} year.

$\text{Ln}E_{it}$ denotes the natural logarithm of exports in the i^{th} province in the t^{th} year.

μ_i denotes the unobserved effects of the i^{th} province.

ε_{it} denotes the unobserved effects of the i^{th} province in the t^{th} year.

3.2 Data selection

Aggregate output

The real GDP of each province of China is used to express aggregate output³ and take 1952 as the base year, which is used throughout this paper.

$$\text{Real GDP} = \frac{\text{Nominal GDP}}{\text{GDP deflator}}$$

We use this formula as follow to calculate GDP deflator.

$$D_{it} = \begin{cases} 1 & , t = 1952 \\ \text{GDP}_{it} / [\text{GDP}_{it-1} * (I_{it} / 100)] & , t > 1952 \end{cases}$$

Where D_{it} denotes the GDP deflator of the i^{th} province in the t^{th} year; GDP_{it} denotes the nominal GDP deflator of the i^{th} province in the t^{th} year; I_{it} denotes the GDP indices of the i^{th} province in the t^{th} year (Data are calculated at constant prices and preceding year=100)⁴.

Capital stock

Wu (2007) has proposed a method of calculating capital stock for China's regional economies⁵ and we use this kind of data. The general technique of calculating capital stock values is the perpetual inventory approach (PIM):

³ Chongqing which is created on 14 March 1997 was part of Sichuan province. Therefore, in this paper we amalgamate the data of Chongqing and Sichuan.

⁴ Owing to absence of Hainan's GDP indices, we utilize the average GDP indices of the whole China.

⁵ Capital stock data are in 1952 constant prices from 1952-2006. Wu(2007) indicate: "*Economists specializing in the Chinese economy have been puzzled by the discrepancy between national and regional data....One possible explanation is that since the mid 1990s capital has become very mobile in China and a lot of cross-regional investment has taken place. As a result, some investment and hence capital formation have been claimed by both the home and hosting regions.*"

$$K_{i,t} = (1 - \delta)K_{i,t-1} + \Delta K_{i,t}$$

where $K_{i,t}$ is the value of capital stock for the i^{th} region in the t^{th} year; $\Delta K_{i,t}$ is the real value of incremental capital stock and δ is the rate of depreciation⁶.

Labor input

Labor input should be measured by the standard labor time and labor intensity, but we cannot gain associated data. Therefore, in this paper we use the number of employment of each province of China to represent labor input⁷.

Exports

The real exports of each province of China are used, and we do not consider the trade between any two provinces.

⁶ The rates of depreciation are different for different regions.

⁷ These data are from *Comprehensive Statistical Data and Materials on 60 Years of New China* Published by China Statistics Press.

4. Results

4.1 Static panel data models in the whole country

The data used in this study are publicly available from government agencies. The National Bureau of Statistics of China publishes data on nominal GDP and we transform them to real GDP taking 1952 as the base year. The capital stock is calculated in the constant prices in 1952 according to Wu (2007). Table 1 reports the summary of the descriptive statistics on the natural logarithm of GDP, employment, capital stock, exports in the whole country (include 30 provinces) from 1978 to 2008 and Table 2 reports the correlation coefficients of these variables.

Table 1. The summary of the variables in the whole country

Variable	Max	Mean	Min	Std Dev	Median	Lower Quartile	Upper Quartile
Ln(GDP)	8.76	5.70	1.86	1.31	5.71	4.85	6.62
Ln(Employment)	8.76	7.21	4.53	0.97	7.39	6.67	7.94
Ln(Capital)	9.65	6.83	2.20	1.27	6.79	5.95	7.77
Ln(Export)	8.56	2.90	-3.70	2.28	3.06	1.58	4.35

Table 2. Correlation coefficients of variables in the whole country

	Ln(GDP)	Ln(Employment)	Ln(Capital)	Ln(Export)
Ln(GDP)	1			
Ln(Employment)	0.67604	1		
Ln(Capital)	0.97387	0.5903	1	
Ln(Export)	0.90166	0.46293	0.88022	1

According to Hausman test⁸ ($Pr < 0.0001$), we use fixed estimation method. The results are reported in Table 3. As we can see, the estimates of the coefficients of the logarithm capital and labor are significant at 1% level. In this study, we get the estimations for the contributions of capital and labor are 48.1% and 41.1%, respectively. What's more, the estimate of the coefficient of exports is small (0.0583) but also significant at 1% level, which means that exports has an important impact on GDP. To be specific, GDP increases 0.06% when exports increase 1%. In the whole country, the impacts of employment and exports are both positive for the economic growth. However, the impact of employment is stronger than exports.

As for the positive contributions to GDP of employment and exports, there are several reasons. First, due to the economic reform in China since 1978, a lot of foreign enterprises have entered and invested in China. Therefore, much employment was provided. That is one of the most important reasons for China's economic growth. And in the recent years, China's policy and the huge number of cheap labor (Not only is unskilled labor has low-priced, highly trained labor is also cheap) have attracted a lot of enterprises of original equipment manufacturer (OEM) like Foxconn. That constitutes the inducement of the exports growth. The growth of exports has led to the economic growth,

⁸ The hausman test tests the null hypothesis that the coefficients estimated by the efficient random effects estimator are the same as the ones estimated by the consistent fixed effects estimator.

which in turn attracted more enterprises into China at the same time.

Table 3. Results of static panel data models in whole country

Variable	Estimate	Standard Error	t Value	Pr > t
Intercept	-0.25356	0.3458	-0.73	0.4636
Ln(Employment)	0.411236***	0.0447	9.21	<.0001
Ln(Capital)	0.481176***	0.0166	28.91	<.0001
Ln(Export)	0.058316***	0.00552	10.56	<.0001
R-Square	0.9929	Hausman Test Pr<.0001		

***, **, * denote statistically significant at 1%, 5%, and 10% level respectively.

4.2 Dynamic panel data models in the whole country

Static panel data model does not consider dynamic effects of GDP. In fact, lagged values of GDP may have effects on current GDP. Therefore, in this part we apply the dynamic panel data model to consider the influence of the lagged GDP. According to (2-2), we get the empirical model as below:

$$\ln Y_{it} = \beta_0 + \gamma \ln Y_{it-1} + \beta_1 \ln K_{it} + \beta_2 \ln L_{it} + \beta_3 \ln E_{it} + \mu_i + \varepsilon_{it} \quad (3-4)$$

Since the result of the estimation using OLS is biased, inefficient, and inconsistent estimates, we estimate the coefficient using GMM that Arellano and Bond (1991) proposed for the dynamic panel data model. In the equation (3-4) there is the lag of dependent variable, so we take the first difference of the model and get the empirical model as follows:

$$\Delta \ln Y_{it} = \gamma \Delta \ln Y_{it-1} + \beta_1 \Delta \ln K_{it} + \beta_2 \Delta \ln L_{it} + \beta_3 \Delta \ln E_{it} + \Delta \varepsilon_{it} \quad (3-5)$$

Estimation by a two-step GMM method is chosen here and five lags of the dependent variables are used as instruments.

Because the number of instrumental variable (IV) is more than number of endogenous variables, we should use Sargan test to check the over-identifying restrictions. According to Table 4, we can find that Sargan test pass the test at 10% level, so over-identifying restrictions test is valid. Thus, IV is uncorrelated with the error term, which shows that IV is valid⁹.

Table 4. Results of dynamic panel data models in the whole country

Variable	Estimate	Standard Error	t Value	Pr > t
$\Delta \ln(GDP)_1$	0.018693***	0.00228	8.18	<.0001
$\Delta \ln(Employment)$	0.242764***	0.0252	9.65	<.0001
$\Delta \ln(Capital)$	0.098254***	0.0142	6.93	<.0001
$\Delta \ln(Export)$	0.010037***	0.00174	5.78	<.0001

Sargan Test Prob > ChiSq 1.0000

***, **, * denote statistically significant at 1%, 5%, and 10% level respectively.

$\ln(GDP)_1$ denotes the one lag of $\ln(GDP)$.

Table 4 reports the results of dynamic panel data model in the whole country. We can find that all the estimates are significant at 1% level and all coefficients are positive including

⁹ The null hypothesis of Sargan test is that the error term is uncorrelated with the instruments.

the estimate of $\Delta \ln(GDP)_1$, which captures the dynamic relationship in the growth of GDP. For this, we can explain as follows. Firstly, the growth of GDP in the last year will bring more capital input this year; therefore, GDP will grow rapidly. Secondly, the rapid growth of GDP in the last term will attract more investors to come into China. Thirdly, anticipation in economy play an important role, and the situation of the growth of GDP in the last term is the base of the anticipation in this term. Therefore, the rapid growth in the last term leads to the growth in the current term.

The effects of $\Delta \ln(\text{Employment})$ and $\Delta \ln(\text{Export})$ are also significant and positive for the growth of GDP. From the results, GDP will increase 0.24% when the employment increases 1%, whereas it grows 0.01% when the exports grow 1%.

4.3 Analysis of the static models in three geographical regions

There are the glaring differences of the China's economic development in different regions. The contributions to GDP from employment and exports are different in various regions. In 1978, China transforms its planned economy into a market economy, the east region reformed firstly. Therefore, it develops more rapidly than the other regions. Generally, we divide China into three geographical regions. The detail of the division is reported in Table 5.

Figure 3 shows the growth of real GDP in different regions. It is obvious that the economy grows faster in the eastern region than the others, and the west region develops slowest. And from Figure 4, real exports of the east region also grow fast, especially in the last decade. Although we can find significant differences in the three regions of China in the respect of both economic growth and exports, Figure 5 indicates that the employment of the three regions grows almost in the same speed. Due to this, it's necessary to analyse the cause of economic growth respectively.

Table 5. The division of China's geographical regions

Region	The provinces, municipalities and autonomous regions	Number
East of China	Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Guangdong, Guangxi, Hainan, Shandong.	12
Middle of China	Shanxi, Inner Mongolia, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan.	9
West of China	Sichuan (including Chongqing), Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Ningxia, Qinghai, Xinjiang.	9

Figure 3 Growth of RealGDP in three regions

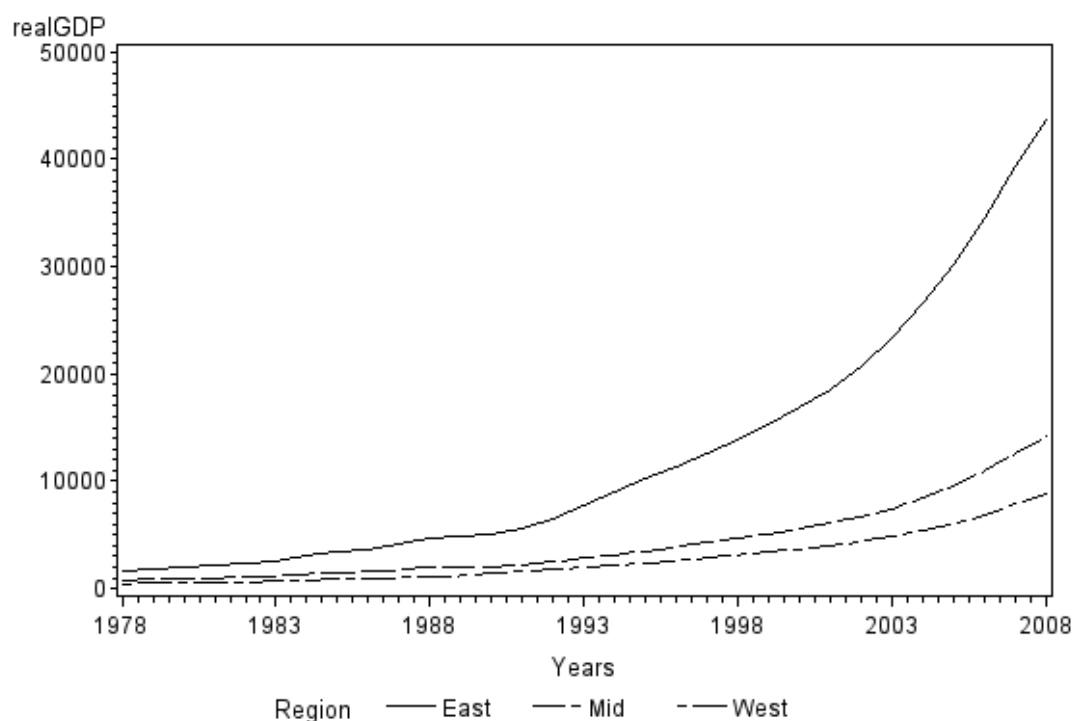


Figure 4 Growth of export in three regions

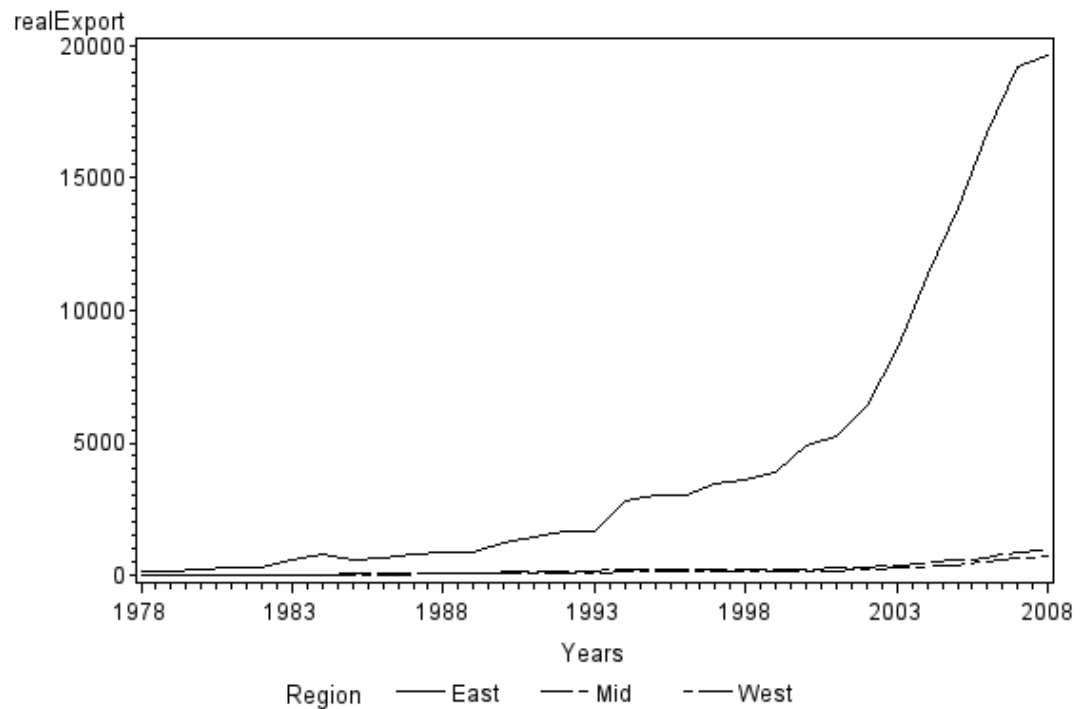
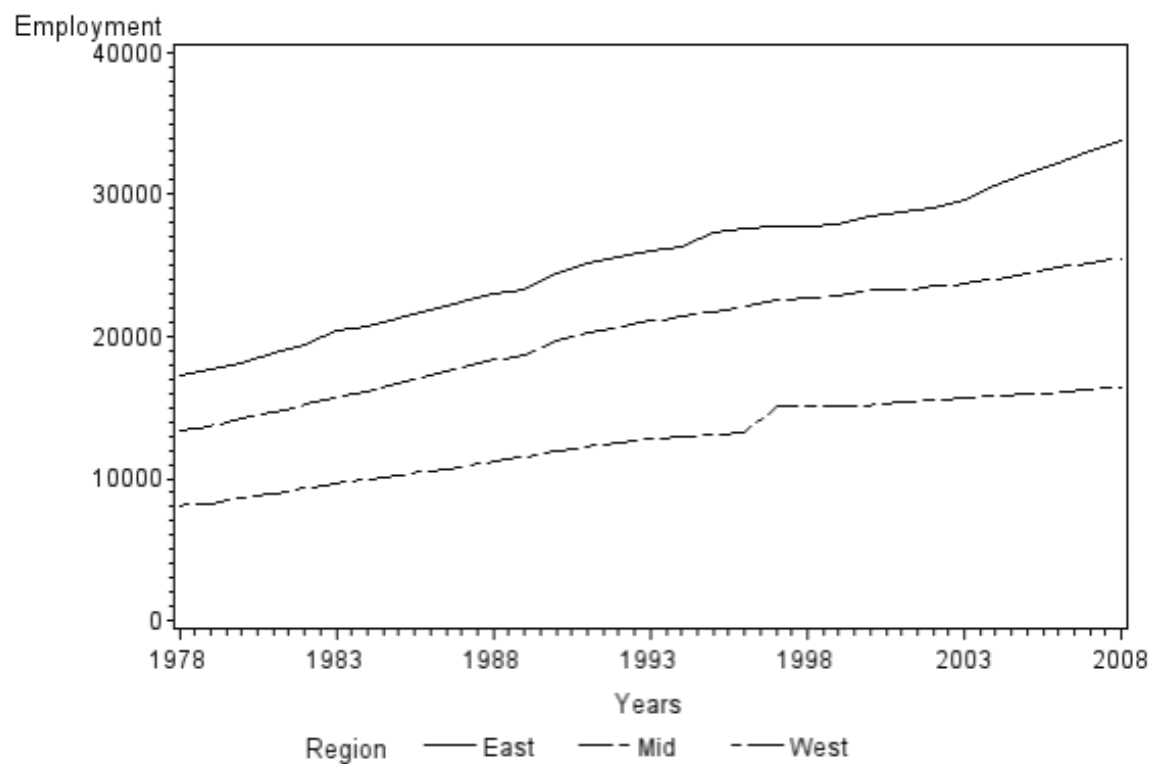


Figure 5 Growth of employment in three regions



In this part, based on the static panel data model we introduce three dummy variables,

D_e , D_m , D_w which are specified as follow:

$$De_{it} = \begin{cases} 1, & \text{The provinces in the eastern region.} \\ 0, & \text{The provinces in the other regions.} \end{cases}$$

$$Dm_{it} = \begin{cases} 1, & \text{The provinces in the middle region.} \\ 0, & \text{The provinces in the other regions.} \end{cases}$$

$$Dw_{it} = \begin{cases} 1, & \text{The provinces in the western region.} \\ 0, & \text{The provinces in the other regions.} \end{cases}$$

Therefore, the model is represented as below:

$$\ln Y_{it} = \beta_0 + \beta_1 \ln K_{it} + \beta_{2e}(De_{it} \times \ln L_{it}) + \beta_{2m}(Dm_{it} \times \ln L_{it}) + \beta_{2w}(Dw_{it} \times \ln L_{it}) \\ + \beta_{3e}(De_{it} \times \ln E_{it}) + \beta_{3m}(Dm_{it} \times \ln E_{it}) + \beta_{3w}(Dw_{it} \times \ln E_{it}) + \mu_i + \varepsilon_{it}$$

where e , m , w denote eastern, middle and western region respectively. The variables have the same meaning with (3-3).

Table 6 reports the summary of the variables in different regions and Table 7 contains the results of the estimation of the coefficients in different regions. We can find all the estimations are significant at 1% level except the intercept. The contribution of GDP from the exports in the eastern area is higher than that in the other two regions, which shows the same result as He Dong and Zhang Wenlang (2010). GDP of the eastern region grows rapidly from 1978, because many foreign direct investments (FDI) were created in many provinces of this region, such as Guangdong, Fujian, Shanghai and so on. That is also why the last global economic crisis brought the greatest impact for the eastern region.

In the western area, although the economic growth is less than the other region, there are a lot of natural resources, such as coal, fossil fuels, rock and mineral resources. Therefore, the contribution of GDP from the exports in the west region achieves almost the level of middle region.

However, the employment is always the most important factor for the growth of GDP. When the employment increases 1% in the eastern region, GDP will increase 0.54%, whereas in the middle and western regions they are respectively 0.30% and 0.37%.

Table 6. The summary of the variables in different regions

Region	N Obs	Variable	Max	Mean	Min	Std Dev
East	372	Ln(GDP)	8.76	6.25	2.57	1.27
		Ln(Employment)	8.73	7.35	5.40	0.87
		Ln(Capital)	9.65	7.32	4.41	1.24
		Ln(Export)	8.56	4.38	-1.96	2.01
Mid	279	Ln(GDP)	7.89	5.76	4.01	0.90
		Ln(Employment)	8.67	7.57	6.47	0.54
		Ln(Capital)	8.86	6.85	4.99	0.94
		Ln(Export)	5.30	2.47	-2.43	1.51
West	279	Ln(GDP)	8.27	4.87	1.86	1.32
		Ln(Employment)	8.76	6.67	4.53	1.18
		Ln(Capital)	8.81	6.16	2.20	1.27
		Ln(Export)	5.67	1.33	-3.70	2.03

Table 7. Parameter estimates of static models by region

Variable	Estimate	Standard Error	t Value	Pr > t
Intercept	0.990119	0.4152	2.38	0.0173
$\ln(\text{export})_e$	0.07686***	0.00716	10.73	<.0001
$\ln(\text{export})_w$	0.053552***	0.0071	7.54	<.0001
$\ln(\text{export})_m$	0.059051***	0.00917	6.44	<.0001
$\ln(\text{employment})_e$	0.53595***	0.0598	8.96	<.0001
$\ln(\text{employment})_w$	0.365053***	0.0538	6.79	<.0001
$\ln(\text{employment})_m$	0.30275***	0.0732	4.13	<.0001
$\ln(\text{capital})$	0.363309***	0.02	18.13	<.0001
R-Square 0.8235		Hausman Test Pr<.0001		

***, **, * denote statistically significant at 1%, 5%, and 10% level respectively.

Table 8. Wald test of coefficient constraints in static models

Null hypothesis	Statistic	Pr > ChiSq	Result
$\ln(\text{export})_e = \ln(\text{export})_m$	2.76	0.0969*	Reject
$\ln(\text{export})_e = \ln(\text{export})_w$	7.33	0.0068*	Reject
$\ln(\text{export})_w = \ln(\text{export})_m$	0.28	0.5985	Accept
$\ln(\text{employment})_e = \ln(\text{employment})_m$	7.72	0.0055*	Reject
$\ln(\text{employment})_e = \ln(\text{employment})_w$	5.98	0.0145**	Reject
$\ln(\text{employment})_w = \ln(\text{employment})_m$	33.02	<.0001***	Reject

***, **, * denote statistically significant at 1%, 5%, and 10% level respectively.

Table 8 reports the Wald test of coefficient constraints, we cannot accept null hypothesis of Wald test except the hypothesis ($\ln(\text{export})_w = \ln(\text{export})_m$). To sum up, we can think that there exist differences of the effect of the exports on GDP among various regions. However, the difference between the effects of the exports on GDP in the western and middle regions is not statistically evident. On the other hand, the contribution of the exports in the east is different from the other two regions and it much higher than the other regions. For employment, there are also the glaring differences in three regions.

4.4 Analysis of the dynamic models in three geographical regions

From the dynamic panel data model in the whole country, we find the growth of GDP in the last term is significant and have the positive effect for the growth of GDP. Therefore, we have the reason to believe the dynamic panel data models are more reasonable to

analyze the determinants of the China's economic growth. We also build three dummy variables, D_e , D_m , D_w which are specified as follows.

$$De_{it} = \begin{cases} 1, & \text{The provinces in the east region.} \\ 0, & \text{The provinces in the other regions.} \end{cases}$$

$$Dm_{it} = \begin{cases} 1, & \text{The provinces in the middle region.} \\ 0, & \text{The provinces in the other regions.} \end{cases}$$

$$Dw_{it} = \begin{cases} 1, & \text{The provinces in the west region.} \\ 0, & \text{The provinces in the other regions.} \end{cases}$$

Therefore, we can get the model as below.

$$\begin{aligned} \Delta \ln Y_{it} = & \gamma \Delta \ln Y_{it-1} + \beta_3 \Delta \ln K_{it} + \beta_1 (De_{it} \times \Delta \ln L_{it}) + \beta_1 (Dm_{it} \times \Delta \ln L_{it}) \\ & + \beta_1 (Dw_{it} \times \Delta \ln L_{it}) + \beta_2 (De_{it} \times \Delta \ln E_{it}) + \beta_2 (Dm_{it} \times \Delta \ln E_{it}) \\ & + \beta_2 (Dw_{it} \times \Delta \ln E_{it}) + \Delta \varepsilon_{it} \end{aligned}$$

Firstly, we run Sargan test which pass the test at 10% level, so over-identifying restrictions test is valid. We estimate the coefficients by a two step GMM method and five lags of the dependent variables are used as instruments. Table 9 reports the results of parameter estimates using dynamic model. It shows that the coefficients are positive and significant at the level 1%, excluding those of the employment in the western region, exports in the middle and western regions. The same as the static panel data model in the whole country, the growth rate in the last term has the positive effect on the growth in the current term. Compared to the static model, we can find that the relationship between the growth rate of employment and the economic growth rate in eastern region is less strong, which is also true for the relationship between the growth rate of export and GDP.

In addition, table 10 reports the results of Wald test of coefficient constraints in dynamic models, we can find there are differences between the effects of exports in the eastern

region and in the other regions in the economic growth. Whether in static models or dynamic models, the impact of export in the eastern area is always positive and significant. Therefore, we can say the exports in the eastern area are quit important for its economic growth.

Table 9 . Parameter estimates of dynamic models by region

Variable	Estimate	Standard Error	t Value	Pr > t
$\Delta \text{Ln}(GDP)_1$	0.018998***	0.00315	6.04	<.0001
$\Delta \text{Ln}(Capital)$	0.090247***	0.0229	3.93	<.0001
$\Delta \text{Ln}(\text{Employment})_e$	0.458069***	0.1299	3.53	0.0004
$\Delta \text{Ln}(\text{Employment})_m$	0.529645***	0.1604	3.3	0.001
$\Delta \text{Ln}(\text{Employment})_w$	-0.08571	0.0834	-1.03	0.3046
$\Delta \text{Ln}(Export)_e$	0.042723***	0.0139	3.07	0.0022
$\Delta \text{Ln}(Export)_m$	-0.01423	0.0128	-1.12	0.265
$\Delta \text{Ln}(Export)_w$	-0.00735	0.0131	-0.56	0.5737
Sargan Test Prob > ChiSq 1.0000				

***, **, * denote statistically significant at 1%, 5%, and 10% level respectively.

Table 10. Wald test of coefficient constraints in dynamic models

Null hypothesis	Statistic	Pr > ChiSq	Result
$\Delta \ln(\text{export})_e = \Delta \ln(\text{export})_m$	5.35	0.0207**	Reject
$\Delta \ln(\text{export})_e = \Delta \ln(\text{export})_w$	5.46	0.0195**	Reject
$\Delta \ln(\text{export})_w = \Delta \ln(\text{export})_m$	0.11	0.7382	Accept
$\Delta \ln(\text{employment})_e = \Delta \ln(\text{employment})_m$	0.15	0.695	Accept
$\Delta \ln(\text{employment})_e = \Delta \ln(\text{employment})_w$	9.69	0.0019***	Reject
$\Delta \ln(\text{employment})_w = \Delta \ln(\text{employment})_m$	0.76	0.3824	Accept

***, **, * denote statistically significant at 1%, 5%, and 10% level respectively.

Considering the negative and insignificant estimates of some coefficients, which does not make sense in the economic context, the results of the dynamic panel data in different regions are not quite satisfying. This might be due to the data we use in this study, which measure the exports without considering the trade between two provinces.

5. Conclusion

Since the reform (1978) in China, the exports increased more than 600% and they rise at a higher rate than the economic growth rate, the employment almost doubled, increasing from 402 million persons in 1978 to 775 million persons in 2008. According to our estimation, both the exports and the employment are important factors in the China's economic growth. Although the contribution for economic growth from the exports is not so much as that from the employment in the whole country, they both have the positive effects in economic growth. From the dynamic models, we can find the effect of economic growth in the last term is also positive in the economic growth in the current year, which shows the dynamic nature of the economic growth. From 1978, a lot of foreign companies entered the Chinese market and have set up a large number of plants which provided many jobs. Due to the number of the low-priced labor, exports exhibit the evident superiority. Therefore, we can conclude that beside labor and capital, exports also lead to the rapid growth of China's economy in the past 30 years.

In different regions, we find that there exist the glaring differences in respect of the effects of exports and employment on the economic growth. The economic growth of the east coastal region, which develops more rapidly and is more economically open to the world than the other regions, has a stronger relationship with its exports. Yet in the middle and western regions, the effects of exports do not show evident differences. The impact of employment is also the most important in the eastern region. Although the western area is less developed in China, the increasing of the government's investment promotes the growth of employment, which is the most important factor in the economic growth in the west. Due to the crucial part played by the employment, the fact that a huge number of cheap labors from the middle and west of China go to the east coastal area to find a job may be the one of the most important reasons of the rapid growth of GDP in the eastern region.

We acknowledge that the specification of the model, the selection of the estimation method and the selection of data will affect the results; therefore, the further improvement is expected.

References

- Alvarez,R. & S,Claro. On the Sources of China's Export Growth , J(2007), *Working Papers Central Bank of Chile*,426
- ASHFAQUE H. KHAN, Employment Creation Effects of Pakistan's Exports, J(1991), *The Pakistan Development Review*,865-877
- Bond,S.,A,Hoeffler & J,Temple. GMM Estimation of Empirical Growth Models, (2001),University of Oxford,University of Bristol.
- Bosworth,B & S.M.Collins. Accounting for Growth: Comparing China and India, J(2008), *Journal of Economic Perspectives, American Economic Association* 12943,45-66
- Chemeda, EF. The Role of Exports in Economic Growth with Reference To Ethiopla Country, A(2001), *Annual Meeting of the American Agricultural Economics Association in Chiago*.
- Dic, Lo. China's Economic Growth and Labor Employment– Structural Change, Institutional Evolution And Policy Issus.A(2007), Renmin University of China and SOAS, University of London.
- He,D. & W,Zhang. How dependent is the Chinese economy on exports and in what sense has its growth been export-led?, J(2010), *Journal of Asian Economics* 21,87-104
- Hu,A. Economic Growth and Employment Growth in China (1978-2001), J.(2004), *Asian Economic Papers*, 166-176.
- Li,J. A Theoretical Analysis on Measuring the Import and Export Contribution to the Economic Growth, A(2008),*The Journal of Quantitative & Technical Economics* 200809, 77-86.
- Lin,JY. & Y,Li. Export and Economic Growth in China: a Demand-Oriented analysis, J(2003), *China Economic Quarterly*.
- Ljungwall,C. Export-led Growth: Application to China's Provinces, 1978-2001, J(2006), *Journal of Chinese Economic and Business Studies* 200604,109-126
- Mileva,E. Using Arellano – Bond Dynamic Panel GMM Estimators in Stata, A(2007), Fordham University.
- Shen,L. & Z,Wu. The Contribution to Economic Growth from Export in China——Empirical Analysis Based on the I/O Table, j(2003), *Economic Research Journal* 200311,33-41.
- Sinoha-Lopete,R. Export-led growth in southern africa, C(1999), Louisiana State University.

- Vohra, R. Export and Economic Growth: Further Time Series Evidence from Less-Developed Countries, J(2001), *International Advances in Economic Research*, 345-350.
- Wu, Y. A(2007), Capital Stock Estimates for China's Regional Economies: Results and Analyses, The University of Western Australia.

Appendix A. Program SAS

```
*Taking nature logarithmic transformation of each variable.
DATA paper.data;
    set paper.data;
    lGDP = log(RealGDP);
    lEmployment = log(Employment);
    lCapital = log(Capital);
    lExport = log(RealExport);
    label lGDP = 'Log(GDP)';
    label lEmployment = 'Log(Employment)';
    label lCapital = 'Log(Capital Stock)';
    label lExport = 'Log(Export)';
RUN;

*The summary of the variables in whole country.
PROC SUMMARY PRINT max MEAN min STD MEDIAN Q1 Q3 data=paper.data;
VAR lGDP lEmployment lCapital lExport;
RUN;

*Correlation coefficient of variables in whole country.
proc corr data=paper.data;
var lGDP lEmployment lCapital lExport;
run;

*Regression of static panel data models in whole country.
PROC SORT DATA=paper.data;
BY code Years;
RUN;
PROC panel DATA=paper.data;
ID Code Years ;
MODEL lGDP=lEmployment lCapital lExport/fixtwo;
RUN;

*The one and two lag of the variables.
proc panel data=paper.data;
    ID Code Years;
    clag LGDP(1) LGDP(2) lEmployment(1) lCapital(1) lExport(1)/
out=GDP_lag;
run;
```

*The first difference of the variables and the second difference of log(GDP).

```
DATA GDP_lag;
    set GDP_lag;
    detalgdp=LGDP-LGDP_1;
    detalgdp_1=LGDP_1-LGDP_2;
    detalEmployment=lEmployment-lEmployment_1;
    detalCapital=lCapital-lCapital_1;
    detalExport=lExport-lExport_1;
    label detalgdp= 'The first difference of log(GDP)';
    label detalgdp_1 = 'The second difference of log(GDP)';
    label detalEmployment = 'The first difference of log(Employment)';
    label detalCapital = 'The first difference of log(Capital)';
    label detalExport = 'The first difference of log(Export)';
RUN;
```

*Regression of dynamic panel data models in whole country.

```
proc panel data =GDP_lag;
    inst depvar;
    ID Code Years;
    MODEL lGDP=detalgdp_1 detalEmployment detalCapital detalExport/gmm
    twostep MAXBAND=5 nolevels noint;
run;
```

*Set a variable region.

```
DATA paper.data;
    SET paper.data;
    if province="Beijing" or province="Tianjin" or province= "Hebei" or
    province="Liaoning" or province= "Shanghai" or province= "Jiangsu"
    or province= "Zhejiang" or province= "Fujian" or province=
    "Guangdong" or province= "Guangxi" or province= "Hainan" or province=
    "Shandong"
    then Region="East";
    else if province="Shanxi" or province="Inner Mongolia" or province=
    "Jilin" or province= "Heilongjiang" or province= "Anhui" or province=
    "Jiangxi" or province= "Henan" or province= "Hubei" or province=
    "Hunan"
    then Region="Mid";
    else if province="SichuanChongqing" or province= "Guizhou" or province=
    "Yunnan" or province= "Tibet" or province= "Shaanxi" or province=
    "Gansu" or province= "Ningxia" or province= "Qinghai" or province=
```

```

        "Xinjiang"
    then Region="West";
RUN;

*Calculate the sum of the variables in different region and save them.
PROC SUMMARY sum data=paper.data NWAY ;
class region years;
VAR realGDP Employment realExport;
OUTPUT OUT=PAPER.SUM SUM=realGDP Employment realExport ;
RUN;

*Drew the three Figures.
PROC gplot data=paper.sum;
goption hsize=15cm vsize =11cm;
plot realgdp*years=region/vaxis=0 to 50000 by 10000
        haxis=1978 to 2008 by 5;
symbol interpol=join w=1;
RUN;
PROC gplot data=paper.sum;
goption hsize=15cm vsize =11cm;
plot Employment*years=region/haxis=1978 to 2008 by 5;
symbol interpol=join w=1;
RUN;
PROC gplot data=paper.sum;
goption hsize=15cm vsize =11cm;
plot realexport*years=region/vaxis=0 to 20000 by 5000
        haxis=1978 to 2008 by 5;
symbol interpol=join w=1;
RUN;

*The summary of the variables in different regions.
PROC SUMMARY PRINT max MEAN min STD MEDIAN Q1 Q3 data=paper.data;
class region;
VAR lGDP lEmployment lCapital lExport;
RUN;

*Set three dummy variables.
DATA paper.data;
    SET paper.data;
    East=(province="Beijing" or province="Tianjin" or province= "Hebei" or

```

```

    province="Liaoning" or province= "Shanghai" or province= "Jiangsu"
    or province= "Zhejiang" or province= "Fujian" or province=
    "Guangdong" or province= "Guangxi" or province= "Hainan" or province=
    "Shandong");

Middle=(province="Shanxi" or province="Inner Mongolia" or province=
    "Jilin" or province= "Heilongjiang" or province= "Anhui" or province=
    "Jiangxi" or province= "Henan" or province= "Hubei" or province=
    "Hunan");

West=(province="SichuanChongqing" or province= "Guizhou" or province=
    "Yunnan" or province= "Tibet" or province= "Shaanxi" or province=
    "Gansu" or province= "Ningxia" or province= "Qinghai" or province=
    "Xinjiang");

RUN;

*Regression and WALD test of static panel data models by region.
DATA paper.data;
    set paper.data;
    eastlexport = east*lexport;
    westlexport = west*lexport;
    middlelexport = middle*lexport;
    eastlEmployment = east*lEmployment;
    westlEmployment = west*lEmployment;
    middlelEmployment = middle*lEmployment;
    label eastlexport = 'log(Export) in the east region';
    label westlexport = 'log(Export) in the west region';
    label middlelexport = 'log(Export) in the middle region';
    label eastlexport = 'log(Employment) in the east region';
    label westlexport = 'log(Employment) in the west region';
    label middlelexport = 'log(Employment) in the middle region';

RUN;

PROC panel DATA=paper.data;
    ID Code Years ;
    MODEL lGDP=eastlexport westlexport middlelexport eastlEmployment
        westlEmployment middlelEmployment lCapital/fixtwo;
    test eastlexport=middlelexport;
    test eastlexport=westlexport;
    test westlexport=middlelexport;
    test eastlEmployment=middlelEmployment;
    test eastlEmployment=westlEmployment;
    test westlEmployment=middlelexport;

```

RUN;

*Regression and WALD test of dynamic panel data models by region.

DATA GDP_lag;

set GDP_lag;

detaeastlGDP_1 = east*detalgdp_1;

detawestlGDP_1= west*detalgdp_1;

detamiddlelGDP_1 = middle*detalgdp_1;

detaeastlexport = east*detalexport;

detawestlexport = west*detalexport;

detamiddlelexport = middle*detalexport;

detaeastlEmployment = east*detalEmployment;

detawestlEmployment = west*detalEmployment;

detamiddlelEmployment = middle*detalEmployment;

label detaeastlGDP_1= 'Deta of east log(GDP)';

label detawestlGDP_1 = 'Deta of west log(GDP)';

label detamiddlelGDP_1 = 'Deta of middle log(GDP)';

label detaeastlexport = 'Deta of east log(Export)';

label detawestlexport = 'Deta of west log(Export)';

label detamiddlelexport = 'Deta of middle log(Export)';

label detaeastlEmployment = 'Deta of east log(Employment)';

label detawestlEmployment = 'Deta of west log(Employment)';

label detamiddlelEmployment = 'Deta of middlel log(Employment)';

RUN;

proc panel data =GDP_lag;

inst depvar ;

ID Code Years;

MODEL datalGDP=datalgdp_1 datalCapital detaeastlEmployment

detamiddlelEmployment detawestlEmployment detaeastlExport

detamiddlelExport detawestlExport

/gmm twostep MAXBAND=5 nolevels noint;

test detaeastlexport=detamiddlelexport;

test detaeastlexport=detawestlexport;

test detawestlexport=detamiddlelexport;

test detaeastlEmployment=detamiddlelEmployment;

test detaeastlEmployment=detawestlEmployment;

test detawestlEmployment=detamiddlelexport;

run;

Appendix B. Data

1. GDP (100 million yuan)

Codes	1	2	3	4	5	6	7	8	9	10
Years	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Liaoning	Jilin	Heilongj iang	Shanghai	Jiangsu
1978	108.84	82.65	183.06	88	58.04	229.2	81.98	174.78	272.81	249.24
1979	120.11	93	203.22	106.4	64.14	244.96	91.12	187.16	286.43	298.55
1980	139.07	103.52	219.24	108.8	68.4	281	98.59	221.04	311.89	319.8
1981	139.15	107.96	222.54	121.7	77.91	288.61	111.16	228.3	324.76	350.02
1982	154.94	114.1	251.45	139.2	93.22	315.07	121.67	248.42	337.07	390.17
1983	183.13	123.4	283.21	155.1	105.88	364.02	150.14	276.94	351.81	437.65
1984	216.61	147.47	332.22	197.4	128.2	438.17	174.39	318.34	390.85	518.85
1985	257.1	175.7	396.8	219	163.8	518.6	200.4	355	466.8	651.8
1986	284.9	194.7	436.7	235.1	181.6	605.3	227.2	400.8	490.8	744.9
1987	326.8	220	521.9	257.2	212.3	719.1	297.5	454.6	545.5	922.3
1988	410.2	259.6	701.3	316.7	270.8	881	368.7	552	648.3	1208.9
1989	456	283.3	822.8	376.3	292.7	1003.8	391.7	630.6	696.5	1321.9
1990	500.8	311	896.3	429.3	319.3	1062.7	425.3	715.2	756.5	1416.5
1991	598.9	342.8	1072.1	468.5	359.7	1200.1	463.5	824.2	893.8	1601.4
1992	709.1	411.2	1278.5	570.1	421.7	1473	558.1	964	1114.3	2136
1993	863.5	536.1	1690.8	704.7	532.7	2010.8	718	1203.2	1511.6	2998.2
1994	1145.3	732.9	2187.5	826.7	695.1	2461.8	937.7	1604.9	1990.9	4057.4
1995	1507.7	932	2849.5	1076	857.1	2793.4	1137.2	1991.4	2499.4	5155.3
1996	1789.2	1121.9	3453	1292.1	1023.1	3157.7	1346.8	2370.5	2957.6	6004.2
1997	2075.6	1264.6	3953.8	1476	1153.5	3582.5	1464.3	2667.5	3438.8	6680.3
1998	2376	1374.6	4256	1611.1	1262.5	3881.7	1577.1	2774.4	3801.1	7200
1999	2677.6	1501	4514.2	1667.1	1379.3	4171.7	1673	2866.3	4188.7	7697.8
2000	3161	1701.9	5044	1845.7	1539.1	4669.1	1951.5	3151.4	4771.2	8553.7
2001	3710.5	1919.1	5516.8	2029.5	1713.8	5033.1	2120.4	3390.1	5210.1	9456.8
2002	4330.4	2150.8	6018.3	2324.8	1940.9	5458.2	2348.5	3637.2	5741	10606.9
2003	5023.8	2578	6921.3	2855.2	2388.4	6002.5	2662.1	4057.4	6694.2	12442.9
2004	6060.3	3111	8477.6	3571.4	3041.1	6672	3122	4750.6	8072.8	15003.6
2005	6886.3	3697.6	10096.1	4179.5	3895.6	8009	3620.3	5511.5	9154.2	18305.7
2006	7870.3	4359.2	11660.4	4752.5	4791.5	9251.2	4275.1	6188.9	10366.4	21645.1
2007	9353.3	5050.4	13709.5	5733.4	6091.1	11023.5	5284.7	7065	12188.9	25741.2
2008	10488	6354.4	16188.6	6938.7	7761.8	13461.6	6424.1	8310	13698.2	30312.6

Continue

Codes	11	12	13	14	15	16	17	18	19	20
Years	Zhejiang	Anhui	Fujian	Jiangxi	Shandong	Henan	Hubei	Hunan	Guang dong	Guang xi
1978	123.72	113.96	66.37	87	225.45	162.92	151	146.99	185.85	75.85
1979	157.64	127.31	74.11	104.15	251.6	190.09	188.46	178.01	209.34	84.59
1980	179.68	140.88	87.06	111.15	292.13	229.16	199.38	191.72	249.65	97.33
1981	204.45	170.51	105.62	121.26	346.57	249.69	219.75	209.68	290.36	113.46
1982	233.41	187.02	117.81	133.96	395.38	263.3	241.55	232.52	339.92	129.15
1983	256.23	215.68	127.76	144.13	459.83	327.95	262.58	257.43	368.75	134.6
1984	322.07	265.74	157.06	169.11	581.56	370.04	328.22	287.29	458.74	150.27
1985	427.5	331.2	200.5	207.9	680.5	451.7	396.3	350	577.4	181
1986	500.1	382.8	222.5	230.8	742.1	502.9	442	397.7	667.5	205.5
1987	603.7	442.4	279.2	262.9	892.3	609.6	517.8	469.4	846.7	241.6
1988	765.8	546.9	383.2	325.8	1117.7	749.1	626.5	584.1	1155.4	313.3
1989	843.7	616.3	458.4	376.5	1293.9	850.7	717.1	640.8	1381.4	383.4
1990	898	658	523.3	419.5	1511.2	934.7	824.4	744.4	1471.8	449.1
1991	1081.8	663.6	622	465.1	1810.5	1045.7	913.4	833.3	1780.6	518.6
1992	1365.1	801.2	787.7	559.5	2196.5	1279.8	1088.4	997.7	2293.5	646.6
1993	1909.5	1069.8	1133.5	701.9	2779.5	1662.8	1424.4	1278.3	3225.3	893.6
1994	2689.3	1320.4	1644.4	948.2	3844.5	2216.8	1700.9	1650	4619	1198.3
1995	3557.6	1810.7	2094.9	1169.7	4953.4	2988.4	2109.4	2132.1	5933.1	1497.6
1996	4188.5	2093.3	2484.3	1409.7	5883.8	3634.7	2499.8	2540.1	6835	1697.9
1997	4686.1	2347.3	2870.9	1605.8	6537.1	4041.1	2856.5	2849.3	7774.5	1817.3
1998	5052.6	2543	3159.9	1719.9	7021.4	4308.2	3114	3025.5	8530.9	1911.3
1999	5443.9	2712.3	3414.2	1853.7	7493.8	4517.9	3229.3	3214.5	9250.7	1971.4
2000	6141	2902.1	3764.5	2003.1	8337.5	5053	3545.4	3551.5	10741.3	2080
2001	6898.3	3246.7	4072.9	2175.7	9195	5533	3880.5	3831.9	12039.3	2279.3
2002	8003.7	3519.7	4467.6	2450.5	10275.5	6035.5	4212.8	4151.5	13502.4	2523.7
2003	9705	3923.1	4983.7	2807.4	12078.2	6867.7	4757.5	4660	15844.6	2821.1
2004	11648.7	4759.3	5763.4	3456.7	15021.8	8553.8	5633.2	5641.9	18864.6	3433.5
2005	13437.9	5375.1	6568.9	4056.8	18516.9	10587.4	6520.1	6511.3	22366.5	4075.8
2006	15742.5	6148.7	7614.6	4670.5	22077.4	12496	7581.3	7568.9	26204.5	4828.5
2007	18780.4	7364.2	9249.1	5500.3	25965.9	15012.5	9230.7	9200	31084.4	5955.7
2008	21486.9	8874.2	10823.1	6480.3	31072.1	18407.8	11330.4	11156.6	35696.5	7171.6

Continue

Codes	21	22	23	24	25	26	27	28	29	30
		Sichuan								
Years	Hainan	&Chong qing	Guizhou	Yunnan	Tibet	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang
1978	16.4	184.61	46.62	69.05	6.65	81.07	64.73	15.54	13	39.07
1979	17.45	205.76	55.28	76.83	7.3	94.52	67.51	15.19	14.36	45.63
1980	19.33	229.31	60.26	84.27	8.67	94.91	73.9	17.79	15.96	53.24
1981	22.23	242.32	67.89	94.13	10.4	102.09	70.89	17.49	17.42	59.41
1982	28.86	275.23	79.39	110.12	10.21	111.95	76.88	19.95	18.22	65.24
1983	31.12	311	87.38	120.07	10.29	123.39	91.5	22.45	20.79	78.55
1984	37.18	358.06	108.27	139.58	13.68	149.35	103.17	26.42	24.78	89.75
1985	43.3	421.2	123.9	165	17.8	180.9	123.4	33	30.3	112.2
1986	48	458.2	139.6	182.3	16.9	208.3	140.7	38.4	34.5	129
1987	57.3	530.9	165.5	229	17.7	245	159.5	43.4	39.6	148.5
1988	77.1	659.7	211.8	301.1	20.3	314.5	191.8	55	50.3	192.7
1989	91.4	745	235.8	363.1	21.9	358.4	216.8	60.4	59.2	217.4
1990	102.5	1186.2	260.1	451.7	24.5	404.3	242.8	69.9	64.8	274
1991	120.5	1383	295.9	517.4	30.5	466.8	271.4	75.1	71.8	335.9
1992	181.7	1624.5	339.9	618.7	33.3	538.4	317.8	87.5	83.1	402.3
1993	258.1	2096.5	416.1	779.2	37.3	661.4	372.2	109.6	103.8	505.6
1994	332	2757.4	524.5	983.8	46	839	453.6	138.4	136.3	662.3
1995	363.3	3459.5	636.2	1222.2	56.1	1036.9	557.8	167.8	175.2	814.9
1996	389.7	4059.2	723.2	1517.7	65	1215.8	722.5	184.2	202.9	900.9
1997	411.2	4601.7	805.8	1676.2	77.2	1363.6	793.6	202.8	224.6	1039.9
1998	442.1	4914.7	858.4	1831.3	91.5	1458.4	887.7	220.9	245.4	1107
1999	476.7	5141.1	937.5	1899.8	106	1592.6	956.3	239.4	264.6	1163.2
2000	526.8	5531.4	1029.9	2011.2	117.8	1804	1052.9	263.7	295	1363.6
2001	558.4	6059.2	1133.3	2138.3	139.2	2010.6	1125.4	300.1	337.4	1491.6
2002	622	6715	1243.4	2312.8	166.6	2253.4	1232	340.7	377.2	1612.7
2003	693.2	7605.9	1426.3	2556	189.1	2587.7	1399.8	390.2	445.4	1886.4
2004	798.9	9072.4	1677.8	3081.9	220.3	3175.6	1688.5	466.1	537.2	2209.1
2005	894.6	10455.6	1979.1	3472.9	251.2	3675.7	1934	543.3	606.1	2604.2
2006	1052.9	12129.4	2282	4006.7	291	4523.7	2276.7	641.6	710.8	3045.3
2007	1223.3	14627.8	2741.9	4741.3	342.2	5465.8	2702.4	783.6	889.2	3523.2
2008	1459.2	17603	3333.4	5700.1	395.9	6851.3	3176.1	961.5	1098.5	4203.4

2. Employment (10 000 persons)

Codes	1	2	3	4	5	6	7	8	9	10
Years	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Liaoning	Jilin	Heilongj iang	Shanghai	Jiangsu
1978	444.1	366.7	2109.4	965.2	652.8	1254.1	645.4	1006.9	698.3	2777.7
1979	470.5	380.5	2141.5	981.1	674.0	1330.9	671.3	1032.7	712.6	2762.3
1980	484.2	394.8	2182.8	1002.6	698.4	1441.7	715.3	1080.7	730.8	2821.0
1981	511.7	413.2	2264.2	1031.9	731.2	1505.1	754.5	1117.5	750.2	2910.6
1982	535.2	420.5	2346.6	1062.4	762.4	1571.6	849.6	1133.1	764.0	2993.0
1983	552.0	435.5	2489.3	1080.2	798.8	1638.6	847.5	1196.2	768.9	3056.5
1984	556.2	447.3	2533.6	1116.7	827.8	1680.7	867.3	1248.4	769.8	3158.8
1985	566.5	456.0	2555.4	1154.1	856.6	1769.1	930.2	1289.6	775.5	3263.0
1986	572.7	466.9	2626.4	1189.5	875.4	1799.2	988.0	1324.2	783.0	3350.0
1987	580.2	470.9	2725.8	1223.0	891.0	1835.4	1032.8	1333.3	788.1	3429.7
1988	584.1	465.2	2808.3	1257.1	909.7	1858.6	1106.2	1358.6	792.1	3502.7
1989	593.9	469.8	2857.9	1281.7	910.3	1874.8	1142.2	1395.0	785.0	3519.8
1990	627.1	470.1	2955.5	1304.0	924.6	1897.3	1169.4	1436.2	787.7	4225.0
1991	634.0	479.7	3040.3	1332.2	962.9	1938.3	1194.7	1481.9	798.1	4273.0
1992	649.3	485.7	3106.3	1363.8	976.0	1957.8	1235.0	1483.4	806.9	4315.1
1993	627.8	503.1	3171.4	1383.6	1008.2	2006.1	1237.7	1500.2	787.3	4339.8
1994	664.3	513.0	3210.4	1403.8	1033.4	2009.3	1250.2	1515.2	786.0	4362.8
1995	665.3	515.3	3252.0	1424.5	1029.4	2027.8	1270.8	1543.1	794.2	4385.2
1996	660.2	512.0	3300.2	1441.2	1039.0	2031.8	1257.1	1557.8	851.2	4387.0
1997	655.8	513.3	3324.2	1439.4	1050.3	1967.1	1237.7	1647.6	847.3	4388.8
1998	622.2	508.1	3367.2	1398.3	1050.3	1958.8	1130.9	1700.0	836.2	4389.9
1999	618.6	508.1	3322.3	1402.2	1056.7	1994.4	1120.0	1654.2	812.1	4390.7
2000	619.3	486.9	3385.7	1392.4	1061.6	2052.0	1164.0	1600.8	828.4	4418.1
2001	628.9	488.3	3409.2	1399.5	1067.0	2069.3	1167.4	1592.6	792.3	4434.3
2002	679.2	492.6	3435.0	1403.3	1086.1	2025.3	1186.6	1603.1	829.7	4458.0
2003	703.3	510.9	3470.2	1469.5	1005.2	2018.9	1202.5	1614.0	854.6	4468.7
2004	854.1	527.8	3516.7	1474.6	1026.1	2097.3	1222.0	1681.1	978.3	4482.5
2005	878.0	542.5	3569.0	1500.2	1041.1	2120.3	1238.9	1748.9	969.2	4510.1
2006	919.7	562.9	3610.0	1561.2	1051.2	2128.1	1250.5	1784.1	1005.2	4564.8
2007	942.7	613.9	3665.0	1595.7	1081.5	2180.7	1266.1	1827.6	1024.3	4618.1
2008	980.9	647.3	3725.7	1614.1	1103.3	2198.2	1281.4	1852.4	1053.2	4648.9

Continue

Codes	11	12	13	14	15	16	17	18	19	20
Years	Zhejiang	Anhui	Fujian	Jiangxi	Shandong	Henan	Hubei	Hunan	Guang dong	Guang xi
1978	1795.0	1873.4	924.4	1254.3	2970.0	2807.0	1910.4	2280.1	2276.0	1455.8
1979	1829.9	1920.6	954.2	1307.0	3016.0	2873.0	1946.2	2328.1	2305.0	1492.9
1980	1856.4	2002.1	963.7	1356.3	3118.0	2929.0	1986.9	2400.0	2367.8	1550.0
1981	1954.5	2078.0	1001.7	1409.8	3192.0	3039.0	2045.1	2449.5	2423.8	1604.9
1982	2021.7	2160.2	1028.0	1434.0	3270.0	3146.0	2107.8	2541.1	2521.4	1667.7
1983	2141.2	2234.1	1056.7	1498.2	3795.0	3289.0	2144.7	2594.4	2569.7	1713.2
1984	2248.9	2311.4	1101.8	1537.3	3563.7	3346.0	2203.1	2672.9	2637.5	1776.4
1985	2318.6	2420.6	1152.1	1584.8	3561.1	3520.0	2238.1	2728.7	2731.1	1830.5
1986	2386.4	2495.9	1188.9	1622.6	3651.0	3598.0	2297.5	2808.9	2811.9	1895.8
1987	2444.7	2563.3	1237.7	1668.4	3766.0	3782.0	2349.4	2904.1	2911.0	1961.0
1988	2502.7	2665.9	1281.1	1723.0	3887.0	3916.0	2407.4	2998.6	2994.7	2012.0
1989	2522.9	2723.9	1301.8	1760.4	3940.3	3943.0	2432.8	3091.4	3041.3	2046.3
1990	2554.5	2807.6	1348.4	1816.5	4043.2	4086.0	3040.4	3158.4	3118.1	2108.5
1991	2579.4	2877.1	1436.5	1874.5	4219.3	4216.0	3082.7	3222.4	3259.2	2170.8
1992	2600.4	2985.8	1489.6	1870.4	4302.6	4332.0	3118.6	3278.8	3367.2	2217.0
1993	2615.9	3156.5	1531.4	1903.7	4379.3	4400.0	3157.6	3345.6	3433.9	2275.0
1994	2640.5	3119.5	1553.6	2007.7	4382.1	4448.0	3196.9	3400.3	3493.2	2336.0
1995	2621.5	3206.9	1567.1	2100.5	5207.4	4509.0	3232.5	3467.3	3551.2	2383.0
1996	2625.1	3257.7	1594.4	2107.2	5227.9	4638.0	3275.5	3514.2	3641.3	2417.0
1997	2619.7	3322.1	1613.4	2120.6	5256.0	4820.0	3311.2	3560.3	3701.9	2454.0
1998	2612.5	3379.3	1621.9	2094.3	5287.6	5000.0	3328.2	3603.2	3783.9	2499.0
1999	2625.2	3398.6	1630.9	2089.0	5314.7	5205.0	3358.1	3601.4	3796.3	2514.9
2000	2726.1	3450.7	1660.2	2060.9	5441.8	5572.0	3384.9	3577.6	3989.3	2566.0
2001	2796.7	3463.0	1677.8	2054.8	5475.3	5517.0	3414.5	3608.0	4058.6	2578.0
2002	2858.6	3500.5	1711.3	2130.6	5527.0	5522.0	3443.0	3644.5	4134.4	2589.0
2003	2918.7	3544.9	1756.7	2168.2	5620.6	5536.0	3476.0	3694.8	4395.9	2601.0
2004	2992.0	3605.2	1814.0	2214.0	5728.1	5587.0	3507.0	3747.1	4681.9	2631.8
2005	3100.8	3669.7	1868.5	2276.7	5840.7	5662.4	3537.0	3801.5	5023.0	2703.0
2006	3172.4	3741.0	1949.6	2321.1	5960.0	5718.7	3564.0	3842.2	5250.1	2760.0
2007	3405.0	3818.0	2015.3	2369.6	6081.4	5772.7	3584.0	3883.4	5402.7	2769.0
2008	3486.5	3916.0	2079.8	2404.5	6187.6	5835.5	3607.0	3910.1	5553.7	2799.0

Continue

Codes	21	22	23	24	25	26	27	28	29	30
Years	Hainan	Sichuan &Chong qing	Guizhou	Yunnan	Tibet	Shaanxi	Gansu	Qinghai	Ningxia	Xinjian g
1978	221.5	3087.0	1053.7	1313.4	93.1	1077.7	694.0	144.7	135.6	491.3
1979	226.2	3143.6	1060.6	1342.7	98.2	1104.5	713.0	150.3	139.5	497.3
1980	231.5	3259.7	1109.6	1404.2	101.1	1158.0	796.0	157.6	146.5	506.4
1981	242.5	3347.6	1153.0	1479.8	100.5	1202.2	842.0	165.6	149.7	523.9
1982	247.1	3467.5	1207.1	1543.6	102.6	1250.4	870.0	171.2	155.6	534.6
1983	253.1	3564.6	1234.2	1583.2	102.0	1285.3	993.8	174.3	162.6	545.8
1984	259.2	3643.1	1285.3	1620.3	104.6	1336.9	1047.0	177.4	169.8	558.8
1985	268.4	3743.1	1335.2	1672.3	105.7	1375.0	1081.4	182.7	177.4	565.8
1986	275.7	3885.8	1383.2	1731.4	107.4	1409.2	1098.9	189.2	183.1	574.7
1987	280.8	3967.4	1435.9	1777.5	107.8	1448.7	1139.7	193.7	190.9	584.9
1988	292.0	4090.1	1501.3	1826.9	107.2	1494.1	1178.8	197.8	197.4	593.7
1989	298.4	4179.6	1570.8	1880.7	107.6	1528.9	1214.0	200.8	203.5	599.6
1990	304.6	4265.2	1651.8	1922.7	107.9	1576.3	1292.4	241.3	211.2	617.7
1991	318.1	4425.1	1701.5	1989.5	109.7	1639.7	1302.4	245.2	219.2	638.5
1992	322.5	4521.2	1739.0	2032.5	110.9	1671.5	1305.9	249.2	225.9	646.9
1993	333.3	4556.9	1779.0	2071.5	112.4	1707.6	1417.8	253.3	229.4	656.0
1994	335.6	4588.0	1828.3	2108.7	114.3	1719.5	1438.8	257.5	232.7	657.5
1995	334.5	4619.1	1812.2	2149.0	115.1	1747.7	1483.3	261.7	240.6	676.0
1996	333.3	4627.2	1783.2	2186.2	117.7	1775.6	1521.5	266.0	245.4	684.0
1997	341.6	6356.6	1796.7	2223.5	120.5	1791.6	1530.3	270.4	256.8	715.4
1998	326.7	6362.4	1844.4	2240.6	120.2	1788.4	1539.8	274.8	254.8	680.9
1999	326.8	6353.4	1832.5	2244.0	123.9	1808.0	1489.0	279.3	272.3	694.3
2000	334.6	6348.4	1866.3	2295.4	124.2	1813.0	1476.5	283.9	275.5	672.5
2001	338.4	6345.2	2068.0	2322.5	126.3	1785.0	1488.9	287.3	279.0	685.4
2002	349.9	6322.1	2106.1	2341.3	130.2	1874.0	1500.6	291.3	282.4	701.5
2003	360.3	6318.3	2145.0	2353.3	132.8	1912.0	1510.9	295.4	291.4	721.3
2004	371.1	6314.9	2186.0	2401.4	137.3	1941.0	1520.5	296.6	298.1	744.5
2005	379.3	6313.6	2220.0	2461.3	143.6	1976.0	1391.4	297.8	299.6	791.6
2006	382.4	6320.5	2235.0	2517.6	148.2	2011.0	1401.4	303.9	308.1	811.8
2007	400.0	6352.0	2280.0	2573.8	158.2	2041.0	1414.8	312.4	309.5	830.4
2008	408.4	6386.4	2292.1	2638.4	163.5	2069.0	1446.3	317.2	303.9	847.6

3. Capital Stock (100 million yuan)

Codes	1	2	3	4	5	6	7	8	9	10
Years	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Liaoning	Jilin	Heilongj iang	Shanghai	Jiangsu
1978	32.1	22.5	48.1	29.6	19.1	59.2	20.1	25.6	49.6	41.8
1979	35.3	24.9	52.7	31.2	20.7	63.3	21.4	28.0	53.3	46.0
1980	38.9	27.4	56.3	32.7	21.6	65.8	22.8	30.3	59.7	50.7
1981	41.8	28.8	58.5	33.9	22.5	67.7	23.9	33.2	67.2	55.3
1982	44.0	31.0	62.7	35.9	24.0	70.6	25.4	37.4	76.6	62.0
1983	48.1	33.8	68.1	38.8	26.3	75.1	27.1	42.6	83.6	69.1
1984	54.5	37.1	75.2	43.3	29.2	83.1	30.0	48.3	94.4	79.4
1985	70.6	43.6	84.9	49.6	32.9	94.3	34.2	55.2	115.3	92.8
1986	82.6	50.4	94.1	55.7	36.1	107.4	38.1	62.8	140.3	109.4
1987	98.1	56.0	103.0	62.5	39.5	122.2	42.9	70.6	165.0	127.4
1988	114.5	64.1	113.6	68.9	44.6	140.3	48.2	78.2	197.5	148.5
1989	132.6	70.8	125.3	75.1	49.5	156.3	53.4	86.0	229.0	167.1
1990	149.9	76.8	138.2	81.4	54.6	172.7	59.6	94.3	254.6	187.2
1991	165.8	84.1	151.7	86.5	59.8	190.2	65.7	101.4	277.8	209.9
1992	186.2	94.0	168.5	93.4	67.6	210.3	71.8	109.5	310.6	245.5
1993	215.2	106.0	191.0	102.3	77.9	240.3	79.3	118.4	354.3	291.5
1994	254.0	120.1	217.1	112.2	87.6	269.8	88.6	127.8	416.2	340.9
1995	301.4	135.4	249.3	120.8	97.0	296.1	98.0	138.7	493.1	396.6
1996	337.7	152.4	287.8	130.2	107.8	320.4	111.2	150.9	584.9	454.6
1997	376.8	171.6	332.8	141.3	118.9	345.3	122.2	163.1	675.3	514.0
1998	420.7	191.7	384.9	159.6	131.2	371.5	134.6	179.7	760.9	584.3
1999	469.5	211.2	439.6	175.2	144.2	397.8	148.0	193.1	841.7	661.0
2000	514.6	233.0	496.6	191.9	158.5	428.1	161.6	205.6	928.2	744.8
2001	566.7	258.0	555.1	210.1	172.3	462.8	177.2	220.6	1023.2	832.6
2002	622.7	286.7	616.3	231.0	193.2	504.3	194.9	240.3	1122.7	932.1
2003	683.6	322.0	686.9	258.4	226.5	563.2	216.9	258.0	1243.3	1060.5
2004	752.1	365.8	771.7	292.1	275.0	655.9	243.3	281.6	1384.5	1223.0
2005	846.0	415.6	864.6	337.9	346.6	761.5	279.4	308.8	1546.1	1396.9
2006	864.6	426.9	924.5	368.1	393.7	806.2	310.6	326.5	1530.6	1495.5
2007	876.7	434.1	946.4	376.2	396.8	799.4	330.0	331.6	1538.5	1517.3
2008	871.0	443.0	990.6	389.2	401.7	823.9	366.0	344.7	1535.6	1551.3

Continue

Codes	11	12	13	14	15	16	17	18	19	20
Years	Zhejiang	Anhui	Fujian	Jiangxi	Shandong	Henan	Hubei	Hunan	Guangdong	Guangxi
1978	23.9	14.7	12.6	18.7	49.2	38.8	30.3	24.4	16.9	22.1
1979	25.8	15.4	13.9	20.5	53.3	41.3	32.0	26.1	19.5	23.5
1980	28.5	16.1	15.5	22.0	58.0	44.0	33.2	27.5	22.5	25.1
1981	31.2	16.6	17.1	23.3	62.1	47.1	34.8	28.9	26.7	26.6
1982	34.4	17.9	18.9	24.8	67.6	49.7	37.4	30.7	31.4	28.0
1983	37.3	19.7	20.7	26.4	73.7	54.9	40.1	32.8	35.9	29.4
1984	42.8	22.4	22.9	28.6	81.9	60.7	44.1	34.9	41.3	31.0
1985	50.5	26.2	26.2	31.4	92.7	68.1	50.0	38.4	50.0	33.9
1986	59.8	30.4	30.2	34.6	104.1	75.2	55.8	42.7	58.7	37.1
1987	70.7	34.5	34.5	38.2	119.0	83.5	61.9	47.6	68.4	40.3
1988	82.6	38.7	38.9	42.7	135.4	94.1	69.2	53.3	80.3	43.6
1989	92.6	42.2	43.1	46.9	152.1	104.7	74.4	57.7	92.2	46.4
1990	99.9	46.0	47.3	50.1	169.7	114.9	81.0	61.7	104.4	48.6
1991	110.2	49.6	52.6	53.9	191.9	126.2	87.6	66.6	118.3	51.6
1992	127.2	54.6	60.0	59.9	220.3	141.2	96.0	73.4	141.8	57.2
1993	153.7	62.2	71.7	67.6	257.4	157.0	107.3	82.0	176.9	65.3
1994	183.2	72.0	88.5	75.6	296.6	174.2	122.3	92.2	216.6	74.4
1995	223.4	83.5	108.3	84.3	339.8	195.4	140.4	104.4	258.2	85.1
1996	266.2	96.8	130.8	93.5	390.0	219.2	160.6	116.8	299.4	95.3
1997	312.4	110.9	155.9	104.8	448.1	246.1	185.2	130.7	337.4	105.6
1998	364.2	125.8	184.7	117.0	512.0	276.3	213.0	146.4	380.3	117.3
1999	416.2	139.7	215.6	130.1	580.2	308.4	244.4	162.4	426.6	129.3
2000	469.3	154.5	247.6	143.0	658.1	342.5	277.0	180.0	472.6	142.0
2001	525.1	170.5	281.5	157.6	739.6	378.2	308.3	200.1	523.7	156.6
2002	591.0	188.5	318.2	176.0	827.8	417.4	339.1	222.4	577.9	173.3
2003	677.4	208.0	359.8	201.9	927.9	460.2	370.5	246.1	649.9	192.9
2004	780.3	234.4	407.3	232.7	1054.4	515.5	408.6	275.5	735.6	216.9
2005	891.6	266.0	453.9	266.0	1198.5	582.6	448.5	307.9	849.8	247.4
2006	941.5	297.0	468.9	296.5	1406.6	637.9	487.6	326.7	873.9	269.2
2007	972.9	318.8	480.3	300.0	1430.7	672.0	504.4	338.9	877.7	275.3
2008	982.5	328.8	509.4	317.3	1486.9	704.2	523.3	351.3	897.4	287.0

Continue

Codes	21	22	23	24	25	26	27	28	29	30
		Sichuan								
Years	Hainan	&Chong qing	Guizhou	Yunnan	Tibet	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang
1978	8.2	46.5	15.3	21.7	0.9	28.8	31.1	7.5	9.7	16.1
1979	9.1	50.9	16.3	23.4	1.1	31.0	32.6	8.3	10.5	17.6
1980	10.1	55.4	17.0	25.0	1.2	32.6	33.5	8.9	11.1	19.1
1981	11.2	58.9	17.5	26.4	1.3	34.4	34.2	9.3	11.5	20.7
1982	12.4	63.0	18.2	28.3	1.5	37.0	35.2	10.0	12.0	22.7
1983	13.8	67.6	19.0	30.0	1.7	39.4	36.4	10.6	12.8	24.7
1984	15.4	73.3	20.2	32.5	1.9	42.8	37.9	11.3	13.7	27.4
1985	17.1	80.5	21.8	35.5	2.1	48.8	40.0	12.5	15.2	30.9
1986	19.0	87.7	23.5	38.5	2.4	55.0	42.9	13.5	16.9	34.4
1987	21.1	96.4	25.3	41.3	2.6	61.7	45.7	14.8	18.7	38.2
1988	23.5	106.2	27.3	44.9	3.0	69.6	49.0	16.0	20.6	42.7
1989	26.1	114.2	29.4	48.7	3.3	78.7	52.9	16.9	22.4	47.9
1990	28.3	122.3	31.2	52.4	3.7	85.9	57.1	17.7	24.3	53.3
1991	30.7	131.6	33.1	57.6	4.2	93.4	61.4	18.6	26.3	59.3
1992	35.2	143.3	35.4	64.5	4.7	100.3	66.1	19.7	28.3	68.1
1993	40.5	159.8	38.2	73.5	5.3	112.1	71.3	20.9	30.8	79.3
1994	46.8	178.4	40.7	82.8	6.0	124.5	76.9	22.1	33.0	92.1
1995	52.4	198.5	44.4	92.0	7.1	137.8	83.2	23.6	35.3	104.8
1996	56.9	228.2	48.4	102.2	7.9	151.5	90.0	25.4	37.9	114.6
1997	61.2	251.9	53.2	114.1	8.7	164.2	98.1	27.7	40.6	125.7
1998	66.1	279.9	59.0	126.7	9.6	180.6	107.2	30.3	44.2	139.8
1999	71.5	308.3	65.8	139.0	10.6	198.2	117.5	33.1	48.3	151.1
2000	77.3	338.1	73.8	150.8	11.7	220.7	128.8	36.3	53.3	161.4
2001	82.6	373.8	83.5	166.8	12.7	246.1	140.2	40.5	59.4	175.6
2002	88.2	416.1	93.8	181.7	14.3	274.9	154.4	45.4	66.7	191.6
2003	94.8	468.1	105.4	201.4	16.8	312.8	170.1	51.2	76.0	212.0
2004	102.1	528.0	117.9	224.6	21.0	357.6	187.5	57.1	86.4	235.9
2005	110.6	599.5	131.8	256.7	25.2	407.1	209.4	63.6	98.9	262.4
2006	112.7	661.1	142.3	279.9	27.8	426.4	220.4	69.1	101.1	309.9
2007	112.9	653.8	144.4	283.3	26.9	437.5	218.1	69.5	103.3	330.0
2008	112.2	668.8	151.7	293.2	27.9	456.4	222.2	72.1	106.3	336.4

4. Export (100 million yuan)

Codes	1	2	3	4	5	6	7	8	9	10
Years	Beijing	Tianjin	Hebei	Shanxi	Inner Mongolia	Liaoning	Jilin	Heilongj iang	Shanghai	Jiangsu
1978	4.80	14.56	4.65	0.12	0.17	25.60	0.40	0.76	48.72	7.05
1979	6.49	18.98	6.47	0.21	0.22	40.43	0.69	1.16	57.15	9.63
1980	8.88	23.10	9.12	0.23	0.40	59.62	0.99	1.47	63.90	12.79
1981	10.78	26.20	13.07	0.49	0.78	74.00	2.20	2.28	64.91	18.70
1982	11.61	26.96	15.33	0.57	1.37	81.40	2.50	3.31	68.24	22.63
1983	290.22	28.20	16.14	0.56	1.13	77.46	3.29	5.40	72.08	27.12
1984	406.40	28.62	17.64	3.86	1.83	115.77	5.79	7.87	83.22	34.50
1985	128.45	33.85	38.13	6.66	4.03	148.06	12.54	12.12	98.70	46.57
1986	128.20	43.33	36.36	10.44	5.91	106.35	18.13	21.25	123.68	64.56
1987	131.90	56.47	55.26	12.86	8.43	140.99	17.41	30.23	154.84	78.80
1988	147.35	62.63	57.55	12.83	10.94	144.19	19.81	34.89	171.40	89.98
1989	113.84	63.48	67.74	15.06	12.66	167.40	25.77	38.68	189.46	95.49
1990	211.11	85.41	90.91	12.58	15.52	268.15	35.96	51.97	254.51	140.81
1991	243.34	85.51	107.56	17.14	22.29	307.26	54.67	73.33	305.56	182.32
1992	309.39	96.63	107.42	20.51	32.47	340.75	72.06	100.98	361.48	220.68
1993	386.01	111.92	96.80	21.95	37.38	357.88	93.14	97.18	425.35	268.06
1994	718.98	206.83	198.49	56.37	51.34	591.67	174.31	106.98	782.32	576.27
1995	855.96	250.40	239.37	95.51	50.81	689.63	118.53	97.41	966.80	816.87
1996	675.09	336.65	256.90	81.23	57.03	693.24	125.08	89.97	1100.63	964.53
1997	796.74	416.00	269.82	93.99	60.95	737.29	77.34	108.37	1220.59	1167.95
1998	870.38	455.23	258.00	73.95	68.17	666.30	62.01	75.02	1321.01	1295.77
1999	819.84	524.18	258.25	69.49	75.01	678.82	84.40	78.66	1555.08	1515.71
2000	990.85	714.35	306.87	102.39	84.59	898.07	102.79	120.12	2098.91	2133.33
2001	974.40	786.46	327.45	121.53	94.40	919.57	121.13	133.44	2286.77	2390.19
2002	1044.05	959.71	380.25	137.56	113.47	1023.53	146.35	164.52	2653.19	3184.96
2003	1397.72	1189.73	490.71	187.56	119.26	1211.03	178.95	237.93	4012.86	4894.99
2004	1702.48	1726.99	773.08	333.96	139.18	1565.78	141.95	304.79	6085.10	7241.92
2005	2528.44	2245.73	895.09	289.06	169.15	1920.13	202.08	497.40	7433.31	10074.33
2006	3025.62	2673.73	1023.16	330.06	170.71	2257.61	238.89	672.53	9053.81	12788.27
2007	3720.36	2901.78	1293.94	496.77	224.12	2686.49	293.38	932.91	10944.29	15491.84
2008	3990.25	2932.86	1668.89	642.06	248.60	2920.41	331.39	1151.07	11761.53	16531.86

Continue

Codes	11	12	13	14	15	16	17	18	19	20
Years	Zhejiang	Anhui	Fujian	Jiangxi	Shandong	Henan	Hubei	Hunan	Guangdong	Guangxi
1978	0.882	0.179	3.202	0.857	0.706	1.723	2.678	2.223	23.374	4.191
1979	1.411	0.433	3.833	1.331	0.847	2.087	3.507	3.467	26.466	4.457
1980	3.636	0.597	5.448	1.389	1.637	3.063	3.761	4.702	32.881	5.480
1981	7.513	1.495	6.842	3.305	1.455	4.254	5.637	6.053	50.127	6.244
1982	10.543	2.681	7.008	3.121	2.514	4.822	6.895	7.263	53.761	6.485
1983	12.884	3.368	7.310	4.274	2.304	5.525	8.140	7.905	59.280	6.772
1984	17.096	5.655	9.087	5.425	33.460	7.928	10.638	9.675	92.336	7.474
1985	27.536	9.013	16.362	7.554	52.799	10.780	15.560	11.631	115.115	10.926
1986	37.680	12.685	23.702	10.540	65.919	15.628	25.049	17.369	232.719	14.859
1987	45.933	19.465	33.648	14.970	24.326	24.355	35.544	23.057	377.421	20.223
1988	55.461	20.610	52.705	18.215	98.110	27.935	36.461	23.769	551.504	20.258
1989	70.491	21.448	68.826	17.676	108.998	30.835	36.258	25.062	681.973	21.999
1990	104.695	31.286	117.143	27.754	41.520	41.465	45.196	38.264	1062.875	34.891
1991	154.710	37.505	167.549	27.050	57.476	55.520	60.155	49.815	1441.177	44.315
1992	196.941	45.837	241.907	35.683	189.916	45.017	63.879	77.836	1845.075	61.119
1993	249.099	55.545	297.247	35.384	177.600	43.530	70.725	65.572	2154.642	76.341
1994	524.583	109.990	554.200	68.962	323.991	88.119	148.108	123.524	4327.535	138.091
1995	642.845	131.714	660.402	84.374	483.444	113.372	165.713	121.174	4725.998	187.551
1996	668.584	145.811	696.929	70.873	580.411	103.097	126.877	107.315	4934.145	159.317
1997	838.192	166.243	850.169	92.380	553.546	106.659	159.234	120.033	6181.206	197.518
1998	899.626	166.850	824.919	84.339	519.129	98.252	141.333	106.213	6260.490	200.202
1999	1065.521	138.791	856.964	75.011	553.971	93.453	125.315	106.128	6432.653	103.231
2000	1609.552	179.812	1068.599	99.122	783.214	123.628	159.848	136.849	7609.423	123.612
2001	1901.845	188.903	1152.350	86.023	896.742	141.990	148.796	145.179	7897.996	102.266
2002	2434.350	203.069	1437.786	87.101	1061.661	175.370	173.731	148.607	9804.769	124.796
2003	3442.817	253.627	1749.073	124.626	1496.868	246.689	219.815	177.646	12651.229	163.063
2004	4812.660	325.820	2432.946	165.154	2061.627	345.647	280.075	256.397	15855.783	198.274
2005	6291.515	425.180	2854.148	199.881	2509.743	417.853	364.518	306.916	19510.254	235.709
2006	8043.089	544.966	3289.303	299.187	2920.947	528.927	498.926	406.084	24070.691	286.876
2007	9753.874	670.768	3797.467	414.017	3602.337	638.086	621.535	496.041	28076.934	388.805
2008	10713.99	788.457	3958.140	536.624	4512.227	744.088	805.082	584.048	28071.261	510.546

Continue

Codes	21	22	23	24	25	26	27	28	29	30
		Sichuan								
Years	Hainan	&Chong qing	Guizhou	Yunnan	Tibet	Shaanxi	Gansu	Qinghai	Ningxia	Xinjiang
1978	0.172	0.321	0.048	1.170	0.027	0.200	0.582	0.166	0.382	0.158
1979	0.264	0.417	0.109	1.383	0.032	0.133	0.618	0.112	0.580	0.135
1980	0.274	0.561	0.246	1.438	0.038	0.146	0.588	0.060	0.652	0.256
1981	0.779	1.336	0.617	1.761	0.045	0.446	0.739	0.078	0.747	0.806
1982	0.384	1.815	0.856	2.068	0.077	0.947	0.820	0.076	0.808	1.710
1983	0.312	1.837	0.827	2.342	0.095	1.072	0.911	0.204	0.584	1.916
1984	0.954	3.528	1.055	2.584	0.090	2.242	1.061	0.401	0.726	3.704
1985	2.382	7.188	1.178	3.789	0.149	3.042	2.084	0.378	1.003	5.292
1986	1.326	11.684	2.196	5.833	0.292	5.924	3.490	0.579	1.843	7.090
1987	4.297	25.377	3.460	9.762	0.452	9.894	4.712	0.420	2.349	8.297
1988	10.979	30.372	4.312	12.728	0.598	13.402	5.659	0.308	3.060	11.124
1989	13.585	35.167	5.016	14.097	0.746	14.410	5.775	0.241	2.352	13.510
1990	22.547	49.919	7.346	20.783	0.667	22.031	8.884	0.106	3.673	16.038
1991	35.647	68.880	10.092	21.345	0.859	32.207	13.459	0.128	4.806	19.333
1992	48.595	76.146	12.366	25.727	1.064	42.204	19.399	0.748	6.218	25.029
1993	51.948	83.770	14.112	30.130	0.866	57.244	16.334	1.307	6.410	28.527
1994	85.065	155.542	32.187	78.444	4.229	104.816	32.185	1.707	12.614	49.654
1995	69.313	189.609	35.929	101.505	2.918	107.111	18.331	2.020	20.052	64.202
1996	69.949	146.280	36.212	91.149	3.776	105.525	22.264	7.497	16.820	45.707
1997	73.751	168.220	39.989	97.176	4.153	102.064	31.317	3.346	20.893	55.166
1998	73.239	139.567	32.118	97.177	6.092	97.419	29.193	0.806	23.373	66.886
1999	61.971	135.029	29.620	85.633	7.123	95.387	26.241	1.738	20.501	85.054
2000	66.466	197.818	34.819	97.284	9.382	108.450	34.351	3.952	27.100	99.679
2001	66.294	222.236	34.904	102.976	6.824	91.911	39.424	4.616	29.122	55.331
2002	67.813	314.759	36.569	118.332	6.713	113.988	45.435	3.776	27.155	108.304
2003	71.940	396.783	48.697	138.771	10.070	143.625	72.606	5.402	42.374	210.419
2004	90.426	438.662	71.767	185.303	10.767	198.360	82.468	9.994	53.505	252.159
2005	83.763	591.558	70.387	216.390	13.543	251.961	89.370	7.384	56.286	412.881
2006	115.955	795.265	82.806	270.358	17.715	289.344	120.314	9.368	75.174	569.125
2007	139.683	997.339	111.408	360.135	24.818	355.292	126.167	17.197	82.770	874.696
2008	129.407	1307.74	132.015	346.349	49.116	373.692	111.272	18.732	87.417	1340.35