Wage Determination in High-paid Industries in Guangdong

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Abstract

This paper evaluates dominance of the supply side versus the demand side in the wage determination of skilled labor through banking and transportation industries in Guangdong, China. The method for decomposition of effects is based on the now standard model from Parkin and Bade (2010) and is detailed in Section 2. The general data from Guangdong Economic Census (GEC) 2004 and Guangdong Statistical Yearbooks (GSY) 2004, 2005, and 2010 used in the decomposition are presented in Section 4. I find that the demand side makes a very significant contribution to the wage rate. However, an examination of elasticity demonstrates that the responses of firms and job applicants to variations in wages are minimal.

1. Introduction

Since the opening up of China in the late 1980s, Guangdong has captured the attention of economists around the globe for its fast paced growth.[1] Taking advantage of the economic policies, specifically the Special Economic Zones, the coastal regions have emerged as the epicenter of China's economy (Naughton 2007). Maruya (1992) notes that the adjacency of Guangdong to Hong Kong gives the province an edge in the regional marketization and external-oriented development strategy. A report from the National Bureau of Statistics of China (NBSC) shows that the contribution of the service sector in Guangdong is conspicuous with respect to the economic and social development in the corresponding territory. From 1979 through 2003, the value-added of the tertiary sector increased at the rate of 14.11 percent annually, which was 0.7 percent higher than annual GDP growth (NBSC 2005). In comparison to other sectors, the service sector had higher employment elasticity over twenty-five years (Table 1), as service has become the main channel of employment since the 1990s (NBSC 2005). The tertiary sector as defined by the NBSC is the workforce in capital and technology intensive trades and new service trades (Wang 2003).

Given the increasing weight of the tertiary sector in the economy of Guangdong and its impact on the provincial employment, I assume that there are interactions between the dual forces (namely, labor supply and labor demand) in the labor market and the skill composition of employees who work in the high-paid industries of the sector. According to the studies referred to in Fan and Lai's work (2006), 24.4 percent of the economic growth from 1952 to 2003 resulted from education investment. In addition, this rate of

[1] See Marya (1992) and Naughton (2007) for growth figures and a more rigorous discussion of their foundation.

contribution leaped to 29.7 percent after the market-oriented economy restructuring.

Table 1

Sectoral Employment Elasticity in Different Periods

	1978-2003	1978-1990	1990-2003
Primary Sector	-0.036	-0.021	-0.035
Secondary Sector	0.286	0.451	0.158
Tertiary Sector	0.312	0.382	0.31

Source: http://www.stats.gov.cn/was40/gjtjj_detail.jsp?searchword=%B9%E3%B6%AB+%B7%FE%CE%F1%D2%B5&channelid=6697&record=2

In Lemieux's opinion, education and labor market experience are the primary composition effects on wage inequality (2006). Hence, the effects of education investment on economic growth are translated via the education attainment of employees, which will be specified as the educational degrees at an undergraduate level or higher in the subsequent analysis.

2. Framework of Analysis

This section first defines the term 'high-paid industries' as used in this paper, and then introduces the model on which my analysis relies.

High-Paid Industries

Since there is no established standard for 'high-paid' industries, I will define such industries as the ones where graduates from colleges and vocational schools can earn high salaries in six months after graduation.[2] A survey conducted by Li and Wang (2011) describes the situation of the employment of college graduates using 445,000 cases. The subjects are the graduates from higher education institutions including vocational schools in 2011. The five highest paid industries are securities (3501 yuan), holding and other investment firms (3354 yuan), air transportation (3314 yuan), banking and credit unions (3289 yuan), and petroleum and gas exploration (3232 yuan). The duration of this paper takes the banking and transportation industries as a fair representation of the high-paid service sector.

Model

Decomposition methods have been used extensively to answer questions such as what accounts for the wage gap in the United States between two periods. The methods

[2] This definition comes from the results of the survey conducted by Li and Wang.

employed by economists for decomposition are mostly related to statistics (Fortin, Lemieux, and Firpo 2010), where a data set is obtained before using the method. In this paper, I will turn to a simpler approach introduced by Parkin and Bade (2010). This method decomposes labor demand and labor supply through the comparison of the effects due to single demand shock and single supply shock on price and labor.

The linear functions I will use for labor demand and labor supply respectively are:

$$w_n^S - w_t = k^S(L_n^S - L_t) \text{ for labor supply} \quad (1)$$

$$w_n^D - w_t = k^D(L_n^D - L_t) \text{ for labor demand} \quad (2)$$

where n represents the period[3] in which the function above is applicable, w_t and L_t denote the actual wage and the actual number of employees in an industry at time t, the parameter k denotes the effect of a change in labor supplied or demanded on wage, w_n and L_n are variables for wage and labor[4] respectively.

In times of shocks to labor supply and labor demand, I assume that at the same wage rate, labor supply and labor demand change based on the size of the shifts. This indicates parallel shifts for the lines, w_n^S and w_n^D. Hence, I have the following equations.

$$w_2^S - w_{2004} = k^S[L_2^S - (L_{2004} + \Delta L^S)] \quad (3)$$

$$w_2^D - w_{2004} = k^D[L_2^D - (L_{2004} + \Delta L^D)] \quad (4)$$

where ΔL^S and ΔL^D represent the supply shift and the demand shift respectively.

3. Estimating Slopes and Shifts

This section elaborates upon the treatment of slopes and shifts. I first set a range for the slopes of the demand and supply functions. Then I use a proxy for the supply shift to back out the demand shift in a certain industry.

Sensitivity Analysis for Slopes

Given that the model is simple, I assume the slope for labor supply being an element of the set {0.5, 1, 1.5, 2} and the slope for labor demand being an element of the set {-0.5, -1, -1.5, -2}. Therefore, there are 16 slope pairs for (k^S, k^D).

[3] There are two periods for each industry in my analysis. 1 and 2 refer to 2004 and 2009 respectively.
[4] The variable for labor refers to the skilled labor who are graduates from specialized areas related to the industries. Section 3.3 will discuss this in greater detail.

Estimating Shifts

As the procedure set forth at the beginning of Section 3, I will start to estimate the size of the shift for labor supply in Guangdong. The supply shifts are industry-specific. An example helps to illustrate the point: the graduates from nursing schools usually do not seek jobs in oil refineries, which means that they are more likely to work in the area of their study such as hospitals. Hence, the supply shift for the banking industry will be the change in the number of graduates in finance and economics.[5] I will use the data for the graduates in science and engineering[6] to compute the supply shift for the transportation industry because the development of transportation in part hinges on the advancement of the technologies applied to vehicles and public transit systems. The difference in the number of total graduates from the areas mentioned above between 2004 and 2009 is the supply shift. I collect the data from GSY 2005 and GSY 2010 and compute the supply shifts for each industry as follows.[7]

ΔL^S =19 for the banking industry and ΔL^S =42 for the transportation industry.

With slopes and supply shifts at hand, I can derive the demand shifts for each industry by solving $w_2^S = w_2^D$, which gives

$$\Delta L^D = L_2^D - L_{2004} - \frac{k^S}{k^D}[L_2^S - (L_{2004} + \Delta L^S)] \tag{5}$$

Noting $L_2^D = L_2^S = L_{2009}$, hence the demand shifts are identified and the model is ready for decomposition.

4. Data

The data from GEC 2004 and GSY 2010 yield Table 2 and Table 3.

Table 2

Average Wage of Staff and Worker by Industry (1000 yuan)

Year	Banking	Transportation
2004	27	18
2009	92	46

(Source: GEC 2004)

[5] Note: The term “finance and economics” refers to the category of the graduates’ specializations instead of a specific program. Similar for “science and engineering”.
[6] See footnote 5.
[7] The supply shifts are presented in thousands.

Table 3

Number of Employed Persons by Industry (1000 persons)

Year	Banking	Transportation
2004	350	590
2009	405	1389

(Source: GSY 2010)

According to the Consumer Price Index released from GSY 2005 and GSY 2010, the inflation rate between 2004 and 2009 is roughly three percent. This factor does not affect the results of decomposition as we can see the increase in wage is very significant.

5. Results

This section first states the method which is used for calculating the effects due to either supply shifts or demand shifts. Then, I will use the assumptions and data to see if labor supply or labor demand dominates in the determination of wages, which reflects how skilled workers are rewarded. Finally, I will investigate supply and demand elasticities in each industry to inform the discussion on firm and individual responses to wage fluctuations.

Decomposition

When there is only a shock to labor supply, the line for labor supply shifts rightward but the line for labor demand remains unchanged. Thus, the effect from the supply shift in an industry can be calculated through $w_2^S = w_1^D$. Rearranging the equation, I have the following:

$$L_S = \frac{k^S(L_{2004} + \Delta L^S) - k^D L_{2004}}{k^S - k^D} \tag{6}$$

where L_S denotes the labor supply after the shock. Likewise, w_S denotes the wage post-shock and it can be obtained by plugging L_S into (3). Similarly, I can use $w_2^D = w_1^S$ to analyze the effect resulting from the demand shift. I denote L_D and w_D as the labor demand and the wage rate post-shock. The equation above gives the following:

$$L_D = \frac{k^S L_{2004} - k^D(L_{2004} + \Delta L^D)}{k^S - k^D} \tag{7}$$

By plugging L_D into (4), w_D is obtained.

Applying Assumptions and Data

Given the assumptions for slopes and shifts in Section 3, the actual data for the two periods in Section 4, and the steps for analyzing effects from a single shock in the previous subsection, I generate Table 4 and Table 5[8] for the banking industry and the transportation industry respectively. It turns out that the demand shifts in both industries are primary reasons for the equilibrium wage and labor in 2009. On average, the demand shift in the banking industry is 4 times more than the supply shift, and the demand shift in the transportation industry is 42 times more than the supply shift. It is surprising that the proxy for the supply shift in the banking industry approximately matches what Su (2009) concludes about the impact of the expansion in higher education institutions since 1999. In terms of the banking industry, the model data using the slope pair (1.5, -1) exactly matches the actual wage rate in 2009 since, based on my analysis, the demand shift being the second shock to the labor market determines the position in equilibrium. As for the transportation industry, the demand shift exceeds the supply shift so much that the wage rate (model data) in 2009 is far away from the actual wage rate. I believe this result is in part attributable to the financial support from the central government for transportation, which is not captured in the model. According to a report on the achievement of the 10th five-year plan,[9] the 10th five-year period witnessed "the rapid and high-quality development of the transportation industry due to the large-scale investment" (NBSC 2011). Nonetheless, the equilibrium labor elicited by using the slope pair (0.5, -2) roughly matches the actual data in 2009.

Supply and Demand Elasticities

Following the results in the previous subsection, I will use the slope pairs, (1.5, -1) and (0.5, -2), and the actual data to calculate the elasticities for the banking industry and the transportation industry respectively.

$$\varepsilon = (k \frac{L_{2009}}{w_{2009}})^{-1} \tag{8}$$

where ε denotes the elasticity of interest.[10] Table 6 summarizes the elasticities for the two industries by plugging numbers into (8).

The elasticities in Table 6 show that two industries are inelastic to the changes in wages. Compared with the banking industry, the transportation industry is more inelastic to the fluctuation in wages, in both labor supply and labor demand.

[8] See Appendix for Tables 4 and 5.

9 The 10th five-year plan covers 2006-2010.

[10] The type of elasticity (i.e. supply elasticity or demand elasticity) is consistent with the type of slope used.

Table 6

The Elasticities for the Two Industries

Industry / Elasticity	ε^S	ε^D
Banking	0.15	-0.23
Transportation	0.07	-0.02

6. Conclusion

This paper employs a simple model (Parkin and Bade 2010) to evaluate whether the supply side or the demand side dominates the high-paid labor markets in the tertiary sector of Guangdong. The results thus inform how the wage of skilled workers is determined. The results show that the demand side plays the major role in the equilibrium as of 2009 in both industries. This reflects the ongoing high-speed development of the industries and the goals set by the central government in the 10th five-year plan (NBSC 2011). As stated in the latest 11th five-year plan (Casey and Koleski 2011), the banking and transportation industries will continue to improve the quality of services and benefit more residents living in the western regions of China.

I predict that the demand side is still going to be the dominant force in the high-paid labor markets. Both supply and demand elasticities show that the decisions of firms and job seekers are not easily affected by the change in wages. Moreover, as long as higher education institutions keep expanding their admissions and raising their quality of teaching, more skilled graduates will be available in the future. Given the fact that the tertiary sector is a primary destination of graduates in Guandong (NBSC, 2005), the high-paid industries in this sector should enhance their productivity by updating physical capital and human resource management such that the high-educated employees can be retained and the industries can keep thriving in the long run.

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Appendix

Table 4
The Effects in the Banking Industry

k^S	k^D	ΔL^D	L_S	w_S	L_D	w_D
1	-1	91	360	18	396	73
1	-0.5	127	363	21	392	69
1	-1.5	79	358	16	397	74
0.5	-1	73	356	21	399	51
0.5	-0.5	91	360	22	396	50
0.5	-1.5	67	355	20	400	52
1.5	-1	109	361	16	394	92
1.5	-0.5	163	364	20	391	88
1.5	-1.5	91	360	13	396	95
1	-2	73	356	14	399	76
0.5	-2	64	354	19	401	53
1.5	-2	82	358	11	397	97
2	-2	91	360	8	396	118
2	-1	127	363	14	392	112
2	-0.5	199	365	19	390	107
2	-1.5	103	361	11	394	115

Table 5
The Effects in the Transportation Industry

k^S	k^D	ΔL^D	L_S	w_S	L_D	w_D
1	-1	1556	611	-3	1368	796
1	-0.5	2313	618	4	1361	789
1	-1.5	1304	607	-7	1372	800
0.5	-1	1178	604	4	1375	411
0.5	-0.5	1556	611	8	1368	407
0.5	-1.5	1051	601	2	1379	412
1.5	-1	1935	615	-7	1364	1179
1.5	-0.5	3070	622	2	1358	1169
1.5	-1.5	1556	611	-14	1368	1185
1	-2	1178	604	-10	1375	803
0.5	-2	988	598	1	1381	413
1.5	-2	1367	608	-18	1371	1190
2	-2	1556	611	-24	1368	1574
2	-1	2313	618	-10	1361	1560
2	-0.5	3827	624	1	1355	1549
2	-1.5	1808	614	-18	1365	1568