Economic Impact of the Coca-Cola System on China

Chapter 3: Multiplier Analysis of the Coca-Cola System in China

Introduction

This chapter presents the major findings of this study based on a quantitative evaluation of Coca-Cola's economic impact on the Chinese economy. The Coca-Cola system is seen as a cluster of businesses that have far-reaching economic effects in China. The bottling system directly provides jobs and income for Chinese citizens, as well as tax revenue for local and central governments. More importantly, the system's local linkages generate a large economy-wide ripple effect. As the bottling system purchases inputs and hires workers, it creates additional income. The income is re-spent in other sectors, leading to further impacts on the local economy. The result is the economic multiplier effect.

This analysis uses the official Chinese input-output accounts for 1992, the most up-to-date version available. Input-output analysis accounts for all direct and indirect effects of any economic stimulus. The stimulus from Coca-Cola is based on primary data collected from a July 1999 survey of its bottlers in China. (The survey instrument is provided in Appendix A of this report.) The survey reflects the Coca-Cola system's production, employment, turnover, and tax payments at the end of 1998. The purchases by the bottling plants yield upstream impacts of the Coca-Cola system. Multiplier impacts are given for the downstream activities as well.

The multiplier effect of the Coca-Cola system is covered in detail in this chapter, beginning with an overview of the economic model. The methodology discussion is followed by a profile of the direct economic impacts. Next, the main findings, the indirect and total impacts of the bottling system, are discussed. An additional section presents the economic impact of the Coca-Cola system on government tax revenue and labor income and capital.

The most notable result is the large employment multiplier: 30 total jobs throughout the economy for every direct job in the bottling system. There are two approaches to calculating the multiplier impact of the Coca-Cola system on employment: the "adjusted average cost of job" and the employment coefficient. Interestingly, the results from these output approaches converge. The dual approach makes the job multiplier more credible.

The Input-Output Model

Input-output (I-O) analysis, the first practical economic impact tool employed throughout the world, is based on economy-wide matrices of government economic data. The matrices account for inter-industry flows of goods and services, final demand, and total output. Each industry is represented as both a column and a row in the matrix. The columns can be seen as a set of recipes for production in each industry, showing an industry's demands from all other industries. In essence, the upstream linkages are depicted in the columns of the table for each industry. Suppliers to all other industries are depicted as the rows of the table for each industry. The basic I-O matrix also includes final demand (consumption, investment, government, and trade) and total output for the economy.

I-O tables for China (1992) form the basis for calculating economic multiplier effects in this study.[1] To measure the impact of a new or ongoing project in an economy, the direct stimulus must be determined and then indirect effects are captured through calculations based on the I-O matrix. For example, the construction of a $15 million Coca-Cola bottling plant provides an initial impact of $15 million on the local economy. This is the direct stimulus. Clearly, the construction of the project will require concrete, steel, construction workers, and so forth. The money spent on these materials and services comprises the indirect expenditures or impacts. Every purchase in the bottling system has the potential to affect other elements in China's economy. Measuring the indirect effects is impossible without an I-O framework.

The stimulus effect of the Coca-Cola system is derived from the original survey data covering bottling system expenditures. Based on the responses, a profile of all purchases was constructed for the production system (23 of the 24 Coca-Cola bottling companies in China). Again, the purchases generate Coca-Cola's *direct* effects on China's economy. The direct impacts are then entered into the model as an *initial injection* into the economy that leads to further rounds of economic activity. Capital spending, which also directly impacts the economy, is included along with operational expenditures.[2]

After the direct effects have been ascertained, the China I-O model is used to estimate the ripple effects—the indirect and total impacts—of Coca-Cola-related economic activity. This calculation is based on the "Leontief inverse" matrix for China, derived from the 1992 China I-O table. The Leontief inverse (named for the Nobel laureate who invented modern input-output economics) captures all indirect effects in one large computation. For example, when upstream suppliers—PET manufacturers, printing companies, sugar refiners, and others—pay workers, buy inputs, and purchase new equipment, they generate more spending and income in the economy. The rounds of spending and income continue until the initial injection of spending from the Coca-Cola system no longer affects any sector of the economy. The Leontief inverse accounts for all rounds of spending and income traceable to the initial injection.

With the total economic impacts resulting from the initial injection, one can compute the multipliers for output, employment, and taxes. The multipliers simply compute a ratio of total (direct and indirect) effects to the initial stimulus. In a nutshell, the multiplier results given in this chapter provide a measure of the Coca-Cola system's support for economic activity in China.

They provide a benchmark from which it will be possible to gauge future effects, given updated I-O tables or new survey information.

To interpret the multiplier results correctly, it is necessary to acknowledge a few of the model's assumptions and limitations. First, I-O models assume a constant technology over time. In this case, the technology was determined by government surveys that led to the 1992 I-O table. Because technical change has taken place since 1992, the multiplier impacts might be somewhat distorted in various industries.

Another assumption is that China is considered a closed economy; that is, there are no imports or exports. This limitation is embedded in the Chinese I-O table, in which there is no external trade sector (imports and exports). This would be a major distortion for import-intensive or export-oriented operations, but not a major limitation in this case because most of the Coca-Cola system's expenditures were paid for domestic China's goods and services. Thus, the closed nature of the Chinese input-output table is not a major drawback in this application. In any event, imports are excluded from the impact analysis. At the same time, the model considers no exports, including concentrate exports from the Shanghai plant, which would boost the Chinese multiplier impact.

Finally, the Chinese model does not capture the price changes that have occurred since 1992. Using the 1992 I-O table assumes that pricing relationships in China have remained constant from 1992 through 1998. However, there have been notable changes. For example, distortions in the China price system in 1992 led to negative taxes (government subsidies) for the coal/mining industry, and money losses in the sugar and gas industries. In using the 1992 I-O table, these factors have to be held constant, implying that the impacts of Coca-Cola system on the tax revenue of those industries in 1998 are still negative. Since 1992, the price system has begun to reflect resource scarcity, which would likely have improved the efficiency of industries like sugar, gas, and coal/mining. Therefore, negative multipliers might disappear when an updated I-O table reflecting the present Chinese economy becomes available.

These limitations affect all applications of input-output analysis in China. Still, the I-O approach is the only way to quantify the extensive industry-specific impacts in the economy as a whole.[3]

Direct Effects of the Coca-Cola System

As described in the previous section, the direct effects of the Coca-Cola system derived from a survey of 23 Chinese Coca-Cola bottlers. This survey produced the first known economic profile of a multinational-local enterprise system in China suitable for use in an input-output framework. Respondents replied to detailed questions about total turnover, expenditures on production inputs, operational and capital payments, labor costs, and tax payments. The major findings are summarized in the Table 3.1.

The first section of Table 3.1 delineates the bottlers' production input, operational, and capital expenditures—the direct linkages between the Coca-Cola system and its major suppliers. The table indicates that concentrate, plastic materials, cans, sugar, commercial service, and

Table 3.1: Direct Operational and Capital Expenditures: Coca-Cola System in China (1998 Prices)

Units: 1000 RMB

1	Industrial Sectors		Local	Imported
	Coal	21,247	21,247	0
	Water	14,030	14,030	0
	Sugar	764,370	764,370	0
	Protective clothing	449	449	0
	Pallets (wood)	5,548	5,548	0
	Paper	252,644	252,644	0
	Office equipment	16,353	16,009	344
	Electricity	50,005	50,005	0
	Gas	1,130	1,130	0
	CO2	33,057	33,057	0
	Concentrate	1,160,904	1,160,904	0
	Lubricants	2,234	2,234	0
	Chemical consumables	80,292	80,292	0
	Plastic	1,064,948	1,064,948	0
	Glass	25,482	25,482	0
	Metal containers	5,751	5,751	0
	Crowns, Cans (empty for canning, if relevant)	1,211,155	1,211,155	0
	Fork lifts	33,294	13,110	20,184
	Fountains/vending equipment	209,138	181,757	27,381
	Cars	115,608	114,712	896
	Coolers	8,109	8,093	16
	Computers	18,200	16,514	1,686
	Plant maintenance	32,600	32,600	0
	Effluent and water treatment	2,152	2,152	0
	Building maintenance	6,096	6,096	0
	Transportation expense	11,757	11,757	0
	Communication expenses	11,999	11,999	0
	Commercial expenses	710,027	709,918	109
	Travel expenses	15,713	14,437	1,276
	Construction	854,113	581,191	272,922
	Training expenses	5,753	5,753	0
	Advertising expenses	174,996	174,996	0
	Legal fees	1,209	1,209	0
	Financial expenses	91,180	94,456	-3,276
	Insurance expenses	10,133	10,133	0
	Others	1,475,949	1,463,639	12,310
	Total	8,497,625	8,163,777	333,848
2	**Government Income**			
	Corporate tax	73,461	73,461	0
	Indirect taxes	299,118	299,118	0
	Local rates and taxes	9,965	9,965	0
	Other taxes and fees paid to government	4,926	4,926	0
	Total	387,470	387,470	0
3	**Labor Income**		**Permanent**	**Temporary**
	Skilled (secondary education or higher)	585,701	575,736	9,965
	Unskilled (less than secondary education completed)	269,778	179,721	90,057
	Total	855,479	755,457	100,022
4	**Number of Employees**		**Permanent**	**Temporary**
	Skilled (secondary education or higher)	8,730	8,000	730
	Unskilled (less than secondary education completed)	5,319	1,711	3,608
	Total	14,046	9,711	4,335

construction are the main sectors that directly benefit from Coca-Cola operations. These industries are considered part of the immediate Coca-Cola cluster, strongly linked, intermediate output sectors, the supplies necessary to produce the final products. The cash outflows from these sectors touch off the multiplier process. Note that Table 3.1 splits the operational and capital expenditures into local and imported spending. As indicated earlier, imports (which range from 2 to 4 percent, depending on whether the system is undertaking new plant construction in a given year) do not lead to further impacts and, thus, are excluded from the initial injection of the Coca-Cola system. Accordingly, the total initial injection into the Chinese economy is about 8.16 billion RMB in 1998.

Government tax payments (Section 2 of Table 3.1) reflect peculiarities of the Chinese tax system, in which indirect tax payments are high (primarily the 17 percent value-added tax). In addition, there are some extra fees imposed by local governments, although Table 3.1 suggests that the fees are not a major consideration for the Coca-Cola system. Altogether, bottlers paid 387 million RMB in taxes.

Besides stimulating intermediate goods and service industries, a significant amount of direct spending goes to labor income. In 1998, this amounted to 855 million RMB (see section 3 of Table 3.1). As consumers, the workers receiving the income stoke the spending-income cycle and enlarge the multiplier effect.

These cash outflows (purchases from industrial sectors, taxes, and labor income) are the direct effects of the Coca-Cola system. However, it is impossible to compute the indirect effect of the tax and labor income payments without a social accounting matrix, which was not available; hence, labor costs and tax revenue are excluded from the *initial injection* of the Coca-Cola system.[4]

Section 4 of Table 3.1 shows the survey results for direct employment in the bottling system. According to the bottler survey, the direct employment tied to the Coca-Cola system (including permanent and temporary, skilled and unskilled) is estimated to be 14,046 in 1998. More than 62 percent were skilled workers who usually get permanent jobs; on the other hand, for about one-third of the workers, job positions were temporary. Most wage costs were spent on permanent workers.

Indirect Impacts of the Coca-Cola System

The previous section discussed first-round economic effects as bottlers inject spending into the Chinese economy. This section presents the results of indirect and total impacts engendered by the bottling system's initial injection.

The indirect multiplier for each of 37 industries contained in the Chinese Input-Output table of 1992 is given in Table 3.2, along with the aggregate indirect multipliers. The initial injection of 8.16 billion RMB in 1998 gave rise to about 21.7 billion RMB in total output. Hence, the indirect output multiplier is around 2.66; that is, for every one RMB purchase of intermediate goods and input, the Coca-Cola system will generate 2.66 RMB for the economy as a whole. The total output multiplier is 3.66 (direct plus indirect divided by direct).

Table 3.2: The Indirect Impacts of the Coca-Cola System on Output in China

Code	Industry	Initial injection: ΔY(1000 RMB)	Resulting output: ΔX (1000 RMB)	Multiplier: ΔX/ΔY
1	Coal/Mining	21,247	160,295	7.54
2	Water	14,030	37,693	2.69
3	Sugar	764,370	833,997	1.09
4	Knitting Mills	449	7,624	16.98
5	Wood Products	5,548	50,448	9.09
6	Paper	252,644	572,618	2.27
7	Culture, Education, Sports,	16,009	60,295	3.77
8	Electricity	50,005	435,417	8.71
9	Gas	1,130	6,357	5.63
10	Basic Chemicals	33,057	254,907	7.71
11	Chemicals, daily use	1,160,904	1,298,567	1.12
12	Synthetic Chemicals	2,234	507,638	227.23
13	Other Chemicals	80,292	104,120	1.30
14	Plastics, production use	24,031	214,635	8.93
15	Plastics, daily use	1,040,917	1,228,635	1.18
16	Glass Products	25,482	87,153	3.42
17	Metal Products	5,751	48,308	8.40
18	Metal Machinery	1,211,155	1,289,185	1.06
19	Special Industrial Equipment	13,110	114,202	8.71
20	Other Special Equipment	181,757	246,773	1.36
21	Motor Vehicles	114,712	385,959	3.36
22	Household Electronic Appli-	8,093	23,643	2.92
23	Computer	16,514	29,833	1.81
24	Machinery Maintenance	32,600	51,413	1.58
25	Scrap Waste	2,152	64,074	29.77
26	Construction	6,096	53,802	8.83
27	Rail, Freight, Transportation	11,757	124,815	10.62
28	Communication	11,999	56,198	4.68
29	Commerce	709,918	2,032,728	2.86
30	Air Passenger	14,437	21,213	1.47
31	Real Estate	581,191	750,745	1.29
32	Educational Services	5,753	14,573	2.53
33	Cultural Services	174,996	187,849	1.07
34	General Technical Services	1,209	138,330	114.42
35	Financial Institutions	94,456	680,465	7.20
36	Insurance	10,133	51,942	5.13
37	Other	1,463,639	9,522,215	6.51
38	Total	8,163,777	21,748,665	2.66

It is also apparent from Table 3.2 that the effects are much higher in some industries: Knitting Mills, Synthetic Chemicals, Scrap Waste, Rail-Freight-Transportation, and General Technical Services. Note that across all 37-industry sectors listed, there is no sector in which the multiplier is less than one, implying that the bottling expands the economy in all sectors. Note that Table 3.2 shows only upstream effects of the Coca-Cola system in China.

Employment Supported by the Coca-Cola System

Throughout the world, employment is the most common gauge of economic impacts. However, in the ever-changing Chinese economy, calculating jobs effects can be difficult. Using several alternative methods, this study made a special effort to estimate the employment supported by the Coca-Cola system.

In the simplest case, total employment effects of the Coca-Cola bottling system were calculated by combining two factors: labor income computed by the I-O model (presented later in the chapter) and the industry-specific average wage level. In other words, to derive the employment estimate, the total wage income supported by the Coca-Cola system by sector is divided by each industry's average wage. Thus, with the total wage income derived from the model, the latest average wage level of each sector is needed. Since the Coca-Cola survey data were measured in 1998 RMB and the latest data for industry-specific average wages is 1997, the total labor income by sector was adjusted to 1997 prices.

The results are striking. Total employment indirectly supported by the bottling system appears to be about 466,000 in 1998 (see Table 3.3). Direct employment in the Coca-Cola bottling system itself is about 14,000, so the total employment multiplier (the total direct and indirect divided by the direct jobs) is more than 33. The multiplier from the indirect influence of the Coca-Cola system is 32. Another measurement of the effect on employment is described in the last column of Table 3.4, which indicates that each 100,000 RMB injection of the Coca-Cola system in China provided an estimated six job positions in 1998.

Since calculating the job impact represents a crucial objective of this study, several additional checks were made to ensure accuracy. Apart from the method discussed already, there are two possible alternatives for computing job effects: an "adjusted" average cost of job and an employment-output coefficient approach.

Essentially, the adjusted average job cost method is similar to the simple method already described, but adjusts the average wage by two factors to better reflect labor costs in China: the non-wage welfare income per worker in the state-owned enterprises (SOEs) of China; and the payment used to support the laid-off workers. In accordance with Chinese central government policy since 1997, when a state-owned enterprise pays wages, it must also pay the four insurance premiums: *(i)* pension insurance (which equals 20 percent of the wage bill); *(ii)* health insurance (which equals 6 percent of the wage bill); *(iii)* birth insurance (which equals 0.6 percent of the wage bill); and *(iv)* unemployment insurance (which is 3 percent of the wage bill). Thus, for each existing job position, the average non-wage labor cost is about 30.6 percent of wage income.

The second adjustment to the average job is the payment for the unemployed workers in the SOEs. Firms are required to pay for unemployed workers. Compared with 46 million active workers in the SOEs, there were about 13 million unemployed SOE workers in China in 1997.[5] The average income for the unemployed workers was about 30 percent of that for the existing workers. This means that the average labor cost for each job was increased by 8.5 percent.[6]

Table 3.3: Employment Multipliers

(Units: 1000 RMB unless specified)

Code	Industry	Injection	Additional employment (ΔE)	ΔE/ΔY
1	Coal/Mining	21,247	7,565	0.36
2	Water	14,030	491	0.04
3	Sugar	764,370	7,826	0.01
4	Knitting Mills	449	95	0.21
5	Wood Products	5,548	588	0.11
6	Paper	252,644	6,300	0.02
7	Culture, Education, Sports, Arts	16,009	1,248	0.08
8	Electricity	50,005	2,666	0.05
9	Gas	1,130	80	0.07
10	Basic Chemicals	33,057	2,920	0.09
11	Chemicals, daily use	1,160,904	11,259	0.01
12	Synthetic Chemicals	2,234	2,769	1.24
13	Other Chemicals	80,292	1,818	0.02
14	Plastics, production use	24,031	1,824	0.08
15	Plastics, daily use	1,040,917	12,806	0.01
16	Glass Products	25,482	1,321	0.05
17	Metal Products	5,751	822	0.14
18	Metal Machinery	1,211,155	22,871	0.02
19	Special Industrial Equipment	13,110	1,821	0.14
20	Other Special Equipment	181,757	3,576	0.02
21	Motor Vehicles	114,712	3,277	0.03
22	Household Electronic Appliances	8,093	219	0.03
23	Computer	16,514	230	0.01
24	Machinery Maintenance	32,600	1,042	0.03
25	Scrap Waste	2,152	0	0.00
26	Construction	6,096	1,540	0.25
27	Rail, Freight, Transportation	11,757	1,858	0.16
28	Communication	11,999	806	0.07
29	Commerce	709,918	62,179	0.09
30	Air Passenger	14,437	79	0.01
31	Real Estate	581,191	5,126	0.01
32	Educational Services	5,753	1,280	0.22
33	Cultural Services	174,996	5,857	0.03
34	General Technical Services	1,209	4,494	3.72
35	Financial Institutions	94,456	9,486	0.10
36	Insurance	10,133	409	0.04
37	Other	1,463,639	277,528	0.19
38	Total	8,163,777	466,078	0.06

After adding the non-wage labor costs to the average wage in 1997, it is possible to compute an adjusted average cost of job, as shown in column 5 of Table 3.4. To calculate the total employment effect, this adjusted cost becomes the denominator used to divide the adjusted increase in total wage income resulting from the initial injection of the Coca-Cola bottling system in China. This yields an alternative estimate of the impact of the Coca-Cola system on jobs supported in China: about 352,704 persons—less than the estimate given without taking into account non-wage labor costs.

Table 3.4: Estimated Employment Impact by "Adjusted Average Cost of Job"

Industry	Adjusted Increase of GDP	Adjusted Increase of Wages	Average Wages	Average Cost of Job	Estimated Jobs
	(1000 RMB)	(1000 RMB)	(RMB)	(RMB)	(person)
Coal/Mining	168,732	54,416	6,833	9,505	5,725
Water	39,676	4,989	9,649	13,422	372
Sugar	877,892	48,874	5,933	8,253	5,922
Knitting Mills	8,025	595	5,933	8,253	72
Wood Products	53,103	3,671	5,933	8,253	445
Paper	602,756	39,349	5,933	8,253	4,768
Culture, Education, Sports, Arts	63,469	7,791	5,933	8,253	944
Electricity	458,334	27,081	9,649	13,422	2,018
Gas	6,691	812	9,649	13,422	61
Basic Chemicals	268,323	18,239	5,933	8,253	2,210
Chemicals, daily use	1,366,912	70,312	5,933	8,253	8,520
Synthetic Chemicals	534,356	17,291	5,933	8,253	2,095
Other Chemicals	109,600	11,356	5,933	8,253	1,376
Plastics, production use	225,932	11,391	5,933	8,253	1,380
Plastics, daily use	1,293,300	79,978	5,933	8,253	9,691
Glass Products	91,740	8,251	5,933	8,253	1,000
Metal Products	50,850	5,137	5,933	8,253	622
Metal Machinery	1,357,037	142,836	5,933	8,253	17,308
Special Industrial Equipment	120,214	11,372	5,933	8,253	1,378
Other Special Equipment	259,761	22,335	5,933	8,253	2,706
Motor Vehicles	406,273	20,464	5,933	8,253	2,480
Household Electronic Appliances	24,887	1,365	5,933	8,253	165
Computer	31,403	1,436	5,933	8,253	174
Machinery Maintenance	54,119	6,508	5,933	8,253	789
Scrap Waste	67,447	0	5,933	8,253	0
Construction	56,634	10,785	6,655	9,257	1,165
Rail, Freight, Transportation	131,384	21,806	11,152	15,512	1,406
Communication	59,156	10,234	12,056	16,770	610
Commerce	2,139,714	317,114	4,845	6,739	47,054
Air Passenger	22,330	1,407	16,865	23,459	60
Real Estate	790,258	49,591	9,190	12,783	3,879
Educational Services	15,340	9,109	6,759	9,403	969
Cultural Services	197,736	46,107	7,478	10,402	4,433
General Technical Services	145,611	42,720	9,031	12,563	3,401
Financial Institutions	716,279	97,034	9,718	13,518	7,178
Insurance	54,676	4,298	9,982	13,885	310
Other	10,023,385	1,890,112	6,470	9,000	210,018
Total	22,893,332	3,116,166	7,313	10,172	352,704

Table 3.5 provides an alternate estimation based an employment-output coefficient approach. The coefficients are employment-output ratios from official Chinese statistics for 1997. To calculate the job impact using employment coefficients for 1997, the output increase in GDP in 1998 must be adjusted to 1997. The results appear in the last column of Table 3.5. Using the employment-output coefficient approach, the impact of the Coca-Cola bottling system on employment supported is 349,554 persons.

Table 3.5: Employment Impact: Employment-Output Coefficient Approach

Code	Industry	Adjusted Increase of GDP	Employment Coefficient	Jobs Supported
		(1000 RMB)	(person/1000 RMB)	(person)
1	Coal/Mining	168,732	0.046	7,762
2	Water	39,676	0.060	2,381
3	Sugar	877,892	0.038	33,360
4	Knitting Mills	8,025	0.015	120
5	Wood Products	53,103	0.021	1,115
6	Paper	602,756	0.009	5,425
7	Culture, Education, Sports, Arts	63,469	0.010	635
8	Electricity	458,334	0.004	1,833
9	Gas	6,691	0.068	455
10	Basic Chemicals	268,323	0.014	3,757
11	Chemicals, daily use	1,366,912	0.022	30,072
12	Synthetic Chemicals	534,356	0.023	12,290
13	Other Chemicals	109,600	0.096	10,522
14	Plastics, production use	225,932	0.019	4,293
15	Plastics, daily use	1,293,300	0.013	16,813
16	Glass Products	91,740	0.026	2,385
17	Metal Products	50,850	0.021	1,068
18	Metal Machinery	1,357,037	0.030	40,711
19	Special Industrial Equipment	120,214	0.008	962
20	Other Special Equipment	259,761	0.022	5,715
21	Motor Vehicles	406,273	0.006	2,438
22	Household Electronic Appliances	24,887	0.015	373
23	Computer	31,403	0.105	3,297
24	Machinery Maintenance	54,119	0.022	1,191
25	Scrap Waste	67,447	0.046	3,103
26	Construction	56,634	0.011	623
27	Rail, Freight, Transportation	131,384	0.030	3,942
28	Communication	59,156	0.025	1,479
29	Commerce	2,139,714	0.018	38,515
30	Air Passenger	22,330	0.006	134
31	Real Estate	790,257	0.007	5,532
32	Educational Services	15,340	0.116	1,779
33	Cultural Services	197,736	0.028	5,537
34	General Technical Services	145,611	0.015	2,184
35	Financial Institutions	716,279	0.010	7,163
36	Insurance	54,676	0.007	383
37	Other	10,023,385	0.009	90,210
38	Total	22,893,332	0.015	349,554

The employment-output coefficient estimate is close to the adjusted average wage cost results given in Table 3.4. Indeed, it falls within 1 percent of the alternative method: 349,554 versus 352,704. Therefore, it is reasonable to estimate the impact of the bottling system on jobs supported throughout the economy at 350,000.

Downstream Employment Impacts

So far, the discussion has been confined to Coca-Cola's upstream linkages. Given the nature of the business as described in the last chapter, downstream impacts through distribution should be considered as well. The July 1999 survey covered only the bottlers' expenditures, not the downstream impacts of the Coca-Cola system. Nevertheless, discussion with Coca-Cola managers and case studies conducted in different regions of China yielded the parameters needed to estimate the downstream effects.

Downstream business, the retail and wholesale trade ventures connected to the Coca-Cola system, have a multiplier impact on the Chinese economy according to the margins charged on various products. These margins become income for the trade sector, which is then re-spent in the economy and leads to a ripple effect similar to the expenditures by the bottlers. It is possible to estimate the impact of the trade sector by using an average gross margin on all Coca-Cola-related income. This source of income is then re-spent according to the average expenditure or cost structure of the trade sector.

Given the downstream impact on the GDP, it is possible to estimate the corresponding downstream employment effect. Two approaches were used; the first is based on employment coefficients for 1997. Since the price index of productive goods is 95 in 1998 (if we treat the price of 1997 as 100), the price in 1998 should be inflated to 1997 by the factor (1/0.95). The downstream employment resulting from the Coca-Cola system, shown in the middle column of Table 3.6, is a total of 48,788 jobs supported by the Coca-Cola system.

The second method is based on the "adjusted average cost of job". The results are shown in the right-most column of Table 3.6. By the average cost of job method, the downstream employment impact of the Coca-Cola system would be 64,046. The lower of these two estimates (48,788 and 64,046) will be taken as the downstream employment impact, although it is believed that the actual job tally may be higher.

Considering both the upstream and downstream employment impacts, the Coca-Cola system's direct employment in China of about 14,000 workers supports an additional 400,000 Chinese workers in upstream (350,000) and downstream (50,000) positions. The overall employment multiplier is 30 (414,000/14,000).

Multipliers for Capital, Labor Income, and Taxes

Besides employment, I-O analysis generates other multipliers. Consider the multipliers derived for different components of China's national income: capital depreciation, labor cost, and tax revenue. Beyond the inter-industry relationships already discussed, I-O analysis can be used to calculate indirect effects of income, wages, and tax revenue derived from Coca-Cola operations. Because the Chinese statistical database lacks a complete household and government account matrix, it is not possible to determine how the expenditures of households and government revenue lead to further impacts on the whole economy, or to derive complete multipliers.[7] Even so, the calculation for the partial multipliers provides some useful insights.

Table 3.6: Downstream Employment Impact of the Coca-Cola System

Industry	Employment-Output Coefficient Estimate	Average Cost of Job Estimate
	(person)	(person)
Coal/Mining	660	487
Water	300	47
Sugar	114	20
Knitting Mills	16	10
Wood Products	297	119
Paper	250	220
Culture, Education, Sports, Arts	121	179
Electricity	146	161
Gas	70	9
Basic Chemicals	164	97
Chemicals, daily use	98	28
Synthetic Chemicals	338	58
Other Chemicals	349	46
Plastics, production use	205	66
Plastics, daily use	182	105
Glass Products	230	96
Metal Products	114	66
Metal Machinery	75	32
Special Industrial Equipment	78	111
Other Special Equipment	132	62
Motor Vehicles	363	369
Household Electronic Appliances	62	27
Computer	208	11
Machinery Maintenance	89	59
Scrap Waste	1,650	0
Construction	202	379
Rail, Freight, Transportation	991	353
Communication	300	124
Commerce	28,625	34,971
Air Passenger	17	8
Real Estate	425	298
Educational Services	299	163
Cultural Services	83	67
General Technical Services	386	601
Financial Institutions	972	974
Insurance	43	35
Other	10,133	23,589
Total	48,788	64,046

Effects on Capital Formation

Table 3.7 shows that, on average, the partial multiplier of the injection of the Coca-Cola system on capital formation (capital depreciation) is 0.17. This implies that about 17 percent of bottling system purchases transfer into new capital formation. The table lists the industry-specific impacts. Note that the partial multiplier for capital depreciation in coal/mining, electricity, synthetic

Table 3.7. The Multipliers of Capital Depreciation, Labor Income, and Tax Revenue

(Units: 1000 RMB)

Code	Industry	Injection (Δy)	Additional capital de-preciation (ΔD)	ΔD/ΔY	Additional wage income (Δw)	Δw/ΔY	Additional tax revenue (ΔT)	ΔT/ΔY
1	Coal/Mining	21,247	24,884	1.17	51,695	2.43	-13,082	-0.62
2	Water	14,030	7,147	0.51	4,739	0.34	1,259	0.09
3	Sugar	764,370	50,050	0.07	46,430	0.06	70,132	0.09
4	Knitting Mills	449	304	0.68	565	1.26	368	0.82
5	Wood Products	5,548	1,448	0.26	3,488	0.63	1,936	0.35
6	Paper	252,644	25,140	0.10	37,381	0.15	32,878	0.13
7	Culture, Education, Sports, Arts	16,009	1,693	0.11	7,401	0.46	3,203	0.20
8	Electricity	50,005	76,190	1.52	25,727	0.51	51,193	1.02
9	Gas	1,130	603	0.53	772	0.68	217	0.19
10	Basic Chemicals	33,057	15,476	0.47	17,327	0.52	21,301	0.64
11	Chemicals, daily use	1,160,904	35,309	0.03	66,797	0.06	134,776	0.12
12	Synthetic Chemicals	2,234	32,754	14.66	16,427	7.35	53,260	23.84
13	Other Chemicals	80,292	4,541	0.06	10,788	0.13	8,406	0.10
14	Plastics, production use	24,031	12,016	0.50	10,821	0.45	11,251	0.47
15	Plastics, daily use	1,040,917	41,936	0.04	75,979	0.07	46,650	0.04
16	Glass Products	25,482	4,832	0.19	7,838	0.31	8,666	0.34
17	Metal Products	5,751	1,097	0.19	4,880	0.85	2,546	0.44
18	Metal Machinery	1,211,155	56,256	0.05	135,694	0.11	73,134	0.06
19	Special Industrial Equipment	13,110	4,606	0.35	10,803	0.82	6,278	0.48
20	Other Special Equipment	181,757	7,453	0.04	21,218	0.12	14,225	0.08
21	Motor Vehicles	114,712	11,583	0.10	19,440	0.17	26,007	0.23
22	Household Electronic Appliances	8,093	635	0.08	1,297	0.16	1,402	0.17
23	Computer	16,514	973	0.06	1,364	0.08	1,224	0.07
24	Machinery Maintenance	32,600	3,049	0.09	6,183	0.19	1,886	0.06
25	Scrap Waste	2,152	0	0.00	0	0.00	0	0.00
26	Construction	6,096	1,266	0.21	10,246	1.68	1,470	0.24
27	Rail, Freight, Transportation	11,757	34,094	2.90	20,715	1.76	6,424	0.55
28	Communication	11,999	12,812	1.07	9,722	0.81	2,052	0.17
29	Commerce	709,918	73,592	0.10	301,259	0.42	18,225	0.03
30	Air Passenger	14,437	1,930	0.13	1,337	0.09	756	0.05
31	Real Estate	581,191	365,030	0.63	47,112	0.08	25,808	0.04
32	Educational Services	5,753	1,750	0.30	8,654	1.50	27	0.00
33	Cultural Services	174,996	14,933	0.09	43,802	0.25	4,326	0.02
34	General Technical Services	1,209	10,837	8.96	40,584	33.57	3,446	2.85
35	Financial Institutions	94,456	24,203	0.26	92,182	0.98	52,837	0.56
36	Insurance	10,133	1,203	0.12	4,083	0.40	4,299	0.42
37	Other	1,463,639	407,385	0.28	1,795,606	1.23	524,854	0.36
38	Total	8,163,777	1,369,009	0.17	2,960,358	0.36	1,203,639	0.15

chemicals, rail-freight-transportation, communication, and general technical services is greater than one, meaning that these sectors are more capital intensive.

Effects on Labor Costs

Table 3.7 indicates that about 36 percent of the initial injection from the bottling system formed additional wage income. Among all of the specific industry impacts, coal/mining, knitting mills, synthetic chemicals, construction, rail-freight-transportation, education services, and general technical services appear to be more labor intensive. Here, the partial labor cost multiplier in these industries is greater than one. Note that the labor cost share is the highest of all the addi-

tional national income resulting from the Coca-Cola system. This indicates that Chinese labor benefited most from the bottling system. Defining the labor-cost multiplier as the ratio of final increase to the initial labor expense of the injection, it follows that the multiplier is about 3.5.

Effects on Tax Revenue

Also shown in Table 3.7 is the contribution to government tax revenue. This reveals that 15 percent of additional purchases by the Coca-Cola system would be transferred to government revenue. If we add this contribution to the direct tax payment described in Table 3.1, then it is clear that the Coca-Cola system would generate about 1.6 billion RMB in tax revenue annually for Chinese government. Observe also that the final tax revenue share of national income (1.2 billion RMB) is more than 3 times that of initial tax payment of the bottling system. In other words, the tax multiplier (defined as the ratio of final tax contribution to the initial tax payment) is over 3.[8]

Conclusion

The results presented in this chapter reveal that the direct economic impact of the Coca-Cola system's capital and operational expenditure is about 8.16 billion RMB. The direct labor cost is around 0.855 billion RMB, while the direct tax payments are estimated to be 0.387 billion RMB. It is estimated that the Coca-Cola's system's expenditure on capital, production inputs, and the operational expenditures (8.16 billion RMB) produced 21.4 billion RMB in intermediate output in China, implying that the indirect multiplier for the GDP is about 2.66. The total multiplier (direct plus indirect divided by direct) is 3.66. This is relatively large, but not surprising.

Moreover, the impacts are given for capital formation, tax revenue, and employment. The total tax revenue indirectly increased by the bottling injection is 1.2 billion RMB in 1998, which is more than 3 times the tax directly paid by the bottling system to the government.

The analysis approached the complex task of estimating the far-flung operations impacts of the Coca-Cola system through careful crosschecking by alternative methods. It is estimated that Coca-Cola production alone buttresses the country's employment base by about 400,000 through upstream and downstream activities. This yields an employment multiplier (the ratio of direct and indirect jobs divided by direct jobs) of 30. These figures suggest that strong employment linkages have been forged, with an extensive network of employment throughout the Chinese economy.

The employment multiplier effect in China is considerably higher than that found in other countries. The Eastern Europe and South Africa studies found the employment multiplier effect was about 11 total jobs supported by each direct job in the bottling system.[9] No doubt, the high aggregate number of jobs associated with the Coca-Cola network and the notably strong multiplier effect reflect the more labor-intensive Chinese economy. They also reveal that *almost all employment associated with Coca-Cola lies outside the bottling system in other businesses in the Chinese economy at large*. These impacts stemmed from both upstream and downstream linkages to the bottling system. The earlier research suggests that the downstream linkages of soft-drink production play a particularly pivotal role in emerging markets. These effects may have

been actually underestimated in this study. Even so, the results suggest that the soft-drink bottling cluster stimulates a strong chain reaction that leads to multiple benefits for local economies.

In an emerging market economy like China, many impacts cannot be precisely quantified. The next chapter discusses the qualitative impacts of the Coca-Cola system, those not addressed by multiplier analyses.

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[1] Three I-O tables are available in China: the inter-industry value flow I-O table, the direct consumption coefficient I-O table, and the whole consumption coefficient I-O table. This research mainly relied on the direct consumption coefficient I-O table, but some calculations (in particular, tax and employment multipliers) also draw on the inter-industry value flow and whole consumption coefficient I-O tables. There are 118 sectors in the I-O table, with all unspecified industries in the bottling survey aggregated into the term of "others".

[2] Imports do not count as local purchases that lead to further impact in the model and, therefore, were excluded from the economic impact.

[3] That is not to say that input-output analysis provides a complete general equilibrium account of any activity. The I-O table lacks household and government accounts. Although it is possible to calculate tax revenue and labor income from an input-output table, without a social accounting matrix (SAM), it is not possible to calculate how government revenue and household income are re-spent. Only a SAM can compute the complete economic impacts of the bottling system on China's economy. In short, the I-O model only estimates the principal direct and indirect effects of Coca-Cola system—the major inter-industry relationships. Yet, the estimated multipliers are partial multipliers.

[4] This distinguishes the direct effects from the term initial injection, for the latter not only affects the economy directly, but also will generate indirect effects.

[5] Typically, it is reported that 100 million people worked in state-owned entities in 1997 (see chapter 1 of this report). Of the 100 million in SOEs, 53 million persons were on the payrolls of state-owned business enterprises. Further, of the 53 million employed in business enterprises, 7 million were receiving wage payments, but unemployed. The number of unemployed SOE workers was calculated by taking the official number of unemployed SOE workers (6 million) and adding the number of laid off workers (7 million).

[6] The 8.5 percent is calculated as [(13 million /46 million)*0.30*100].

[7] These are the results of vector-point-product; i.e., the point multiplication between the *whole consumption coefficients* of GDP, wage, taxes, capital depreciation, and the *total impacts* of the Coca-Cola system on the industry output. The proof for this method justification is given in Appendix B, the technical appendix, to this report.

[8] Note that the additional tax revenue from coal/mining is negative. This reflects the fact that, in 1992 when the China I-O table was constructed, the Chinese government subsidized the sector of coal/mining.

[9] Division of Research (1995); Division of Research (1998).