WORLD BANK CHINA RESEARCH PAPER NO. 8

RAW MATERIAL PRICES, WAGES, AND PROFITABILITY IN CHINA'S INDUSTRY—HOW WAS PROFITABILITY MAINTAINED WHEN INPUT PRICES AND WAGES INCREASED SO FAST?

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October 2007

Abstract

China's industrial sector has faced large increases in raw material prices, and wages have also risen significantly. This paper aims at analyzing and quantifying the impact of the cost pressures on the profitability of industry, as well as the way that China's industry has responded to the pressures. By combining information from the input output table and time series from the enterprise survey and on prices, wages, and employment, we estimate what has happened to the "technical efficiency" of the usage of intermediate inputs: the amount of intermediary inputs adjusted for price changes. We find that it has improved significantly since 2002 in most sectors in core manufacturing, although not for all. The second factor that has offset increases in input prices and wages is labor productivity growth, measured here as value added per worker. Our results suggest that sectors that faced higher cost pressures have made larger efforts to offset the cost pressures. The gap between output price rises and input price rises increased from 4 percentage points in 2005 to 4.3 percentage points in 2006 for core manufacturing. That this was possible while at the same time increasing the average profit margin shows that the ability of China's industry to offset rising raw material prices by increasing efficiency has so far remained undiminished.

Keywords: China, profitability, commodity price, raw material, wage

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We thank Bert Hofman for encouragement and comments.

I. Introduction

Many have raised concerns about the impact of input price increases and wages in recent years and in the future on the profitability of China's industrial sector. However, to our knowledge, no systematic study has been done to quantify the impact of these cost pressures and to analyze quantitatively the way that China's industry has responded to them. This paper aims to fill this gap.

Input prices have increased significantly since 2002. Many raw material prices rose very rapidly, even though for some primary commodities products China's prices did not grow as rapidly as international ones and prices of some "raw materials", including chemicals and certain machinery and equipment, rose only modestly. On average, raw material prices increased 34 percent between 2002 and 2006. As some rose much more in price than others, different sectors were hit differently, depending on which raw materials they consumed. While output prices (PPI) also rose significantly for most sectors, they generally lagged behind raw material prices significantly. As a result, relative (or, real) input prices went up substantially for almost all sectors, putting pressure on profitability. Wages rose even faster, adding to the pressure. Yet, profit margins did not decline in most industrial sectors. On the contrary, they have continued to rise in most sectors.

In this paper we investigate how these developments add up. Using information from China's (2002) input output table and time series from the enterprise survey and on prices, wages, employment, we quantify the costs pressures bearing on different sectors. We also look at what have been the key avenues by which sectors have offset the cost pressures.

By putting together this information and data, we are able to estimate what has happened to the "technical efficiency" of the usage of intermediate inputs: the amount of intermediary inputs adjusted for price changes. We find that it has improved significantly since 2002 in most sectors in core manufacturing, although not for all. The second factor that has offset increases in input prices and wages is labor productivity growth, measured here as value added per worker. The third factor has been that net taxes, as a share of gross output, have gone down by almost 1 percentage point, further contributing to the improved profit margin.

We also analyze whether sectors that faced higher cost pressures have made larger efforts to offset the cost pressure coming in via input prices. Our results suggest that this has been the case, although we need to interpret the results carefully.

Against a backdrop of concerns about different kinds of cost pressures impinging on China's industry, our analysis is useful in identifying the key source of cost pressures. Our results suggest that the dominant source has been via higher raw material prices. Since 2002, average weighted output prices have risen significantly less than average weighted input prices. The gap between output price rises and input price rises increased from 4 percentage points in 2005 to 4.3 percentage points in 2006 for core

manufacturing.[1] That this was possible while at the same time increasing the average profit margin shows that the ability of China's industry to offset rising raw material prices by increasing efficiency has so far remained undiminished.

II. Conceptual Framework and data

We combine information on the cost structure from the input output (IO) tables with time series data on those cost items to analyze the changes in the cost structure. We get information on the revenue and cost structure of different sectors of China's industry using the input-output table of 2002.[2] We identify time series data on prices, wages, employment, taxes, and depreciation that best proxies the concepts used in the input output tables. These time series come from the enterprise survey and statistics on employment, wages, taxes, and investment of the National Bureau of Statistics (NBS).

We focus on industry, and within that, on manufacturing.[3] The industry classification in our analysis is the same as the one used in input-output table.

The data on total gross output in the IO table matches conceptually the data on sales revenue from the enterprise survey. The absolute levels are not the same, due to differences in coverage. But we assume that changes over time are sufficiently similar between the 2 data sets.

Intermediate input in the IO tables is the value of all the intermediate goods and services consumed to produce output. Each sector consumes intermediate input from all other sectors, at sectoral prices. Value added is the newly added value in the production process. It can be broken down into compensation of employees, operating surplus, depreciation of capital, and net taxes on production. These items are assumed to develop over time in the same way as the following items from other NBS statistics: business profit, depreciation, labor cost (wages * employment), and various taxes and extra charges.

Firm's profit

Let π_i be sector i's profit, p_i the output price (PPI), Y_i output, r_{ij} the price of input from sector j, M_i the amount of input from sector j, w_i the wage, L_i employment, δ_i depreciation, and t_i intermediate input.

$$\pi_i = p_i Y_i - \sum r_{ij} M_{ij} - w_i L_i - d_i - t_i \qquad (1)$$

Dividing both sides by $p_i Y_i$ gives

$$marg_i = 1 - \sum (r_{ij} / p_{i)} * (M_{ij} / Y_{i)} - (w_i / p_i) * (Y_{i.} / L_i) - d_i / (p_i Y_{i)} - t_i / (p_i Y_{i)} \qquad (2)$$

[1] In this paper, core manufacturing refers to industry excluding mining and quarrying, coking, gas and petroleum refining, production and supply of electric power, heat power and water industries.
[2] 2002 is the most recent year for which we could find the IO table.
[3] Manufacturing firms include mining and quarrying, energy and utility enterprises.

Where $marg_i$ is the profit margin.

In Equation (2), r_{ij} / p_i is the relative price of inputs from sector j into sector i, compared to output prices of sector i, M_{ij} / Y_i is the amount of input from sector j into sector i per unit of (real) output, w_i / p_i is the real wage for sector i, and Y_i / L_i is labor productivity in sector i.

We analyze economic developments in China's industry for the period 1999-2006. Our industry classification follows the classification of the input-output table with 17 sectors/commodities. Table 1 shows how we mapped the raw material price data and the producer price data to this industry classification.

Table 1: Mapping three sets of data

Intermediate input cost	**Input-Output Table**	**Output price**
Purchasing Price index of Raw Materials		**Producer Price Index**
Farm and Sideline Products	Agriculture	-
Fuels and Power	Mining and Quarrying	Coal
Farm and Sideline products	Foodstuff	Food
Textile Materials	Textile, Sewing, Leather and Furs Products	Average of Textile, Tailoring, and Leather
Timber and Paper Pulp	Other Manufacturing [1/]	Average of Timber, Paper, Cultural, Educational and Handcrafts Article
Fuels and Power	Production and Supply of Electric Power, Heat Power and Water	Power
Fuels and Power	Coking, Gas and Petroleum Refining	Petroleum
Chemical Materials	Chemical Industry	Chemical
Building Materials	Building Materials and Non-metal Mineral Products	Building Materials
Average of Ferrous Metal Materials and Non ferrous Metal & Electric Wire	Metal Products	Metallurgical
Ind Raw Materials & Semi Finished Pdts	Machinery and Equipment	Machine Building
Consumer Price Index: Services	Construction	
CPI: Services	Transportation, Post and Telecommunication Services	
CPI: Services	Wholesale and Retail Trades, Hotels and Catering Services	
CPI: Services	Real Estate, Leasing and Business Services	
CPI: Services	Banking and Insurance	
CPI: Services	Other Services	

1/ Other manufacturing include furniture, paper, and cultural, educational and handcrafts light manufacturing.

While we have tried to find the best mapping, we are aware that it is a rough estimate. In particular, the mapping is constrained by the fact that in some cases the raw material prices are at a rather aggregate level, lacking a more detailed breakdown. For instance, the mining and quarrying sector includes ferrous and non-ferrous metal ore mining, in addition to coal mining and petroleum and natural gas's extraction. Price developments of raw materials coming from these sectors differ substantially. The raw materials price index most closely associated with input costs from mining and quarrying is the one of fuels and power, as coal and petroleum make up 69 percent of the output of that sector (according to the 2002 IO table). But, the price of metal ore mining is not considered when we estimate input cost from the sector. This is a problem especially for periods when energy prices and those of metal ore have not moved in the same direction. For the period that we analyze, prices of energy and metal ore fortunately move broadly in the same direction.

The input output tables provide information on the composition of output in different sectors in terms of intermediate input from other sectors and value added. As a share of gross output, enterprises in China's manufacturing industries use 70 percent of intermediate input from other sectors and create 30 percent of value-added (Table 2). Value added comprises employees' compensation (11 percent), profit (8 percent), taxes (6 percent) and depreciation (5 percent). The third column in table 2 reports inputs from different sectors as a share of total intermediate inputs from industry—that is, not including inputs from sectors such as construction, transportation etc. These weights we used to reproduce the overall raw material index.

We use the input coefficients of China manufacturing industry from the 2002 input output table (see below) as a basis. The time series data, for the period 1999-2006, were estimated using information on the change in revenues, earnings, depreciation, tax and operating surplus taken from enterprise survey data, China labor statistical yearbook and China statistical yearbook. The details are follows:

Revenue = Total Output 2002 * (1+growth rate of revenue series from the Enterprise Survey)

Profit = Operating Surplus 2002 * (1+growth rate of profit series from the Enterprise Survey)

Earnings = Compensation of Employees in 2002 * (1+growth rate of earnings series from the China Labour Statistical Yearbook)

Depreciation = Depreciation of Fixed Assets in 2002 * (1+growth rate of our estimate for depreciation). This estimate is urban fixed asset investment from the China Statistical Yearbook minus increase in net fixed asset of Enterprise Survey)

Tax =Net Taxes on Production in 2002 *(1+growth rate of sales taxes and VAT from the Enterprise Survey)

Table 2: Summary of Input-Output coefficients for the Manufacturing Industry

	As share of gross output	As share of intermediate output	As share of intermediate input from industry
	100		
Intermediate Input	70	**100**	
Agriculture	5	7	8
Mining and Quarrying	6	8	10
Foodstuff	1	2	3
Textile, Sewing, Leather and Furs Products	4	6	7
Other Manufacturing	4	5	7
Production and Supply of Electric Power, Heat Power and Water	3	4	5
Coking, Gas and Petroleum Refining	2	2	3
Chemical Industry	10	14	17
Building Materials and Non-metal Mineral Products	1	2	2
Metal Products	10	14	17
Machinery and Equipment	12	18	22
Construction	0	0	
Transportation, Post and Telecommunication Services	3	5	
Wholesale and Retail Trades, Hotels and Catering Services	5	7	
Real Estate, Leasing and Business Services	2	3	
Banking and Insurance	1	2	
Other Services	1	1	
Total Value-added	**30**		
Compensation of Employees	11		
Net Taxes on Production	6		
Depreciation of Fixed Assets	5		
Operating Surplus	8		

Source: NBS, Input-output table (2002)

The nominal intermediate input is calculated as a residual, as total output minus all other costs and profits.

The machinery and equipment industry is the most important intermediate input into other sectors, making up 18 percent of the total, with the chemical and metal industry both contributing 14 percent. Therefore, output price increases of these industries would most affect cost pressures from intermediate inputs. Machinery and equipment prices have increased little since 2002, which has dampened cost pressures.

III. Price increases

International commodity prices have risen strongly since 2002, particularly since 2003. Fuelled by high oil prices, prices of energy rose by an average of 29 percent per year in 2004-2006, in RMB terms (Table 3). Non-energy commodity prices also rose

substantially—some 17 percent on average in 2004-2006—, with prices of metals and minerals rising a particularly rapid 36 percent per year on average in 2004-2006.

Table 3: International commodity prices and China raw material prices (RMB)
(Annual percent change)

	2002	2003	2004	2005	2006	2004-6
International commodity prices						
Energy	2.4	15.9	30.6	40.1	17.1	28.9
Non-energy	5.3	10.2	17.4	12.4	21.2	16.9
Metals and Minerals	-3.1	12.6	37.1	25.5	46.8	36.2
Purchasing Price Index of raw materials						
Overall	-2.3	4.8	11.4	8.3	6.0	8.5
Fuels and power	0.2	7.4	9.7	15.0	11.8	12.2
Non-ferrous Metals[4]	-3.5	5.3	20.1	14.0	30.8	21.5

Source: World Bank, National bureau of Statistics

Domestic raw material prices in China also rose significantly, although they lagged international prices. The overall purchasing price index of raw materials rose 8.5 percent per year on average in 2004-2006, with the sub-index "fuel and power" rising 12 percent per year and that of "non-ferrous metals" 21.5 percent.

There are 2 key reasons why overall raw material prices in China have not risen as much as the international commodity price indices. First, looking at prices of individual products, while some domestic prices have followed closely international prices, other have not (Table 4). Prices of copper, nickel, rubber, and, to some extent, zinc and coal have followed world market prices closely. However, prices of aluminum, steel, and, importantly, oil and oil products, have risen significantly less than international ones. For oil and oil products, the reason behind the difference is that the government controls the price of refined products administratively. For others, such as steel and aluminum, domestic market conditions may have affected price movements over and beyond the impact of international prices. Comparing the absolute price level of commodities is difficult, because of the difficulty of finding the exact same product. However, prices of some commodities are quite similar to international prices, including copper and, to some extent zinc and aluminum (Table 5). Rubber even appears to be more expensive in China.

The second reason is that the composition of China's raw material price index differs from the international commodity price indices. In part this reflects different consumption patterns and economic structures. Another reason is that China's "raw material prices" include prices of intermediary goods such as chemicals, metals, and "machinery and equipment".[5] Indeed, we are able to reproduce the overall raw material price time series by using the weights from the 2002 input output table from Table 2 (Figure 1). And,

[4] Non-ferrous metals include aluminum, copper, gold, nickel, silver, tin, and zinc

[5] China's raw material price index is estimated based on goods used by industrial enterprises and captures over 900 products in 9 categories. The index measures what happens to prices paid by industrial enterprises when they purchase inputs such as raw materials, fuels, and power.

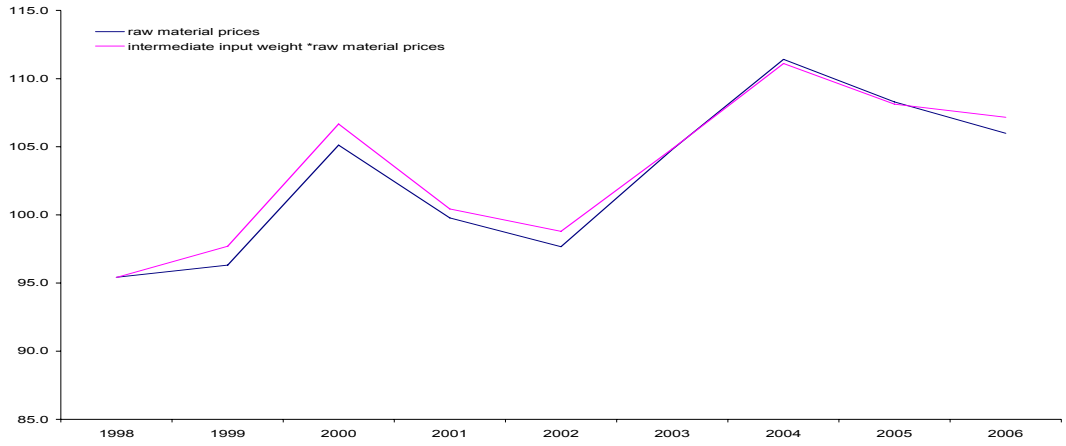
indeed, prices of intermediary goods such as chemicals and "machinery and equipment" prices have not increased as strongly as primary commodity prices.

Table 4: World Commodity Prices vs. China Wholesale prices
(Annual percent change)

		2002	2003	2004	2005	2006	2004-6
Aluminum	World	-6.4	6.0	19.9	9.6	31.7	20.0
	China	-4.3	1.8	10.5	2.0	22.6	11.4
Copper	World	-1.1	14.1	61.1	27.1	77.8	53.8
	China	-6.1	8.3	46.2	29.1	79.7	50.2
Nickel	World	13.9	42.2	43.6	5.6	60.1	34.4
	China	-9.8	14.3	52.0	11.9	47.3	35.8
Zinc	World	-12.1	6.3	26.6	30.5	130.7	56.2
	China	-8.9	-4.3	25.9	19.9	102.4	45.1
Steel	World	2.9	8.3	44.2	13.5	-4.0	16.3
Round steel	China	-3.7	21.8	27.9	-5.4	-7.7	3.7
Rubber	Singapore	33.0	41.6	20.4	14.0	36.6	23.3
	China	-2.2	20.8	28.7	6.0	48.2	26.5
Logs	Malaysia	2.7	14.6	5.4	1.9	14.7	7.2
	China	-2.6	-0.8	3.9	6.8	-1.4	3.0
Coal	Australia[1]	-21.7	3.2	102.7	-10.9	0.4	21.9
	China	6.3	8.3	25.8	21.3	7.3	17.9
Crude Oil	World	2.1	16.1	30.5	40.2	17.2	28.9
Diesel Oil	China-	-1.2	11.5	11.6	15.3	17.5	14.8
Natural gas	U.S.	-15.0	61.8	7.3	49.4	-26.7	5.5
	China	-4.5	10.3	1.5	0.3	13.6	5.0

Source: World Bank, NBS

Figure 1: The official PPI and a proxy using our price and weight estimates
(year on year change)



Source: NBS, authors' estimates

Table 5: Price levels of raw materials on international markets and in China (2006)

Commodity	Region	Unit	In RMB
Aluminum	**World**	**Per ton**	**20491**
	China	**Per ton**	**19828**
Copper	World	Per ton	53599
	China	Per ton	54452
Zinc	World	Per ton	26113
	China	Per ton	23234
Wire Steel	**World**	**Per ton**	**4262**
	China	**Per ton**	**3195**
Rubber	Singapore	Per ton	16818
	China	Per ton	20421
Logs	Malaysia	Cum	1909
	China	Per cube m	930
Coal	Australia[1/]	Per ton	391
	China	Per ton	558
Crude Oil	World	Per ton	4102
Diesel Oil	China-	Per ton	5043
Natural gas	U.S.	Mmbtu	53
	China	Cube m	2

1/ Commodities in bold are closer to each other in terms of definition and unit.

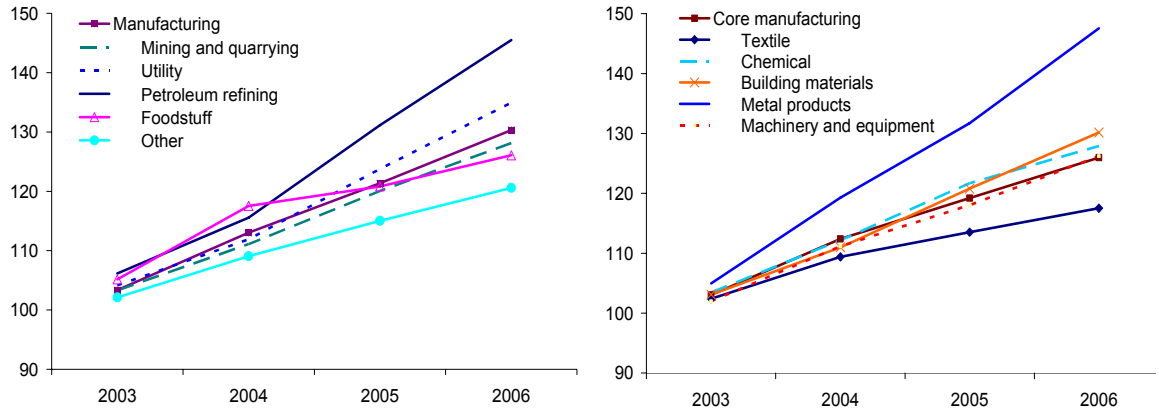
Nonetheless, even measured by China's raw material price index, input prices in manufacturing have risen substantially. We constructed time series for the intermediate input costs of all sectors of industry, using the raw material price data and the intermediate input value weights of the 2002 input output table (Table 2). The weighted input prices are shown in Figure 2.

The overall numbers are affected significantly by the sectors mining and quarrying and petroleum refining. For analytical purposes we define an aggregate "core manufacturing". This excludes mining and quarrying, electric power, and coking, gas and petroleum refining. Thus, sectors that are heavy users of the raw materials that have risen most in prices—for instance, non ferrous metals and fuel and power—have faced the highest overall increases in intermediate input costs. Overall, input costs have increased most for the metal industry, petroleum refining, and utilities.[6]

Output prices (PPI, or factory gate) have generally also increased, although much more for some than for others (Figure 3). The impact of input price increases on sectors depends on how much output price rises offset the input price increases. The relative prices are shown in Figure 4 and Table 6. Thus, with the factory gate prices for the metal sector also increasing substantially, the relative ("real") cost of inputs for the metal sector did hardly increase (it was 3 percent higher in 2006 than in 2002).

[6] For instance, machinery and equipment consumed metals at 19 percent of the value of total intermediate inputs.

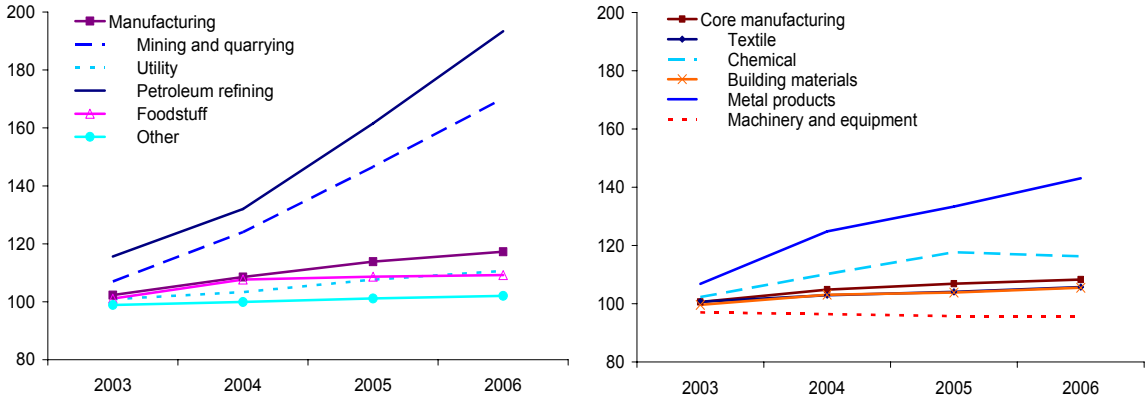
Figure 2: Weighted input prices (raw materials) 2002 = 100 [1/]



Source: NBS, authors' estimates.

1/ In this and all other figures, the aggregate "manufacturing" refers to mining, manufacturing and utilities.

Figure 3: Output prices 2002 = 100



Source: NBS, authors' estimates.

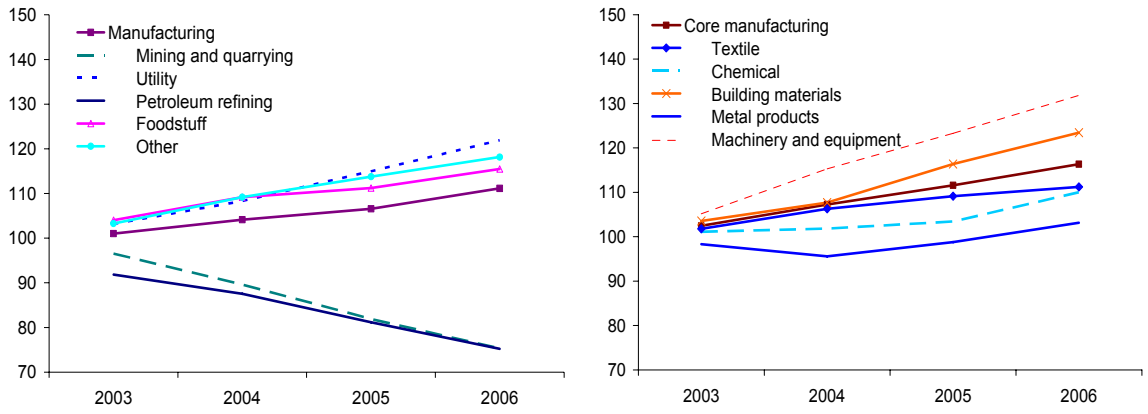
On the other hand, the relative price of input costs for the machinery and equipment sector worsened significantly, because it consumes a lot of metal products (19 percent of the total), while its own output prices have been stuck at the 2002 level or worse over the four years as shown in Figure 4. Outside of core manufacturing, sectors such as petroleum refinery and mining and quarrying saw their factory gate prices rise more than the average price of input costs.

Table 6: Intermediate Input Cost

2002=100	Weighted input prices (r_i)				Relative input price to output price (r_i / p_i)			
	2003	2004	2005	2006	2003	2004	2005	2006
Mining, manuf., and utilities	103.3	113.0	121.4	130.3	101.0	104.1	106.6	111.1
Core manufacturing	103.1	112.4	119.2	126.0	102.4	107.2	111.6	116.3
Mining and Quarrying	103.3	111.1	120.1	128.1	96.5	89.6	81.9	75.3
Utilities [7]	104.1	111.9	123.8	134.9	103.2	108.3	115.0	121.9
Petroleum Refining	106.1	115.6	131.2	145.5	91.8	87.5	81.2	75.2
Foodstuff	105.2	117.5	120.8	126.1	104.0	109.2	111.2	115.5
Textile	102.4	109.4	113.5	117.5	101.8	106.3	109.1	111.2
Other	102.1	109.1	115.0	120.6	103.3	109.2	113.8	118.1
Chemical	103.4	112.2	121.7	127.9	101.1	101.8	103.4	110.0
Building Materials	103.1	111.0	120.8	130.2	103.5	107.7	116.4	123.4
Metal	105.0	119.3	131.7	147.6	98.3	95.6	98.8	103.1
Machinery and Equipment	102.0	111.2	118.0	126.2	105.1	115.3	123.3	131.8

Source: NBS, authors' estimates.

Figure 4: Relative prices (input/output) 2002 = 100



Source: NBS, authors' estimates.

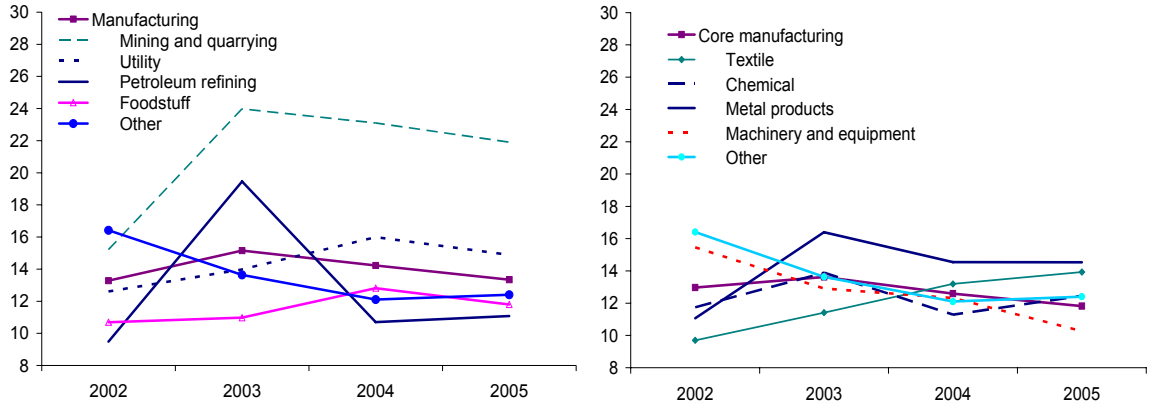
IV. Wage increases

Wage growth has also been fast. The official sectoral wage data indicates that wages have risen by 10-15 percent per year since 2002 in most sectors, with wage growth in the booming mining and quarrying sector particularly high (Figure 5). Comparing nominal wage developments with output prices, real wage increases have also been rapid in almost all sectors. The official wage data only covers formal employment at SOEs and some large private sector enterprises. Including other forms of employment would reduce the average wage increase, since informal employees and employees outside of SOEs and

[7] Indicate production and supply of electric power, heat power and water.

large firms have seen lower wage increases than the formally employed. At the same time, including these forms of employment—which grew faster than formal employment—would increase the average increase in employment, which offsets the effect on wages. We make the rough assumption that these two effects cancel each other out.

Figure 5: Nominal wages (percent change)

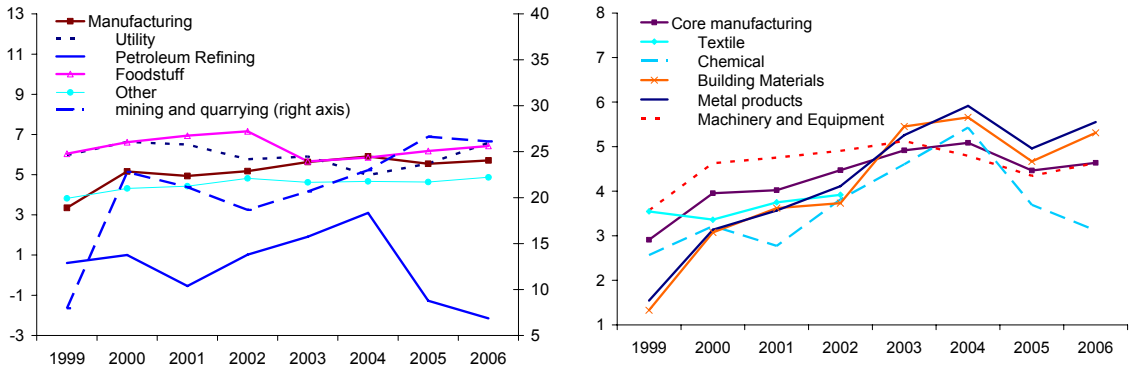


Source: NBS, authors' estimates.

V. Impact of cost pressures on industry and response

Despite rapid increases in prices of intermediate inputs and wages, profit margins have actually continue to rise in many sectors since 2002 (Figure 6). Combined with rapid growth of turnover/sales in industry, this has resulted in impressive profit growth (Table 7).

Figure 6: Profit margin (percent)



Source: NBS, authors' estimates.

Table 7: China's manufacturing industry
(percent change)

	2002	2003	2004	2005	2006	2002-6
Sales	16	38	34	30	26	29
Profit	22	50	40	22	30	33

Source: NBS.

What has happened to offset the cost pressures?

First, the technical efficiency of the usage of intermediate inputs real terms has improved substantially over time. We estimate what has happened to the technical efficiency of using intermediate inputs over time by putting together the time series data on input prices, output prices, wages, employment, and profit margins. We calculate time series for all industrial sectors of the amount of intermediate inputs per unit of output in constant prices. Referring to equation (2), we solve it for $\sum M_{ij} / Y_i$ in prices of 2002. We interpret a decline in this indicator as an improvement in the technical efficiency of using intermediate inputs. This improved technical efficiency and upgrading of the production structure leads to more profit per unit of sales.

Our estimation suggests that since 2002, when the raw material price increases accelerated, technical efficiency gains have been large in core manufacturing (Table 8). The implied intermediate input share of total output in constant prices declined on average from almost 74 percent in 2003 to 67 in 2006, with a significant amount of variation between sectors. That is, most of manufacturing industry improved substantially the technical efficiency of the usage of real intermediate inputs. Interestingly, this was not the case for mining and quarrying, petroleum refining, and metals.

Second, labor productivity increased rapidly in core manufacturing industries during this period. Table 9 shows labor productivity growth across sectors in industry, calculated as value added in real terms divided by employment. The furniture, paper and handcraft industries achieved the most rapid productivity increase. As a result, the labor cost burden, estimated as the ratio of wage costs to total output, decreased significantly over the period 2003-2006 (Table 10).

Table 8: The ratio of intermediate input to output (percent)

	2002	2003	2004	2005	2006	Change[1/]
Mining, manuf., and utilities	(Nominal intermediate input ratio)					
	70.1	73.2	73.1	74.7	75.1	4.9
	(Real intermediate input ratio)					
	70.1	72.5	70.2	70.1	67.5	-2.6
Core manufacturing	72.9	75.7	76.2	78.1	78.0	5.1
	72.9	73.9	71.1	70.0	67.1	-5.8
Mining and Quarrying	42.2	41.4	40.5	39.6	42.0	-0.2
	42.2	42.9	45.2	48.3	55.8	13.6
Utilities	49.9	56.8	52.5	52.5	51.1	1.2
	49.9	55.0	48.4	45.7	41.9	-8.0
Petroleum Refining	82.6	81.7	81.0	94.9	98.3	15.7
	82.6	88.9	92.5	116.9	130.7	48.1
Foodstuff	68.9	86.6	81.5	81.7	80.9	11.9
	68.9	83.3	74.7	73.5	70.0	1.1
Textile	75.3	75.7	75.3	73.9	73.4	-1.9
	75.3	74.4	70.8	67.7	66.0	-9.3
Other	65.0	70.4	67.8	70.7	67.1	2.2
	65.0	68.2	62.1	62.1	56.8	-8.1
Chemical	73.1	71.6	72.5	78.5	80.0	6.9
	73.1	70.8	71.2	75.9	72.7	-0.4
Building Materials	67.1	68.4	72.0	74.4	73.3	6.2
	67.1	66.0	66.9	64.0	59.4	-7.7
Metal	75.8	76.2	79.7	82.0	82.8	7.0
	75.8	77.6	83.4	83.0	80.3	4.5
Machinery and Equipment	75.1	77.3	78.8	79.1	78.5	3.4
	75.1	73.5	68.3	64.1	59.5	-15.6

Source: NBS, authors' calculation.
1/ from 2002 to 2006

Table 9: The growth rate of labor productivity across industry
(Percent)

	2002	**2003**	**2004**	**2005**	**2006**	**2003-6**
Mining, manuf., and utilities	26	24	27	14	16	20.2
Core manufacturing	29	29	24	14	19	21.4
Mining and Quarrying	-1	21	37	21	5	20.5
Utilities	9	9	33	23	21	21.4
Petroleum Refining	77	20	35	-69	-67	-36.5
Foodstuff	28	-5	64	25	21	24.0
Textile	19	23	24	25	13	21.2
Other	40	39	37	19	32	31.8
Chemical	35	36	20	-2	15	16.6
Building Materials	24	28	15	14	28	21.1
Metal	24	38	14	12	13	18.8
Machinery and Equipment	33	32	18	20	24	23.2

Source: China Labour Statistical Yearbook, author's calculation.

Table 10: The ratio of labor cost to total gross output in current prices
(Percent)

	2002	2003	2004	2005	2006	Change
Mining, manuf., and utilities	11.5	9.5	8.3	7.5	7.1	-4.3
Core manufacturing	10.7	8.8	7.6	6.9	6.3	-4.5
Mining and Quarrying	24.9	22.0	19.7	16.9	15.0	-9.9
Utilities	15.6	10.5	9.7	8.6	8.2	-3.4
Petroleum Refining	5.3	4.5	3.5	3.1	2.8	-2.5
Foodstuff	8.3	4.3	3.8	3.5	3.3	-5.0
Textile	11.8	10.7	10.3	10.0	9.4	-2.4
Other	12.8	9.4	8.6	7.5	6.9	-5.9
Chemical	9.5	8.4	7.0	6.0	5.6	-3.9
Building Materials	17.0	15.1	12.9	11.6	10.5	-6.6
Metal	10.7	8.6	6.4	5.7	4.9	-5.7
Machinery and Equipment	10.3	8.9	7.8	7.3	6.6	-3.8

Source: China Labour Statistical Yearbook, author's calculation.

Playing a smaller role, a reduction in the impact of taxation also help boost profitability. We did not find a significant change over time in the impact of depreciation on profitability.

Table 11. Input cost pressures and technical efficiency of using intermediate inputs in industry
(2002-06, annual average change)

	Weighted relative input price (%) [1/]	Efficiency of using intermediary inputs (%p) [2/]	Wage (nominal) (%)	Labor productivity (nominal) (%)
Manufacturing	2.7	0.7	14.0	21.3
Core manufacturing	3.8	1.5	12.7	22.9
Mining and Quarrying	-6.8	-3.2	21.0	16.0
Utility	5.1	2.1	14.4	18.9
Petroleum Refining	-6.9	-10.3	12.6	-22.1
Foodstuff	3.7	-0.3	11.6	24.9
Textile	2.7	2.4	12.0	20.7
Other	4.2	2.1	13.6	33.4
Chemical	2.4	0.1	12.3	20.0
Building Materials	5.4	2.0	11.9	21.7
Metal products	0.8	-1.1	14.1	19.8
Machinery and Equipm.	7.1	4.2	12.7	25.2

Source: NBS, authors' estimates.
1/ For each sector, the weighted raw material price increase is estimated using weights from the 2002 input output table.
2/ Estimated improvement technical efficiency of using intermediary inputs.

A look at the patterns across sectors suggests that the effort to increase the technical efficiency of using intermediary inputs, improve labor productivity, and limit wage increases have been the largest in those sectors with the highest cost pressures. This is illustrated in Figures 7-9. Figure 7 suggests that sectors with a higher increase in relative input prices have paid out lower wage increases. Figure 8 suggests that sectors with higher increases in relative input prices have seen higher labor productivity growth. Figure 9 suggests that sectors with higher relative input prices have seen a large reduction in the usage of intermediary inputs per unit of output.

For instance, sectors with particularly high pressure from input price rises, such as building materials and machinery and equipment industries, have limited wage growth, boosted labor productivity, and improved the technical efficiency of the production process more than other sectors.

Figure7: wage growth is lower where cost pressures are higher

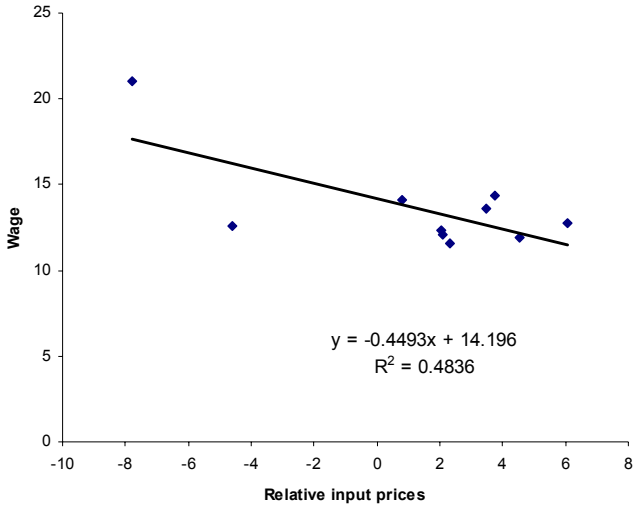
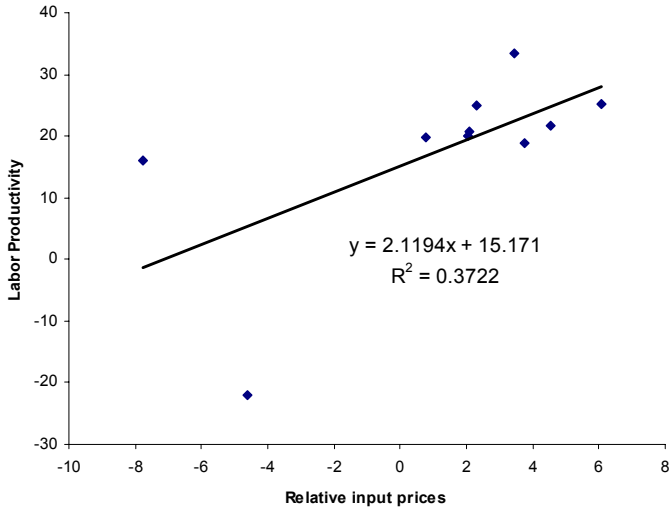


Figure 8: labor productivity growth higher where cost pressures higher

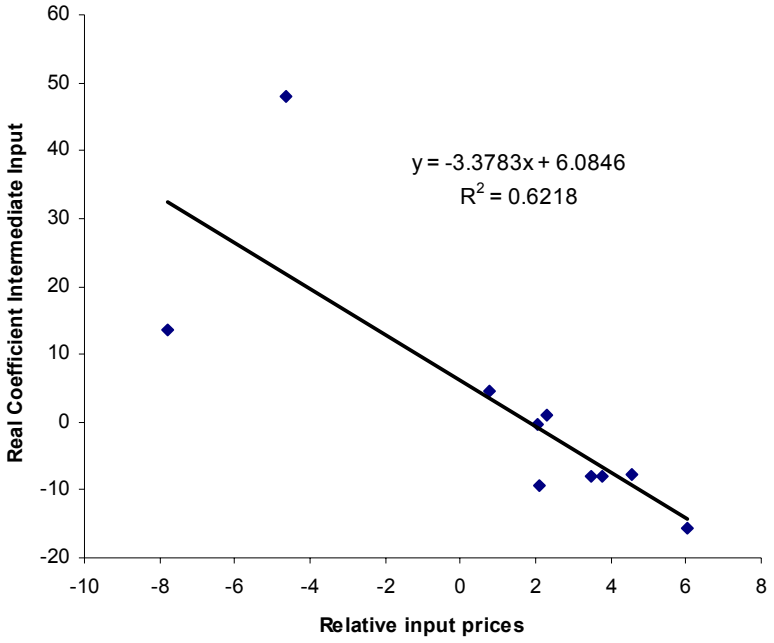


Source: authors' estimates.

V. Conclusion

The main contribution of this paper has been to provide a general framework for analyzing how improvements in the cost structure and efficiency have partly or fully offset the impact on profit of a rapid rise in raw material prices and wages in China's industry. Caveats are in place. Our findings are qualified by the fact that prices and input and output figures are broad and that 2002 was the most recent IO table available. There are other data concerns. For instance, the data on wages and employment has limited coverage. Nonetheless, we think that the data contains useful information on changes over time. Our analysis helps in understanding the impact of cost increases and how they have been partly or fully offset, as well as the impact across industries.

Figure 9. Improvement in technical efficiency is higher where cost pressures are higher



Source: NBS, authors' estimates.

China's industrial sector has experienced hefty cost pressures in recent years coming from rapid increases in raw material prices and wages. At the same time, profit margins have largely continued their trend rise. China's industrial enterprises have been able to cope with the cost pressures because of rapid growth of productivity and efficiency and output price increases. We quantify the productivity and efficiency gains. Our results suggest that those sectors with the largest cost pressures appear to have made the largest effort in offsetting the cost pressures.

Against a backdrop of concerns about different kinds of cost pressures impinging on China's industry, our results are also useful in identifying the key source of cost pressures. Our results suggest that the dominant source of cost pressures is via higher raw material prices. Since 2002, average weighted output prices have risen significantly less than average weighted input prices. The gap between output price rises and input price rises increased from 4 percentage points in 2005 to 4.3 percentage points in 2006 for core manufacturing (Table 6), while the average profit margin rose in that year. This shows that the ability of China's industry to offset rising raw material prices by increasing efficiency has so far remained undiminished.