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The challenge to china's enterprises from increasing labor costs: the product quality perspective

Dandan Li, Ting Tang, Dezhuang Hu, Feifei Song and Lianfa Luo

Institute of Quality Development Strategy, Wuhan, P.R. China; Macro-quality Management Collaborative Innovation Center in Hubei Province, Wuhan, P.R. China; China Enterprise Survey and Data Center, Wuhan, P.R. China

ABSTRACT

Using China Employer–Employee Survey data, this paper investigates the possible heterogeneous results of increasing labor costs of different firms. The paper finds that, unskilled labors have a higher wage growth rate than the skilled labor. Firms with higher product quality employ more skilled labor, and thus are less affected by the increasing labor costs. On the other hand, firms with higher product quality have less elastic demand, which makes it possible for them to increase their prices without demand decreasing. The conclusions are well supported by the data. Therefore, we should treat the challenge of increasing labor cost in a new way. The real challenge of increasing labor cost is greater for low-quality firms. The empirical results suggest that some of the low-quality firms should upgrade their quality to a higher level to offset their labor cost increase.

Abbreviations: CEES: China Employer-Employee Survey LP: Labor productivity LTP: Lewis turing point TFP: Total factor productivity

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Introduction

Increasing labor costs is one of the hottest topics regarding China's economic growth, given that cheap labor has been the prerequisite for more than 30 years of high growth. The source of growth has mainly been structural change, i.e., surplus labor has migrated from rural areas to urban areas, and their marginal product has changed from near zero to a positive value (Lewis 1954). However, most researchers have realized that this growth model may be coming to an end, because the unlimited supply of cheap labor no longer exists. The cost index published by Oxford Economics indicates that China's comprehensive cost of manufacturing is 96% that of the United States.

The real challenge of increasing labor costs comes from the fact that productivity growth does not match the labor cost increase. Therefore, the next question we should ask is: why does productivity not grow as fast as labor costs? We can consider this problem from two different aspects: supply of labors and productivity of firms. Regarding the labor supply, the sudden slowdown in the birth rate has led the labor supply to stop increasing. In fact, the statistics from NBSC show that the labor supply

CONTACT Lianfa Luo luo0708sky@163.com

decreased in 2012. When this happens, and all other factors remain constant, firms tend to obtain less profit.

More scholars tend to study this problem from the viewpoint of productivity. For a long time, Chinese firms have concentrated on the Original Equipment Manufacturer (OEM) industries, which are characterized by low added value, low quality, low Total Factor Productivity (TFP), and intensive labor use. This is why some economists have stated that there is no economic growth miracle in East Asia (Krugman 1994). Since the late 1990s, wages have been increasing faster than productivity in China (Hongbin et al. 2012). Chinese firms were unable to increase the prices of their products, resulting in the slowing down of economic growth.

Most of the literatures has assumed that the results of increasing labor costs are homogeneous, and paid little attention to the possibility of heterogeneous results. However, the existence of heterogeneous effects means that different firms may have completely different stories after the Lewis turning point (LTP). Although the increase of labor costs is not confined to any particular sector (Hongbin et al. 2012), the wage growth rate is relatively different between groups. On the whole, primary labor costs (for unskilled workers with lower education) have experienced a larger increase than skilled labor costs. This makes a big difference, as some firms may use a larger proportion of primary labors, while others use more skilled labors. Product quality is one of the most important factors in determining the labor structure (Verhoogen 2008), and thus it provides a good perspective to view different stories in relation to increasing labor costs. In China, companies that produce goods of higher quality (e.g., with good brands, manufactured to higher standards) do not decrease much in performance, and may even grow at a much higher rate.

At the same time, there was a large change on the demand side. As the income increased, domestic demand changed to higher-quality goods (Cheng and Li 2014). At the beginning of the 1980s, when China commenced its reforms, most Chinese households' consumption demands were not well satisfied, creating large opportunities for firms that could meet these demands. For example, industries producing goods such as clothing, shoes, appliances, and cars, were very profitable because their products was in huge demand. However, the structure of this demand changed in 2010. Given the lack of high-quality supply by domestic manufacturers, China was forced to increase imports to meet the demand for higher-quality goods. However, this is unsustainable, and in response to the increased demand for higher-quality products and the subsequent increase in imports, Chinese enterprises had to promote their product quality (Karen and Terry 2009).

Theoretical thinking and the case outlined above have inspired this study, in which we aim to investigate which types of firms can sustain steady growth despite the rapid increase in labor costs. To investigate this problem, we have differentiated the firms on the basis of quality. The basic hypothesis is that firms of higher quality may use less primary labor and produce products that are less elastic in demand, and thus will suffer less from increasing labor costs. This hypothesis suggests that increasing labor costs, though unwelcomed by all firms, may have a greater negative effect on low-quality firms. If this hypothesis can be proved, it will provide a different view on the labor costs in China, i.e., although increasing labor costs present a challenge to low-quality firms, they may provide opportunities for high-quality firms.

Our findings indicate considerable policy implications for both the government and the firms. If we can show that firms of higher quality experience less growth in labor costs and higher growth in productivity, it will be clear that firms should upgrade to a model of high quality, i.e., developing self-owned brands, adopting more international standards, and paying more attention to product innovation instead of imitation. From the government perspective, policies should focus on increasing the firms' supply ability, especially their high-quality supply ability, rather than on increasing gross demand.

Compared with the existing relevant research literature, the main contribution of this paper is that we explain why firms with higher quality suffer less from the increasing labor costs from the aspect of supply and demand. For the supply aspect, firms with higher quality hire more skilled labors which have a lower wage growth rate than unskilled labors, and thus are less affected by the increasing labor costs. For the demand aspect, firms with higher product quality have less elastic demand, so it is possible for them to increase the price without decrease in demand. Both of them provide a new perspective for the research of quality improvement to relieve the pressure of increasing labor costs in China. Besides, this paper guarantees the reliability of the research by using the China Employer-Employee Survey data, which provides the most up-to-date record of increase in labor costs in China's manufacturing industry.

Data and variables

This paper will use CEES data to research the problem. The survey collected high-quality data to observe how Chinese firms respond when faced with rapidly increasing labor costs. Given such a specific aim, the questionnaires include detailed questions on labor costs and firms' behaviors.

The CEES data are particularly good for research on labor costs for three reasons. First, they match the employer and the employee. Prior to the CEES, most researchers could only study firm behavior by using data from the NBSC and labor costs by using data from labor surveys such as the China Family Panel Survey (CFPS) and the China Households Income Project (CHIP). However, these surveys did not capture the real changes in Chinese firms' labor costs and performance. The CEES fills this gap with matching data. Second, the CEES is the most up-to-date data available. Most of the surveys were conducted 3 or 5 years ago, and the yearly published data, i.e., China Industrial Enterprises Data (CIED), has only included large firms. The CEES data collected in 2015 provide the most up-to-date record of increase in labor costs. Third, the CEES provides representative samples, obtained in 19 cities in Guangdong Province which has the highest GDP in China and thus is most representative of China's manufacturing industry.

The measurements of labor costs used in this paper mainly include total yearly expenditure of the firm on labor, unit labor cost (value added divided by labor cost), monthly wage of the employee, and average monthly income (including wages, bonuses, and subsidies). While the unit labor cost is widely used in the analysis of increasing labor costs relative to productivity (Hongbin et al. 2012), by using CEES data, we can derive the micro-level unit cost because data are available in firm-level labor costs and added value.

Table 1. Variables and summary statistics.

Variables	Obs	Mean	Std.Dev.	Min	Max
Labor Cost Per Capita 2014	512	4.643	4.998	0	52.73
Labor Cost Per Capita 2013	500	4.307	5.201	0	75.56
Labor Cost Growth	499	0.309	1.394	−0.907	17.69
Unit Cost 2014	467	8.124	108.8	−36.50	2276
Unit Cost 2013	457	6.920	106.3	−441.7	2155
Unit Cost Growth	455	0.620	13.02	−30.67	272.1
Monthly wage 2014	558	4604	2150	850	25484
Monthly wage 2013	558	4378	2616	0	24823
Monthly wage growth	557	0.133	0.357	−0.838	3.690
Rate of product return	491	0.008	0.0304	0	0.392
Rate of unqualified	515	1.998	3.257	0	30
No. of Brands	541	1.266	2.767	0	50
No. of International Standards	513	3.345	12.06	0	221
Quality index	461	0.245	0.0483	0.100	1

As for quality measurement, we mainly use the following four variables: rate of product returns, rate of unqualified products, number of brands, and number of international standards adopted. According to the quality definition provided by the ISO, quality means the degree to which the internal characteristics of products satisfy the requirements (ISO 2000). Quality is usually measured from two aspects: the internal characteristics and the degree of satisfaction (Cheng and Li 2014). The rate of product returns means the total sales divided by the value of returned products, and illustrates the degree to which a product cannot satisfy market demand as a result of quality deficiencies. The statistics of the variables are shown in Table 1.

Product quality and labor using structure

In this section, we discuss the proposition that firms of lower quality will employ more unskilled labor, whose wages will increase more than those of skilled labors, and thus will be affected more by the increasing labor costs. There are two ways to measure product quality: the micro-index and the macro-index. The macro-index is unable to characterize product quality at the individual level, while the micro-index is unable to measure product quality at the enterprise level (Kang 2014). We use four variables as proxies for an enterprise's quality, as noted in Section 2: rate of product returns, rate of unqualified products, number of brands, and number of international standards adopted. Products of high quality would be represented by one or more brands, be produced abiding by international standards, or show lower levels of returns on sales (i.e., less than the median for the whole samples). At the same time, we divide workers into two categories: skilled workers who obtain a higher education (beyond junior high school) or have professional qualifications, and unskilled workers who have a lower level of education (junior high school or below) or lack professional qualifications.

Because there are various variables that could be treated as proxies for quality, we allow for the fact that the ratio of returned product to sales, the number of brands, the number of international standards adopted in the production process and the failure rate reflect the quality of an enterprise. In addition, we use principal component analysis to combine these four variables and obtain a single index of an enterprise's quality to compute the quality index for each firm.[1]

Labor costs and labor skill components

We assume that when the economy first passes the LTP, the cost of unskilled labor will increase more than that of skilled labor. This is because labor-intensive manufacturers have developed rapidly, while low-skilled workers have become relatively scarce, and the degree of which is greater than that of high-skilled workers to technology-intensive enterprises (Ligao et al. 2014). The reason for this heterogeneous change is that the decrease in the labor supply has mainly come from rural areas. Meanwhile, the demand for skilled labors has not decreased too much, because most firms are traditionally labor-intensive, and have not changed in response to the change in the labor supply. This assumption should be tested before we move on to further discussion.

The monthly average wage and the growth rates of skilled and unskilled labors are presented in Table 2. It can be seen that skilled workers who obtained a higher level of education (middle school and above) or obtained work-related licenses or certificates received higher wages in both years, which suggests a premium for education and skills. As for the growth rate of the average monthly wage, there is no significant difference between workers who obtained a higher level of education (above middle school) and those who obtained a lower level of education (below middle school), while the growth rate of the monthly wage of workers who had obtained work-related licenses or certificates is much higher than that of workers who did not have work-related licenses or certificates, which suggests that the growth rate of the monthly wage of skilled workers is less than that of unskilled workers.

Figure 1 provides a clearer picture of the difference in wage increases between skilled and unskilled workers. The wage growth rate for workers obtained no job trainings is 14.59%, which is higher than that for workers with job trainings. Further, workers with no professional certifications received an average wage increase of 15.53%, which is nearly 6% higher than that of those with certifications. Based on these results, we can conclude that the cost of unskilled workers increases more than that of skilled workers.

Product quality and labor use component

The second assumption to be tested is that firms producing higher-quality products will use less unskilled workers, based on the theory that high-quality products require a higher percentage of skilled labors. Therefore, in this section, we discuss whether firms of lower quality will employ more unskilled labors and firms of higher quality will employ more

Table 2. Labor costs for different skill levels.

	Low education	Medium and higher education	Diff
monthly wage 2013	3315.21	5208.33	−1893.12***
monthly wage 2014	3458.59	5584.56	−2125.968***
wage growth	12.99%	15.09%	−2.1%
	No certificate	With certificate	Diff
monthly wage 2013	4279.85	5246.89	−967.046***
monthly wage 2014	4570.08	5532.66	−962.582***
wage growth	15.53%	9.73%	5.8%
	No training	Training	Diff
monthly wage 2013	4145.19	5305.40	−1160.215***
monthly wage 2014	4405.17	5634.78	−1229.609***
wage growth	14.59%	13.88%	0.71%

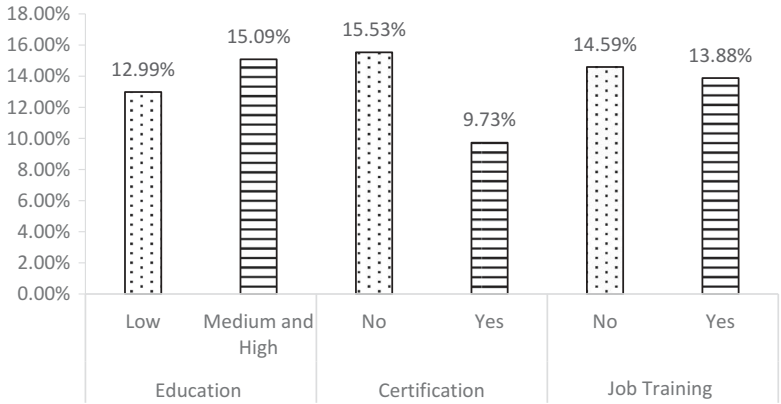

Figure 1. Wage growth of skilled and unskilled labor.

skilled labors. We first correlate the quality variables separately with labor skills, and then analyze the correlation between the quality index and the labor skills structure.

Firms with one or more brands employ more skilled labor than those have no brands, as shown in Table 3. In relation to education, the average proportion of workers with an education level above middle school in firms with brands was 52.64%, while it was 43.86% in firms without brands. Focusing on front-line workers, in 2013, 12.87% of these workers in firms with brands had a professional qualification, which is about three times the rate in firms without brands. In 2014, the difference between firms with brands and firms without brands in the average proportion becomes larger, almost 8%. Further, the growth rate in the number of workers with professional qualifications in firms with brands was 7.96%, compared with 4.70% in firms with no brands.

In Table 4, it is shown that there is indeed a difference in the proportions of skilled and unskilled workers between enterprises adopting international standards in the production process and enterprises which do not. The proportion of front-line workers with professional qualification in firms adopting international standards is 1.24%, which is 1.19% higher than that in firms which did not adopt international standards in 2013 and 2014 respectively. The growth rate in the number of workers with professional qualifications in firms adopting international standards is 8.57%, which is around 1.59 times higher than that in firms that do not adopt international standards and the growth rate of the proportion of workers with professional qualifications in firms that adopt international standards is around 1.44 times higher than that in firms that do not adopt international standards. One possible reason might be that in face of rising labor costs, firms of higher quality tend to employ more skilled workers with professional qualifications to further enhance their product quality to offset the rising labor costs.

Table 3. Brand and labor skills structure.

	No brand	Own Brand	Diff
% of workers with medium and higher education	43.86%	52.64%	−8.78%***
% of front-line workers with professional qualification 2013	5.81%	12.87%	−7.06%***
% of front-line workers with professional qualification 2014	5.71%	13.32%	−7.61%***
Growth of the qualification proportion	6.33%	8.55%	−2.22%
Growth of workers with professional qualification	4.70%	7.96%	−3.27%

Table 4. International standards adoption and labor skill structure.

	Not Adopting International standard	Adopting International standard	Diff
Proportion of staff above middle school	49.30%	48.62%	0.68%
Proportion of front-line workers with professional qualification 2013	9.31%	10.55%	−1.24%
Proportion of front-line workers with professional qualification 2014	9.58%	10.77%	−1.19%
Growth of the qualification proportion	6.27%	9.04%	−2.77%
Growth of workers with professional qualification	5.39%	8.57%	−3.17%

Table 5. Rate of product returns and labor skill structure.

	Low quality	High quality	Diff
Proportion of staff above middle school	47.81%	50.62%	−2.81%
Proportion of front-line workers with professional qualification 2013	10.06%	10.32%	−0.26%
Proportion of front-line workers with professional qualification 2014	10.08%	10.88%	−0.80%
Growth of the qualification proportion	3.80%	12.71%	−8.91%
Growth of workers with professional qualification	2.78%	10.75%	−7.97%*

In Table 5, we define firms with a rate of product returns above the median as low quality and those with a rate below the median as high quality. The proportion of front-line workers with professional qualifications in high-quality firms is 10.32% in 2013 and 10.88% in 2014 respectively, both of which are higher than that in low-quality firms. Moreover, the growth rate of the qualification proportion in firms with a lower rate of returns is more than twice that of firms with a higher rate of returns. These results suggest that enterprises producing high-quality products employ more skilled workers.

Moving to the quality index, which is more comprehensive at the quality level, we find that in general, a higher quality makes a higher proportion of skilled labors used (Figures 2 and 3). The quality index is positively correlated with both the percentage of skilled labors and the average education of the workers. The correlation coefficients are 0.08 and 0.09 respectively.

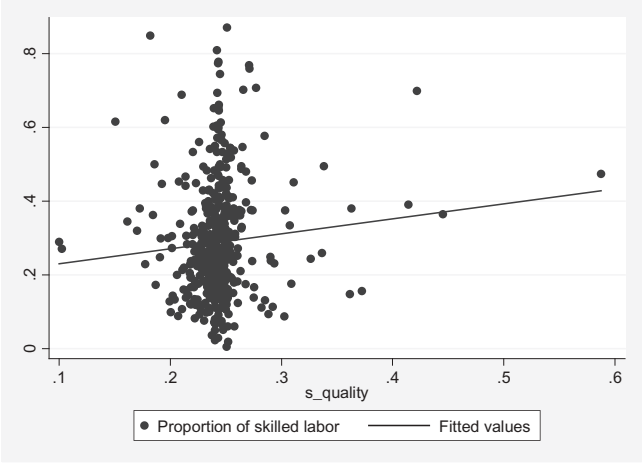

Figure 2. Quality and skilled labor use.

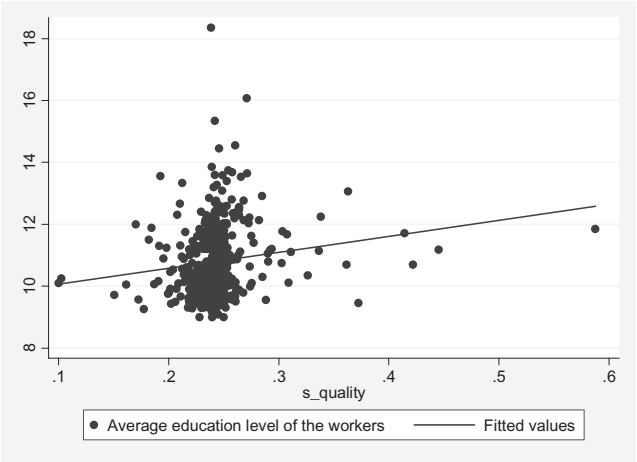

Figure 3. Quality and education level.

Table 6. Quality index and labor skill structure.

	Low quality	High quality	Diff
% of skilled 2013	26.11%	30.39%	−4.28%***
% of skilled 2014	26.87%	30.71%	−3.84%***
% of medium and higher education	47.18%	50.95%	−3.77%
% of trained workers	24.19%	26.28%	−2.09%

In order to determine the quality level, this paper then divided all the firms into two groups by using the median quality index as the cut-off point. As shown in Table 6, firms with quality indexes below the median use 26.11% skilled labor in 2013 and 26.87% in 2014 respectively, less than those above the median. And the difference is statistically significant at 1% level. In terms of the average percent of medium and higher education and the average percent of trained workers, firms with relatively low quality are also on average around 3% lower than the firms with relatively high quality.

Quality, labor costs, and performance

Based on detailed data analysis, we can confirm that the cost of unskilled labors increases at a greater rate than that of skilled labors, and firms with higher product quality use a lower proportion of unskilled labors. Thus, we can conclude that labor costs will increase more in low-quality firms than in high-quality firms because they use a larger proportion of 'relatively expensive' labors. To confirm this conclusion, we testify it by using CEES data. If the high-quality firms experience relatively slower increase in labor costs, this implies structural effects, i.e., the challenge presented by increasing labor costs, are relatively lower for high-quality firms due to their labor use structure. In addition, we also testify another hypothesis proposed in the introduction, namely demand effects, which suggests that high-quality products are less elastic in price, so the firms can add the increased labor cost to the price without decrease in demand.

Product quality and labor costs

First, we attempt to determine whether there are significant differences between different quality groups. Table 7 shows the unit labor cost changes between different quality groups. As expected, higher-quality firms experience relatively lower unit cost growth. For example, the firms below the median quality have a growth rate of 6.31% in terms of their unit labor cost, while the firms above the median show a decrease in their unit labor cost. If we consider the firms in three different quality index quantiles, we find that the unit labor cost of low-quality firms increases by 4.52% on average, but that of medium- and high-quality firms decreases. Figure 4 show the general negative correlation between quality and labor cost increases.

Thus, it is clear that there is a significant structural difference between firms of different quality. As a result of their structure, firms of higher quality will experience less increase in labor costs. In other words, low-quality firms will be hurt more than high-quality firms by the increasing labor costs. Therefore, the real challenge arising from the increasing labor costs is for those firms that are still producing low-quality products. We can see that the productivity growth of high-quality firms exceeds the growth of their labor costs, resulting in a decline in their unit labor cost (Figure 5).

Table 7. Growth in labor costs in different quality groups.

	Unit labor cost in 2014	Unit labor cost in 2013	Growth rate of unit labor cost
Quality index under the median	53.74%	50.55%	6.31%
Quality index over the median	78.68%	78.79%	−0.14%
Low quality	58.42%	55.89%	4.52%
Medium quality	35.68%	36.44%	−2.08%
High quality cost	94.14%	95.39%	−1.31%

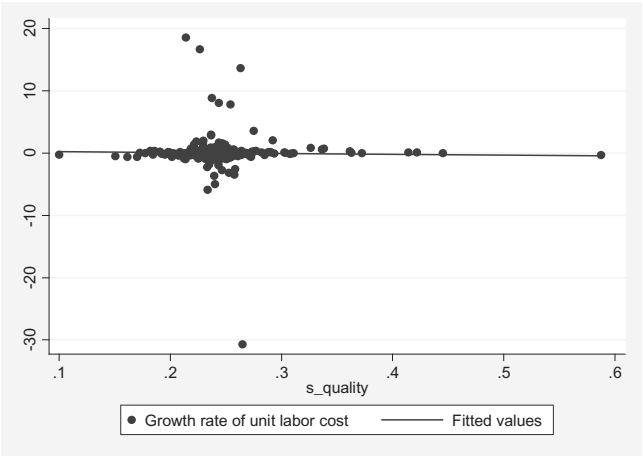

Figure 4. Quality index and labor cost increases.

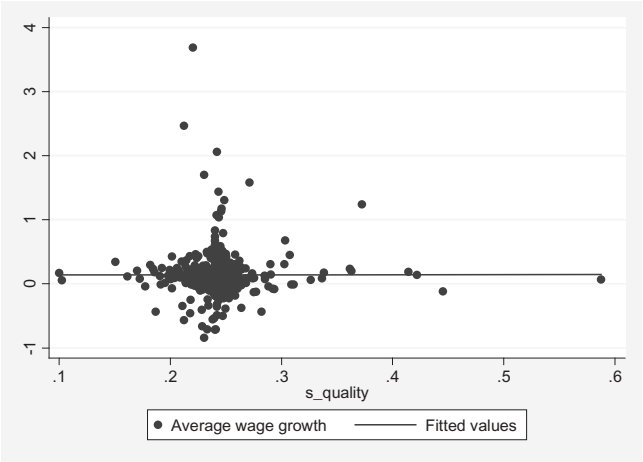

Figure 5. Quality index and wage growth.

Quality and performance

This section discusses the relationship of quality and performance, which is the key to understanding the decreasing unit labor cost. We include two performance variables that are most frequently used by researchers: labor productivity (LP) and total factor productivity (TFP).[2] Table 8 shows that both LP and TFP grow at a higher rate in the higher-quality group. For example, in firms of above-median quality, LP growth is 20.58%, which is 1.6 times higher than that of firms below the median. TFP growth for firms of above-median quality is 8.86%, which is more than 40% higher than that of firms below the median.

If we divide firms into groups based on quality, we find that the highest-quality group delivers the best performance. For example, the growth in LP of the high-quality group is 23.82%, which is about twice as high as that of the low-quality group. Further, the high-quality group is the only group that experiences positive TFP growth. The growth rate of TFP in the high-quality group is 22.97%, while it declines by 27.85% in the low-quality group and 21.27% in the medium quality group.

Based on these results, it was our assumption that products produced by firms of higher quality have less elastic demand, and thus these firms will experience more stable market demand. Combined with the first assumption, it is easy to conclude that firms of higher quality are less affected by increasing labor costs (Figure 6 and 7).

Table 8. Performance change in different quality groups.

	LP 2013	LP 2014	LP growth	TFP 2013	TFP 2014	Growth rate of TFP
Quality index under the median	8.81	9.51	7.93%	35.52%	23.16%	−34.79%
Quality index over the median	9.15	11.03	20.58%	42.69%	46.47%	8.86%
Low quality	8.02	9.00	12.21%	35.29%	25.46%	−27.85%
Medium quality	14.26	15.51	8.76%	50.61%	39.84%	−21.27%
High quality cost	7.82	9.68	23.82%	33.21%	40.84%	22.97%

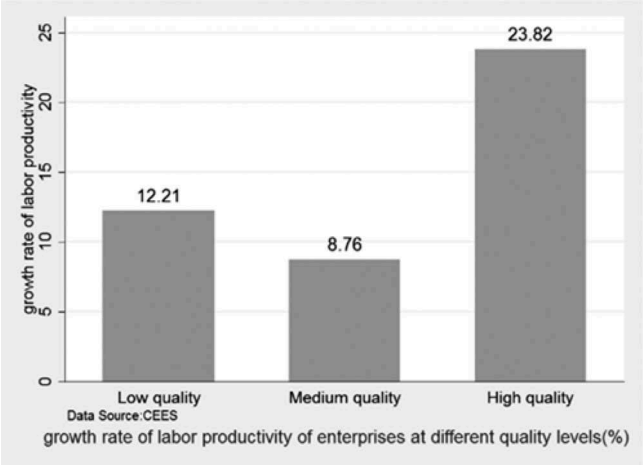

Figure 6. Quality index and labor productivity growth.

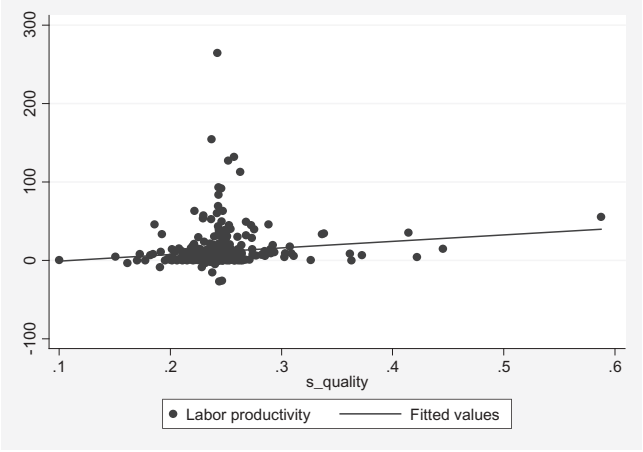

Figure 7. Quality index and labor productivity.

Industry analysis

The preceding analysis provides new insights into the effects of the increasing labor costs. High-quality firms can become more stable after the LTP because of both the structural effect and the demand effect. We can also test the two effects by looking at the industry-level evidence.

Firstly, we divide firms into five different industry categories: Industry I is light industry, e.g. food manufacturing, textile product manufacturing and wood processing; Industry II includes chemical materials and pharmaceutical etc.; Industry III includes metal manufacturing; Industry IV includes machinery and equipment manufacturing; Industry V includes computer, communications and other electronic equipment manufacturing.[3] And then we correlate the quality indexes and unit labor cost growth in figures.

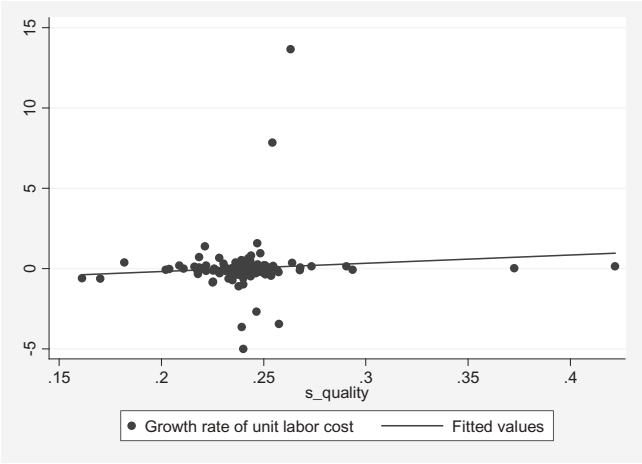

Figure 8. Light industry.

Figure 8-12 present the results of the correlation analysis. It can be found that the growth of the unit labor cost declines as the quality index increases in Industry II (Chemicals), Industry III (metal manufacturing) and Industry IV (machinery and equipment manufacturing). That is to say, for these 3 industries, we can find out evidence supporting the hypothesis in this paper. We also locate two industries that do not show any obvious relationship between quality index and unit labor cost. These are light industry and electronics. For the light industry (Figure 10), there exist slight positive relationship between quality and unit labor cost growth. Firms in this industry are mostly labor-intensive, and demand for their product quality is less elastic. However, it does not change the overall conclusions as most of the industries show the negative relationship between quality index and unit labor growth.

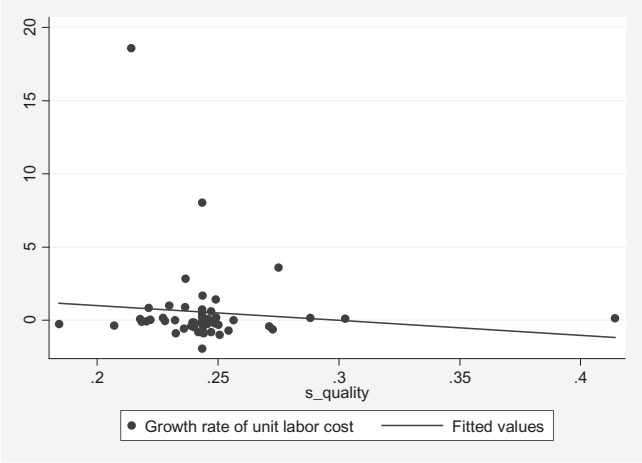

Figure 9. chemical materials and pharmaceutical etc.

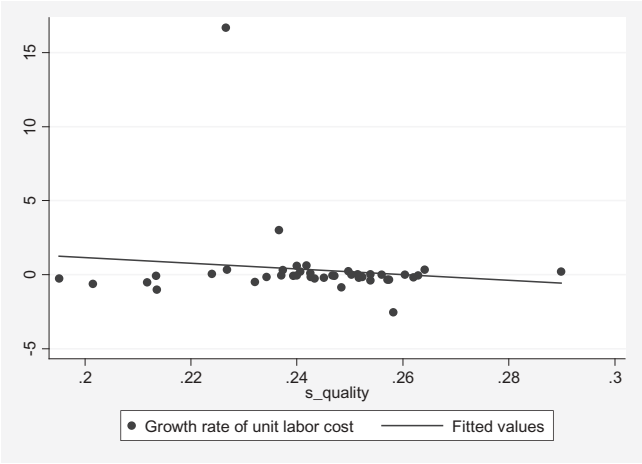

Figure 10. Metal manufacturing.

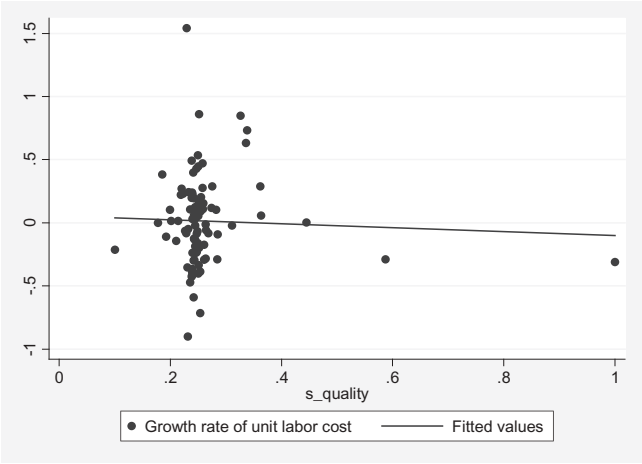

Figure 11. Machinery and equipment manufacturing.

With these results from most of the industries, it can be supported that firms with higher quality may be less affected by the labor cost increasing than the low quality firms. This makes the conclusions more robust.

Conclusions and policy implications

In this study, we use CEES data to identify the real challenge for China's manufacturing firms. Many people worry about China's economic growth after the LTP, because most firms will become unprofitable when the cheap labor supply ends. However, most researchers have not considered the heterogeneous effects of increasing labor costs. We propose that firms producing higher-quality products that experience less elastic demand employ more skilled labors, which means that they are less affected by the increasing labor costs. The results show that unskilled labors are experiencing higher

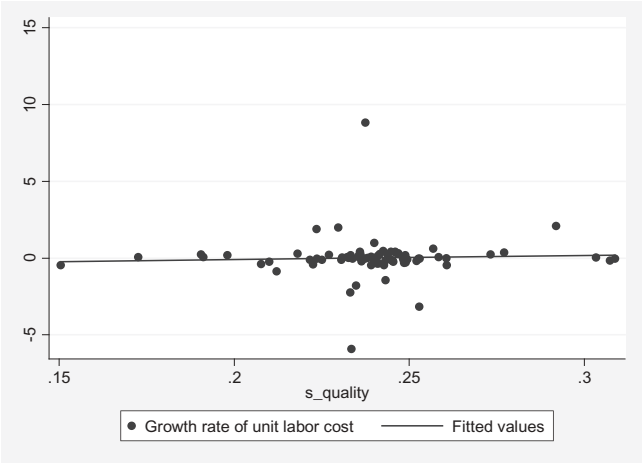

Figure 12. Computer, communications and other electronic equipment manufacturing.

wage growth than skilled labor. The assumptions that firms of high quality employ more skilled labors and have higher productivity growth are also supported by the statistics.

Our results have three implications. First, we should not worry too much about the arrival of the LTP and the rapid increase in labor costs. The real challenge in terms of labor costs is for firms of low quality, because they cannot transform to a high added value model. For firms of high quality, increasing labor costs will not be a big problem. Second, it is necessary for China to promote the development of quality in various industries. Third, some of these industries should upgrade to higher-quality production. Most Chinese firms are labor intensive, so it is difficult for them to innovate in the short term. However, they can still upgrade to higher-quality products by, for example, establishing their own brands and adopting advanced manufacturing standards. HLA is one of the most successful firms that has followed this path, as a good example.

Notes

1. The process for the computation of quality indexes is not shown in the paper. Anyone who wants to look at the computation process can write to the authors.
2. The TFP is calculated by the Solow Residual Model. The steps to derive the TFP are: first, run OLS regression on the output controlling the labor quantity and capital stock; second, calculate the elasticity coefficients of labor and capital; third, TFP equates the output growth minus the growth of labor multiple its elasticity coefficient, and minus growth of capital multiple its elasticity coefficient.
3. The CEES includes 27 of the 31 two-digit-coded manufacturing industries. The codes are provided by the NBSC.

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