Assessment of China's Qualitative Demographic Dividend for Economic Growth during 2016-2020 *

Li Gang, Liang Yongmei and Shen Keting
Institute of Industrial Economics, Chinese Academy of Social Sciences, Beijing, China

Abstract: *Given the great strides that China's education sector has made in recent decades, it can be expected that the overall workforce quality of exiting China's labor market in coming one or two decades will be relatively low, while the overall quality of workforce newly entering into China's labor market will be high. As the new, better-educated generation takes over, China's workforce quality will be vastly improved. This in turn will promote economic growth. We refer to economic growth arising from improved workforce quality as qualitative demographic dividend. Using the computable general equilibrium (CGE) model, this paper investigates the relationship between workforce quality improvements and economic growth. According to the model's results, an improvement in workforce quality will raise the economic growth rate by about two percentage points per annum between 2016 and 2020 and by 10 percentage points cumulatively by 2020. In other words, GDP will be 1.1 times the level of baseline GDP by 2020 due to the improved education levels. Given different production functions across sectors, the improvement of workforce quality will affect different sectors in different ways. On the whole, the improvement of workforce quality is more favorable to the development of capital-intensive sectors and sectors with rapid technology progress. According to this paper, considering the improvement of workforce quality, we cannot conclude that China's potential economic growth rate has already begun to decline. Despite diminishing conventional quantitative demographic dividends, China's qualitative demographic dividends will keep rising. Qualitative demographic dividends will further push forward China's industrial restructuring and the strategic transition of industrial competitiveness from quantitative to qualitative and from an extensive to an intensive pattern of development.*

Keywords: *qualitative demographic dividends, economic growth*
JEL Classification: J11, J24, O40

1. Introduction

It is widely believed in the academia that China's potential economic growth rate is in decline, and yet relevant quantitative analysis and calculations have not taken into account the improvement of China's workforce quality that can be expected over the coming 10 to 20 years. The relevant data show that China's workforce quality has dramatically improved over the past three decades since the initiation of China's reform and opening-up program in

* Corresponding author: cassligang@gmail.com

质量型人口红利对中国未来经济影响评估*

李钢　梁泳梅　沈可挺

中国社会科学院工业经济研究所

摘　要： *由于近年来中国教育大发展，可以想象今后10～20年退出劳动力市场的总体劳动力素质是较低的，而新进入劳动力市场的劳动力素质是较高的；这一进一出，将极大地提高中国劳动力的素质，进而能促进中国经济的增长，我们将这种由劳动力素质提升所带来的经济增长称为质量型的人口红利。本文采用CGE模型对劳动力素质提高与经济增长的关系进行分析。模型运行的结果显示，劳动力素质的提高将会提高经济增长率：从2016年到2020年每年提高经济增长率2个百分点左右，到2020年累计提高经济增长率达到10%左右（也就是2020年冲击结果的GDP是基线GDP的1.1倍）。由于不同行业的生产函数不同，劳动力素质提升对不同行业产生的影响也有较大差异。总体而言，劳动力素质的提高更加有利于资本密集型产业的发展，有利于技术进步较快的行业的发展。本文研究表明，考虑到劳动力素质的提升，不能轻言中国经济潜在增长率已经下台阶了，因为虽然中国传统的数量型人口红利在不断减弱，但质量型人口红利会不断增强；质量型的人口红利将进一步推进中国产业结构优化，实现中国产业国际竞争力从数量型向质量型、从粗放型向集约型的战略性转变。*

关键词： *质量型人口红利；经济增长*

JEL 分类号: J11，J24，O40

一、引言

目前有不少学者认为中国经济潜在增长率要下台阶，但目前所看到的相关定量分析计算都没有考虑中国今后10～20年劳动力素质提升这一因素。数据显示，改革开放30多年来中国劳动力的素质有了大幅提升。根据各次全国人口普查数据，1964～2010年，全国每10万人口中，具有大学文化程度的（包括大专及以上）从416人大幅上升至8930人；具有高中文化程度的从1319人上升至14032人；具有初中文化程度的从4680人上升至38788人，具有小学文化程度的由28330人下降为26779人。从整体来看，劳动者的各类教育程度都在提高，其中，大学程

* 作者邮箱：cassligang@gmail.com

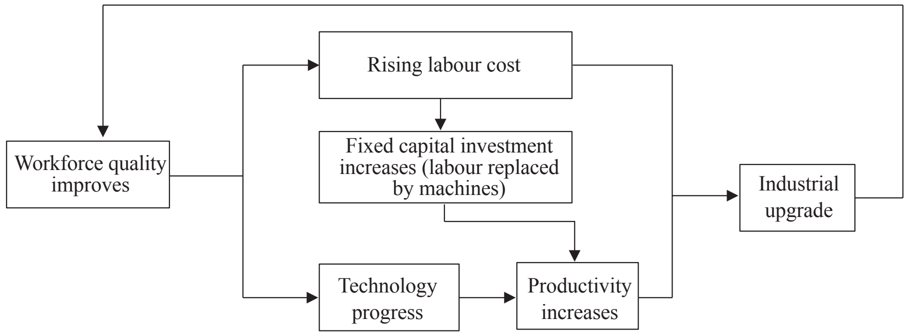

Figure 1: Relationship between Workforce Quality and Economic Growth

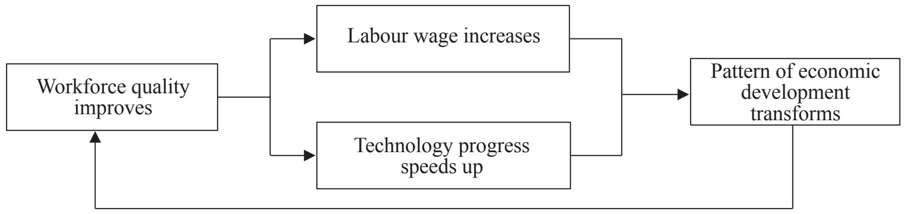

Figure 2: Simplified Chart Showing Relation between Workforce Quality and Economic Growth

1978. According to data from various national demographic censuses between 1964 and 2010, per 100,000 people in China, the number of college-educated people in the workforce (including junior college and above) increased from 416 to 8,930; the number of people with high-school educations increased from 1,390 to 14,033; the number of people with junior-middle-school educations increased from 4,680 to 38,788; and the number of people with primary-school educations declined from 28,330 to 26,779. Generally speaking, workforce education increased at all levels, particularly at the collegiate level. Between 1964 and 2010, the number of people with a college education increased by 20.5 times; in 2010, the number of people with a primary-school education was only 90% that of 1964. This demonstrates a marked improvement in workforce competence.

Given the rapid development of education in China over recent decades, it can be expected that the overall workforce quality of those in exiting labor market in the coming 10 to 20 years will be relatively low, while the workforce quality of those entering the labor market will be relatively high. As the new generation takes over, China's workforce quality will vastly improve, contributing to China's economic growth. We refer to this kind of economic growth arising from an improvement in workforce quality as qualitative demographic dividend.

The relationship between workforce quality and economic growth is described in Figure 1. Workforce quality improvement will induce technology progress and productivity growth, thus expediting industrial upgrade. Improving workforce quality will also necessarily call for higher labor wages, which will result in a higher cost of labor, alter the price relation between capital and labor and prompt companies to adopt capital-intensive technologies while reducing employment. This will also increase labor productivity reflected in industrial upgrade. In order to conduct quantitative analysis, we have simplified Figure 1 into Figure 2.

This paper employs the computable general

度的提升速度最迅速。1964～2010年，全国每10万人口中，具有大学文化程度的人数增长20.5倍，是提升速度最快的；接受高中教育及初中教育的人数分别增长了9.6倍和7.3倍，而2010年具有小学文化程度的人数仅为1964年的90%。这表现出了劳动力素质结构的优化。

由于近年来中国教育大发展，可以想象今后10～20年退出劳动力市场的总体劳动力素质是较低的，而新进入劳动力市场的劳动力素质是较高的。这一进一出，将极大程度地提高中国劳动力的素质，进而促进中国经济的增长；我们将这种由劳动力素质提升所带来的经济增长称为质量型的人口红利。

劳动力素质与经济增长关系可以用图1表示。一方面劳动力素质提高将会导致技术进步，提高劳动生产率，从而促进产业升级；另一方面劳动力素质提高后必须要求更高的劳动报酬，促使劳动力成本上升，改变资本与劳动力的比价，从而促使企业采取资本密集型的技术，降低劳动力的使用，这会提高劳动生产率，最终也会表现为产业升级。为了进行定量分析，我们将图1简化为图2。

本文将采用CGE模型对提高劳动力素质与经济增长的关系进行分析。可计算一般均衡(Computable General Equilibrium，CGE)模型通过对家庭、企业、政府等各个经济主体的行为设定，可对经济体系中各部门之间的相互影响进行定量分析，从而可以分析一项经济政策的直接与间接影响。比较而言，大部分经济计算模型都需要以较长时段的时间序列数据为基础才能进行分析估计，而CGE模型是以经济主体在成本最小化和效用最大

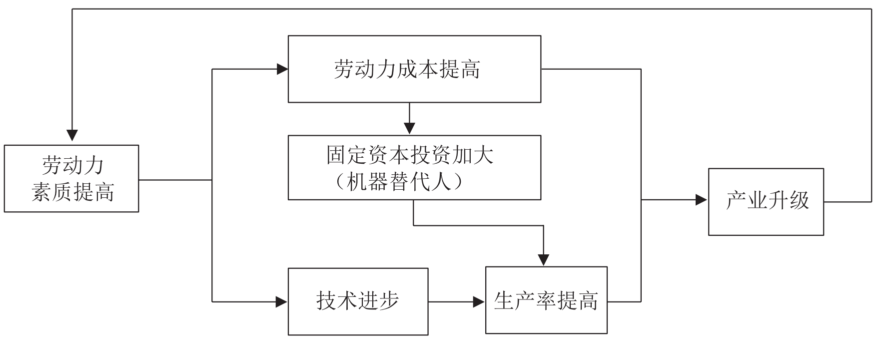

图 1　劳动力素质与经济增长的关系

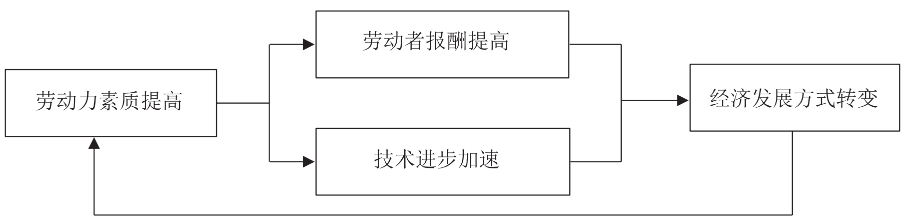

图 2　劳动力素质与经济增长的关系的简化图

equilibrium (CGE) model for the analysis of the relationship between workforce quality and economic growth. By configuring the behaviors of various economic entities including households, enterprises and governments, the CGE model enables the quantitative analysis of interactions among various sectors within an economic system and thus reveals the direct and indirect effects of an economic policy. Most economic computable models require time series data over a relatively long timeframe in order to conduct analysis and estimation, whereas the CGE model provides quantitative analysis based on behavioral patterns under conditions of cost minimization and utility maximization for economic entities and therefore may loosen the presumption that the economy should be roughly stable over a long timeframe. This is of unique significance to rapidly changing economic systems like China's, wherein there is no external system to provide reference. For these reasons, the CGE model has been widely applied in economic analyses of various Chinese sectors, including the national economy, regional economies, international trade, fiscal and tax revenues, energy and environmental policy, employment and income distribution, and more. The CGE model takes as its data foundation the social accounting matrix (SAM) first put forward in China's 2002 input-output table. The SAM provides a complete and coherent accounting framework for CGE modeling. This paper has made adjustments using the cross-entropy method to compensate for differences in statistical data from different sources in the original SAM table as well as the statistical error terms inherent in the input-output table. Values for key parameters such as the elasticity of substitution and income elasticity are mainly determined in reference to other literature on the CGE model, while the values of other parameters are arrived at by using base-year data from the SAM table combined with exogenously given key parameters.

This model improves on normal modeling processes in that we have made appropriate adjustments to certain key parameters based on large-scale corporate questionnaire surveys. In October 2009 and June 2010, the Institute of Industrial Economics (IIE) of the Chinese Academy of Social Sciences (CASS) organized two rounds of large-scale questionnaire surveys in the business community. Based on survey results, we have made adjustments to some key parameters to make them more consistent with the reality of China's economy. For instance, in the trade module, we have applied different configurations to the international market prices of various sectors according to pricing strategy changes made by relevant enterprises in response to exchange rate fluctuations. Furthermore, assumptions related to a large-country model have been adopted for some sectors. Looking at the scale and price sensitivity of exported goods related to China's export rebate policy for enterprises of different sectors, we have made relevant differentiation configurations for the export rebate of various sectors. We have also adjusted technology progress across sectors according to survey results on the technological upgrade processes of relevant enterprises.

2. Quantitative Calculation of the Relationship between Labor Cost and technology progress

China's rising labor cost is an outcome of technology progress. The application of advanced and more productive technologies has led to an increase in total factor productivity (TFP). For workers themselves, the same level of labor input brings about higher output, which suggests that the labor intensity of the workforce has increased, i.e. workers must exert themselves and their labor more intensively than before. This in turn requires an increase in worker remuneration. Hence, we will employ the data of various provinces between 2001 and 2008 to investigate the effect of technology progress on labor cost using the following econometric model:

$$\ln w_{it} = \gamma_1 + \gamma_2 \ln A_{it} + e_{it} \qquad (1)$$

Where, w_{it} denotes the average labor remuneration for province i in year t given data from *China Compendium of Statistics of 60 Years since 1949*. A_{it} denotes technology progress of province i in year t. Here, we have employed the

化条件下的行为模式为基础进行定量分析，因而能够放松对经济体在长时期内结构基本稳定的假设，从而对于像中国这样经济体系快速变化而且难以有外部体系可供参照的独特经济体具有特殊的意义。有鉴于此，CGE模型在引入中国后已经被广泛用于宏观经济、区域经济、国际贸易、财政税收、能源与资源环境政策、就业与收入分配等众多领域的经济分析。CGE模型的数据基础是在2002年中国投入产出表的基础上构建的社会核算矩阵（SAM）。SAM能够为CGE建模提供一个完整一致的核算框架。对于原始SAM表中不同来源统计数据存在的一些差异以及投入产出表本身存在的统计误差项，本文采用跨熵法（Cross Entropy）进行调整。模型中的替代弹性、收入弹性等一些关键参数的取值主要是通过借鉴其他一些CGE模型相关文献确定，其余参数的取值则是利用SAM表的基年数据和外生给定的关键参数通过校准（Calibration）方法得到。

相对于一般的建模过程而言，本模型的一个进步在于，我们基于大规模的企业问卷调查，对一些关键参数进行了适当调整。2009年10月与2010年6月，中国社会科学院工业经济研究所分别组织了两次针对企业的大规模问卷调查，根据调查的结果，我们对一些关键参数进行了调整，使之更加符合中国经济的实际。例如，在贸易模块中，我们根据有关企业为应对汇率波动而在国际贸易中采取的定价策略变化，对不同行业的国际市场价格采取了不同的设定，比如对部分行业采用了大国模型假设；根据不同行业企业的出口产品价格和产品出口规模对国家出口退税政策调整的敏感程度差异，我们在模型中对不同行业的出口退税率进行了相应的差异化设定；针对有关企业技术升级问题的调研结果，我们对不同行业的技术进步率进行了相应的调整。

二、劳动力成本与技术进步关系的定量计算

中国的劳动力成本正在不断提高，这是技术进步的结果。越来越多先进的、生产效率更高的技术被应用，促进了全要素生产率的提高。对于劳动力本身而言，同样的劳动力投入带来了更高的产出，这意味着劳动力的劳动强度提高了，劳动者必须付出更高强度的劳动。这也相应地要求劳动者报酬有所增加。鉴于此，我们将使用各省2001～2008年的数据，通过以下计量模型来分析技术进步对劳动力成本的影响：

$$\ln w_{it} = \gamma_1 + \gamma_2 \ln A_{it} + e_{it} \tag{1}$$

其中w_{it}，表示第i个省份的劳动者在第t年度获得的平均劳动者报酬，数据来源于《新中国六十年统计资料汇编》。A_{it}表示第i个省份在第t年度的技术进步率。这里，我们使用新古典增长函数来测算出全要素生产率，用来作为技术进步率A的衡量。

这里，A_{it}的计算如下：

$$A_{it} = \frac{Y_{it}}{L_{it}^{\alpha} K_{it}^{\beta}} \tag{2}$$

其中，Y_{it}为省、市、自治区的地区生产总值，并调整为2000年不变价。K_{it}为各省的固定资本存量，借鉴张军等（2004）的方法测算，并调整为2000年不变价，由于1997年之前的固定资产投资价格指数将重庆与四川合并在一起，本文在测算固定资产投资时也将重庆与四川合并在一起，统称为“四川”。L_{it}为各省的平均就业人数，计算数据均来自《中国统计年鉴》、《新中国六十年统计资料汇编》。

将由式（2）计算出的A_{it}，代入式（1）进行回归。

Table 1: Regression of the Result between Labor Cost Increase and Technology Progress (A)

Independent variable	Dependent variable $\ln w$
$\ln A$	1.797*** (13.04)
γ_1	2.61*** (46.01)
R^2	0.64
Wald chi2(1)	179.91
Prob>chi2	0.000

Note: Numbers in brackets are Z test values and *** denotes significance at 1% level.

neoclassical growth function to estimate TFP as a measurement of technology progress A.

Here, A_{it} is calculated as follows:

$$A_{it} = \frac{Y_{it}}{L_{it}^{\alpha} K_{it}^{\beta}} \tag{2}$$

Where, Y_{it} is regional gross product for various provinces, municipalities and autonomous regions, adjusted given a constant price of 2000. K_{it} is fixed capital inventory for various provinces and is estimated based on the approach of Zhang Jun et al. (2004), and adjusted given a constant price of 2000. This paper has combined Chongqing and Sichuan into the general reference of "Sichuan" for estimating fixed asset investment given that the pre-1997 fixed asset investment price index was of Chongqing and Sichuan combined. L_{it} is the average employment of various provinces, with data taken from *China Statistical Yearbook and China Compendium of Statistics of 60 Years since 1949.*

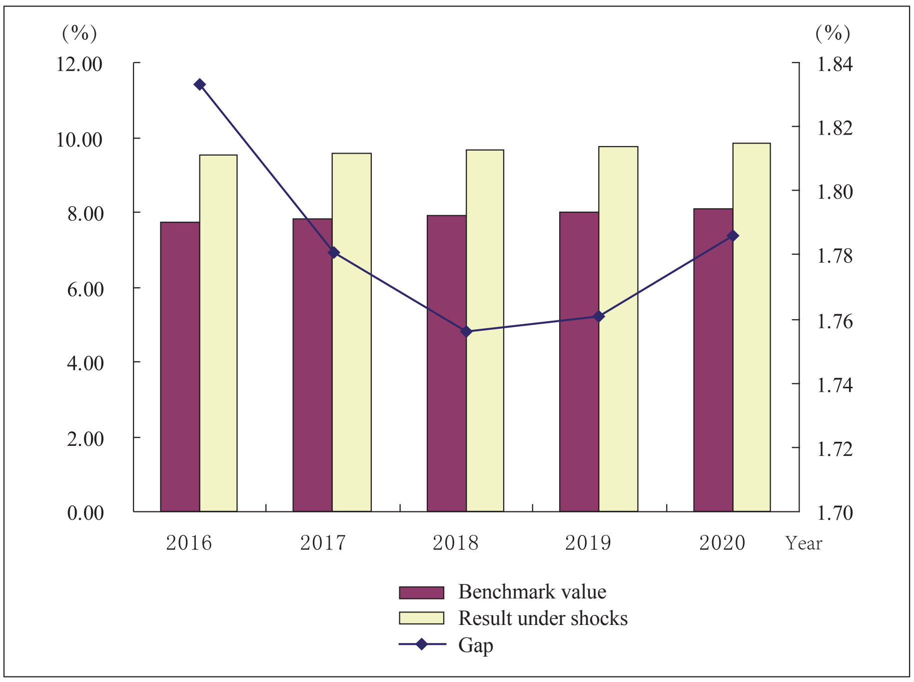

Figure 3: Effect of Workforce Quality Improvement on China's Macroeconomic Variables

表 1 劳动力成本提高与A关系回归结果

自变量	因变量 $\ln w$
$\ln A$	1.797*** (13.04)
γ_1	2.61*** (46.01)
R^2	0.64
Wald chi2(1)	179.91
Prob>chi2	0.000

注：括号内数据为Z检验值，***表示在1%的水平上显著。

回归结果见表1。从回归结果来看，全要素生产率对于劳动力成本具有显著的影响。从模型结果来看，全要素生产率与劳动力成本正向相关，当全要素生产率提高1%时，劳动力成本也会相应地提高1.797%。

三、劳动力素质对中国经济的影响

本文对中国2016～2020年的经济增长及产业结构进行了预测，以预测值作为研究的基线；然后根据前述的研究结果在CGE模型中同时进行技术进步与劳动力成本提高的冲击，根据冲击的结果来分析劳动力素质提高对中国经济的影响。这里分别分析了劳动力素质提高对中国经济总产出的宏观影响和劳动力素质提高对不同行业的影响。

1. 对中国总产出的影响

单独提高技术进步率对经济的影响是正向冲击，即提高技术进步率将会提高经济增长率；单独

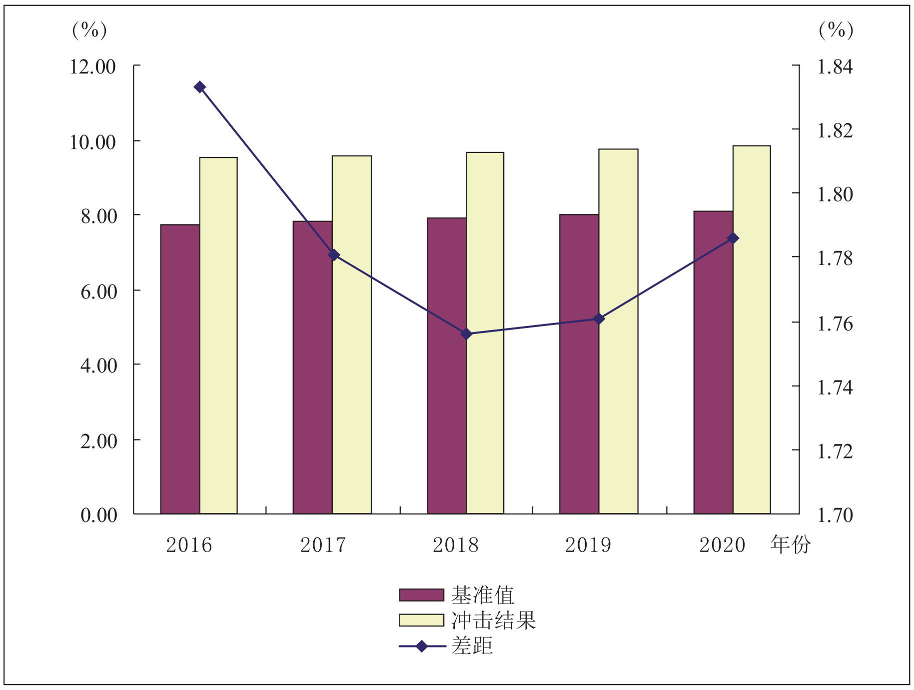

图 3 劳动力素质提升对中国宏观变量的影响

Table 2: Effect of Labor Quality Improvement on the Output of Various Sectors (Unit of measurement: %)

Sectors	2016	2017	2018	2019	2020
Agriculture	1.72	1.67	1.62	1.56	1.5
Coal extraction and washing	1.05	1.95	2.88	3.73	4.41
Petroleum and natural gas extraction	1.77	1.98	2.22	2.49	2.76
Metal ore extraction and dressing	0.57	0.83	1.31	1.99	2.78
Non-metal ore extraction and dressing	1.97	1.74	1.55	1.43	1.38
Food production and tobacco processing	1.68	1.76	1.87	1.97	2.04
Textiles	0.41	0.67	1.07	1.56	2.04
Apparels, leather, down and their products	-0.91	-0.58	-0.03	0.67	1.38
Timber processing and furniture manufacturing	2.34	2.71	2.93	2.97	2.86
Paper making, printing and cultural and educational goods manufacturing	1.82	1.85	1.92	2.01	2.1
Petroleum processing, coking and nuclear fuel processing	2.96	2.74	2.66	2.8	3.23
Chemical industry	0.48	0.76	1.25	1.85	2.43
Non-metal ore products	2.19	1.73	1.27	0.89	0.65
Metal smelting and rolling	1.93	1.78	1.65	1.58	1.58
Metal products	2.78	2.77	2.67	2.54	2.42
General and dedicated equipment manufacturing	2.13	1.73	1.34	1.02	0.82
Transport equipment manufacturing	2.47	2.18	1.86	1.56	1.33
Electric device, machinery and apparatus manufacturing	2.16	2.21	2.3	2.41	2.52
Communication equipment, computers and other electronic device manufacturing	2.66	2.49	2.33	2.18	2.08
Apparatus, instruments and cultural and office machine manufacturing	-3.55	-3.66	-3.29	-2.39	-1.06
Other manufacturing and discarded goods and waste materials	3.31	3.6	3.78	3.84	3.78
Electric power and heating production and supply	2.02	2.04	2.07	2.12	2.18
Gas production and supply	1.97	2.19	2.44	2.69	2.9
Water production and supply	1.96	1.99	2.06	2.14	2.23
Construction sector	0.42	-0.82	-1.9	-2.66	-2.99
Transport and warehousing, postal service, information transmission, computer services and software	2.68	2.59	2.46	2.29	2.11
Wholesale and retail trade	1.9	1.84	1.8	1.77	1.77
Hotel and catering	1.8	1.8	1.84	1.87	1.88
Finance and insurance	2.29	2.12	1.94	1.78	1.64
Real estate, leasing and commercial services	1.87	1.81	1.81	1.84	1.88
Tourism, scientific research, integrated technical services, other social services and educational undertakings, health and social security, social welfare, culture, sports and entertainment, public administration and social organization	2.28	2.27	2.22	2.11	1.94

Source: Calculated by the authors

表 2 劳动力素质提升对各行业产出的影响（单位：%）

行业	2016年	2017年	2018年	2019年	2020年
农业	1.72	1.67	1.62	1.56	1.5
煤炭开采和洗选业	1.05	1.95	2.88	3.73	4.41
石油和天然气开采业	1.77	1.98	2.22	2.49	2.76
金属矿采选业	0.57	0.83	1.31	1.99	2.78
非金属矿采选业	1.97	1.74	1.55	1.43	1.38
食品制造及烟草加工业	1.68	1.76	1.87	1.97	2.04
纺织业	0.41	0.67	1.07	1.56	2.04
服装皮革羽绒及其制品业	−0.91	−0.58	−0.03	0.67	1.38
木材加工及家具制造业	2.34	2.71	2.93	2.97	2.86
造纸印刷及文教用品制造业	1.82	1.85	1.92	2.01	2.1
石油加工、炼焦及核燃料加工业	2.96	2.74	2.66	2.8	3.23
化学工业	0.48	0.76	1.25	1.85	2.43
非金属矿物制品业	2.19	1.73	1.27	0.89	0.65
金属冶炼及压延加工业	1.93	1.78	1.65	1.58	1.58
金属制品业	2.78	2.77	2.67	2.54	2.42
通用、专用设备制造业	2.13	1.73	1.34	1.02	0.82
交通运输设备制造业	2.47	2.18	1.86	1.56	1.33
电气、机械及器材制造业	2.16	2.21	2.3	2.41	2.52
通信设备、计算机及其他电子设备制造业	2.66	2.49	2.33	2.18	2.08
仪器仪表及文化办公用机械制造业	−3.55	−3.66	−3.29	−2.39	−1.06
其他制造业+废品废料	3.31	3.6	3.78	3.84	3.78
电力、热力的生产和供应业	2.02	2.04	2.07	2.12	2.18
燃气生产和供应业	1.97	2.19	2.44	2.69	2.9
水的生产和供应业	1.96	1.99	2.06	2.14	2.23
建筑业	0.42	−0.82	−1.9	−2.66	−2.99
交通运输及仓储业，邮政业，信息传输、计算机服务和软件业	2.68	2.59	2.46	2.29	2.11
批发和零售贸易业	1.9	1.84	1.8	1.77	1.77
住宿和餐饮业	1.8	1.8	1.84	1.87	1.88
金融保险业	2.29	2.12	1.94	1.78	1.64
房地产业，租赁和商务服务业	1.87	1.81	1.81	1.84	1.88
旅游业，科学研究事业，综合技术服务业，其他社会服务业，教育，卫生、社会保障和社会福利事业，文化、体育和娱乐业，公共管理和社会组织	2.28	2.27	2.22	2.11	1.94

资料来源：作者计算

A_{it} calculated from equation (2) is substituted into equation (1) for regression. The regression result is shown in the table below. Judging by the regression results, TFP has a significant impact on labor cost. According to these results, TFP is positively correlated with labor cost, and, when TFP increases by 1%, labor cost will increase by 1.797 %, accordingly.

3. Effect of Labor Quality on China's Economy

This paper has forecasted China's economic growth and industrial structure between 2016 and 2020, using the forecast values as the baseline of study; then, based on the above-mentioned research results, we have included the shocks of technology progress and rising labor cost into the CGE model thus examining the effect of workforce quality improvement on China's economy. This section analyzes the overall effect of improved workforce quality on China's aggregate economic output as well as the effect of improved workforce quality on various sectors.

3.1 Effect on China's Aggregate Output

The increase in technology progress alone exerts a positive shock on the economy, i.e. technology progress will lead to higher growth rates. Meanwhile, an increasing cost of labor will cause negative shocks to the economy, i.e. rising labor costs will bring down growth rates. As mentioned before, improved workforce quality increases technology progress on the one hand while increasing labor costs on the other. According to the results of this model, improved workforce quality would increase the growth rate (as shown in Figure 3); between 2016 and 2020, economic growth would see a boost of about two percentage points per annum; and by 2020, economic growth would have been boosted by 10% on a cumulative basis (GDP given these shocks would be 1.1 times of the baseline GDP by 2020).

3.2 Effect of Workforce Quality Improvement on Various Sectors

The effect of labor quality improvement varies greatly across sectors due to the different production functions across those sectors (see Table 2 for specific calculation results). On the whole, the improvement of workforce quality is more favorable to the development of capital-intensive sectors and sectors dependent on rapid technology progress.

4. Conclusions and Policy Recommendations

Based on our study of the relationship between workforce quality and economic growth, this paper has arrived at the following conclusions:

(1) Workforce quality will promote economic growth. An improvement in workforce quality will promote technology progress and, given the cost of workforce quality improvement, will also raise labor wages. According to our study, improved workforce competence will raise the economic growth rate over the long term. According to the results of the CGE model, improved workforce quality will promote economic growth: the economic growth rate will increase by about two percentage points per annum between 2015 and 2020; by 2020, economic growth will demonstrate a cumulative increase of around 10% due to this effect.

(2) Increased workforce quality will promote TFP and expedite the transition of growth patterns. The positive effect of improved workforce quality on economic growth is realized in the form of improved TFP; that is to say, an improvement of workforce quality contributes to economic growth in the form of endogenous growth (rather than simply through exogenous growth). According to our study, an increase in workforce quality will bring about a 0.638% increase in technology progress.

(3) Improved workforce quality will raise the share of labor remuneration in GDP and reverse the previously lopsided proportion of GDP distribution in favor of capital. Studies have found that, since 1990, the share of labor remuneration in China's GDP has been on the decline. This figure decreased 13.66 percentage points, from 53.4% in 1990 to 39.74% in 2007; the operating

提高劳动力成本对经济的影响是负向冲击，即提高劳动力成本将会降低经济增长率。如前所述，劳动者素质的提高一方面将会提高技术进步率，另一方面将会提高劳动力成本。模型运行的结果显示，劳动力素质的提高将会提高经济增长率（见图3）：从2016年到2020年每年提高经济增长率2个百分点左右，到2020年累计提高经济增长10%左右（也就是2020年冲击结果的GDP是基线GDP的1.1倍）。

2. 劳动力素质提升对不同行业的影响

由于不同行业的生产函数不同，劳动力素质提升对不同行业产生的影响也有较大差异（具体计算结果见表2）。总体而言，劳动力素质的提高更加有利于资本密集型产业的发展，有利于技术进步较快行业的发展。

四、结论与政策建议

本文主要对劳动力素质与经济增长的关系进行了研究。研究的主要结论是：

（1）劳动力素质的提高将促进经济增长。劳动力素质提高一方面将促进技术进步，另一方面也是有成本的，进而会提高劳动力的工资。我们的研究表明，劳动力素质的提高将会提高经济增长率，并且这种影响是长期的。CGE模型运行的结果表明，劳动力素质的提高会促进经济增长：从2015年到2020年每年提高经济增长率2个百分点左右，到2020年累计提高经济增长率10%。

（2）劳动力素质的提高将提升全要素生产率，促进经济增长方式的转变。劳动力素质的提高对经济增长的促进作用是通过提高全要素生产率的方式进行的；也就是说劳动力素质的提高是通过内涵式的增长来实现经济增长，而不是简单地通过外延式扩大来促进经济增长。我们的研究表明，劳动力素质每提高1%，技术进步就会提高0.638%。

（3）劳动力素质的提高将提高劳动者报酬在GDP中的份额，改变GDP分配过度向资本倾斜的局面。有研究发现，从1990年开始，中国劳动者报酬占GDP的比例在不断下降，从1990年的53.4%降低到2007年的39.74%，降低了13.66个百分点；同期企业营业余额占GDP的比重却从21.9%增加到31.29%，增加了9.39个百分点。而美国等发达国家劳动力报酬占GDP的比例一般在50%以上。劳动者收入占GDP的比例过低，不仅不利于和谐社会的建设，也成为了中国一些长期难以解决问题的根源。通过提高劳动力素质来促进经济增长，将会有利于提高劳动收入，从而改变GDP分配过度向资本倾斜的局面。

中国社会科学院蔡昉研究员的研究表明："在制造业，职工受教育年限每提高1年，劳动生产率就会上升17%。如果企业职工全部由初中以下学历的职工构成，改为全部由高中学历的职工组成的话，企业劳动生产率可以提高24%，如果进一步改为全部是大专学历的职工组成的话，企业劳动生产率可以再提高66%（蔡昉，2011）"。董敏杰的预测表明，从目前到2030年劳动力受教育年限平均每年提高0.1年（李钢，2015），根据上述数据我们可以估测仅劳动力素质提高一项就可以带动中国工业每年增长1.7个百分点。这些研究都表明，考虑到劳动力素质的提升，不能轻言中国经济潜在增长率已经下台阶了，可以说虽然中国传统的数量型人口红利在不断减弱，但质量型人口红利会不断增强；质量型的人口红利将进一步推进中国产业结构优化，实现中国产业国际竞争力从数量型向质量型、从粗放型向集约型的战略性转变。

李钢、廖建辉的研究表明，到2010年中国人

balance of firms during the same period as a share in GDP increased 9.39 percentage points, from 21.9% to 31.29%. In comparison, the share of labor remuneration in GDP always stayed above 50% for advanced economies such as the United States. An excessively low share of labor income in GDP not only undermines social harmony but may be a root factor in many of China's entrenched socio-economic challenges. Promoting growth through workforce quality improvement is conducive to raising labor income and reversing the excessive preference of GDP distribution in favor of capital.

According to the study by Professor Cai Fang of the Chinese Academy of Social Sciences (CASS), "In the manufacturing sector, an increase of education for employees by one year will bring up productivity by 17%. If a workforce consisting entirely of employees with education levels below middle school is replaced by one consisting of employees with high-school education levels, labor productivity could increase by 24%; if it was further replaced by employees with junior college education levels, then productivity could be raised by another 66% (Cai, 2011)". According to a forecast by Dong Minjie, if the length of workforce education increases by 0.1 year every year between now and 2030 (Li, 2015), we may estimate, based on the above data, that workforce quality improvement alone can contribute 1.7 percentage points per annum to China's annual industrial growth. These studies contradict conclusions that China's economic growth rate potential is in decline; despite diminishing quantitative demographic dividends, qualitative demographic dividends will continue to increase. Qualitative demographic dividends will further push forward China's industrial restructuring and promote its strategic transition from quantitative to qualitative competitiveness and from extensive to intensive development.

Studies by Li Gang and Liao Jianhui indicate that, by 2010, China's per capita carbon capital was only a third of that figure for the United States and Japan ; great gaps still exist between China and advanced economies, and China's goal of complete industrialization is still distant. This also reveals that China's conventional economic growth pattern may continue until 2025. From this perspective, the challenge of transforming China's growth pattern is not insurmountable. Yet considering China's status as an ultra-large economy, change is not easy as it seems. Nevertheless, transitioning China's economic growth pattern is necessary and urgent. According to a recent survey of economists conducted by the Institute of Industrial Economics (IIE) of the CASS, the most important factor contributing to the current economic slowdown is the cost that China must pay for transitioning its economic growth pattern. However, it is fair to say that the new normal of China's economic growth decline represents adjustments made on China's own initiative in response to the challenges that await beyond 2030. This new normal reflects the rational understanding and sense of historic responsibility of China's central government. This new normal also represents China's ambitions to seize historic opportunities, continuously challenge itself and induce industrial upgrade. We must make a proper assessment of the current stage and future tendencies of China's economic development. We cannot afford to refrain from action out of fear, for to do so is to miss the opportunities presented to us. Nor can we rush headlong in search of quick results while pursuing unrealistic aims. CE

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均碳资本仅相当于美日两国1/3 （李钢，廖建辉，2015），中国与发达国家之间仍旧有十分大的差距，中国完成工业化的任务仍旧十分艰巨，这一结果也显示了中国传统的经济增长模式大体可以持续到2025年，从这个角度上讲当下中国转变经济增长方式的压力并不太大。考虑到中国作为超大经济体，并非好掉头的小船；中国转变经济增长方式的确又时不我待，必须只争朝夕。中国社会科学院工业经济研究所针对经济学家的调查表明，经济学家认为当前经济增速下降最重要的原因是转变经济增长方式所付出的成本。因而可以说目前中国经济增速下降这种“新常态”是为了应对中国2030年以后的挑战而主动进行的调整；是新一届中央政府充分把握中国经济趋势、有历史责任担当的“新常态”；是抓住历史机遇，不断挑战自我，促进产业不断升级的“新常态”。我们必须进一步对中国经济目前的发展阶段及下一步的趋势进行研判，既不能裹步不前，丧失机遇，也不能好高骛远，急于求成。CE

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