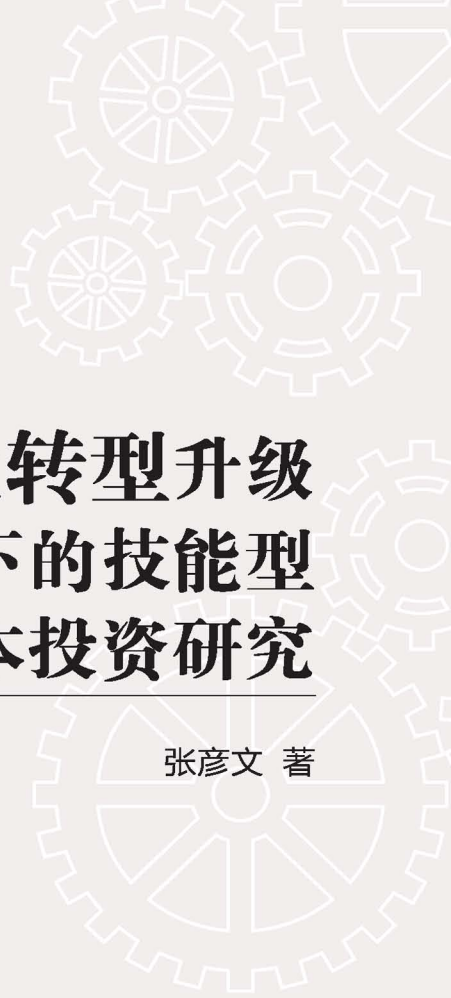




# 制造业转型升级 视域下的技能型 人力资本投资研究

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新华出版社

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## 摘要

制造业是国民经济的支柱。总体而言，目前中国制造在核心技术、创新能力、产品质量等方面与发达国家相比依然存在较大差距，国际竞争力较弱。作为转型升级的重要目标，中国制造要完成由要素驱动向创新驱动转变、由规模扩张向质量效益提升转变，赶上并引领智能制造潮流。除了要摆脱低成本依赖、不断吸收国际前沿技术和创新成果、努力掌握核心技术之外，还要构建并不断完善包括技能型人才在内的多层次、多类型的人才培养体系，培育精益求精的工匠精神，推进精细化管理和精品制造。

国内学术界针对人力资本开展的研究较多，但大都围绕人力资本理论，以及人力资本投资与经济增长、人力资本投资与生产效率、人力资本投资与收入分配等之间的关系展开，现状描述和问题阐述较多，鲜有将技能型人力资本投资与制造业转型升级结合起来专门加以论述的研究。本研究基于人力资本投资理论，结合我国制造业转型升级大背景，深入剖析我国技能型人力资本投资积累面临的问题，并借鉴国际成功经验，分析技能型人力资本投资的激励机制，探索提高技能型人力资本投资积累水平的方法和路径。

研究发现，技能型人力资本投资能够提升各国人均 GDP 和人均制造业产值。现实来看，世界诸多国家在制造业转型升级过程中均出现了技能型人力资本供给不足的现象。据估计，全球技能人才缺口已达 1 000 万，熟练工人和高技能人才短缺程度尤为严重。本书将我国制造业转型升级放在国际制造业发展的大背景中，对比世界主要国家的技能型人力资本投资与积累情况，分析我国技能人才短缺和技能型人力资本投资问题。通过对比发现，中国制造业生产工人数量处于世界首位，但是技术工人比例较低，非技术工人比例较高，技能型人才结构和人才质量同发达国家相比差距巨大，一定程度上导致了我国制造业大而不强，缺乏足够的国际竞争力。我国技能型人力资本投资不足，技能型人力资本积累没有满足制造业的人才需求，不利于我国制造业的转型升级。

本书通过 DEA-Tobit 模型测算在不同转型升级路径下技能型人力资本投资对企业生产绩效的影响。测算发现，绝大多数转型升级路径对企业生产效率、纯技术效率和规模效率的影响不显著，在本书关注的 8 种转型升级路径下只有新产品

和新服务开发在 5% 显著性水平、降低成本在 1% 的显著性水平上正向影响企业规模效率。技能型人力资本投资在不同转型升级路径下对企业生产效率、纯技术效率、规模效率存在不同影响。对于企业生产效率而言,技能型人才的受教育年限、技能型人才比例和技能型人才参加培训比例正向影响企业生产效率,但影响不显著;技能型人才初中以上学历比例负向影响企业生产效率,但影响不显著。对于企业纯技术效率而言,技能型人才比例和技能型人才参加培训比例显著正向影响企业纯技术效率,技能型人才的受教育年限正向影响企业纯技术效率,但影响不显著;技能型人才初中以上学历比例负向影响企业纯技术效率。对于企业规模效率而言,技能型人才比例和技能型人才参加培训比例负向影响企业规模效率;技能型人才初中以上学历比例对企业规模效率影响不显著。

本书通过调研数据计量分析技能型人力资本投资对制造业转型升级人才需求匹配的影响。分析发现,企业制订培训计划、设立培训基地、增加培训投入能够降低技能型人才短缺程度,并显著正向影响技能型人才的价值创造;而中级以上技能型人才比例显著负向影响企业技能型人才短缺程度,中级以上技能型人才比例越大,企业技能型人才的短缺程度越高。此外,企业产值越高,越能降低技能型人才的短缺程度。按照企业的所有权从国有、集体到民营的顺序,技能型人才短缺程度依次递减。而企业技术水平越高,取得的专利数量越多,提供的养老保障越好,则技能型人才的短缺程度越低。

本书针对我国技能型人力资本投资状况展开了系统分析。技能型人力资本投资具有有限的非排他性和有限的非竞争性的特征,因此应被划分为准公共产品,政府、企业以及个人或者家庭都是技能型人力资本投资的主体,都应该承担技能型人力资本的投资责任并将投资维持在合理水平,都应当获得相应的投资收益。政府对不同类型的人力资本投资存在投资偏好,通过政府人力资本投资偏好分析框架可知,中央政府教育供给偏好会影响地方政府教育供给的偏好,与此同时,地方政府的教育投入偏好也受到自身条件和教育溢出效应的影响。在对技能型人才培养机构数量和培养人数、技能型人才培养师资力量和生师比以及经费投入等几个指标对比分析中发现,政府对技能型人才培养投入不足,没有体现出对技能型人力资本的投资偏好,一定程度上导致了技能型人力资本投资积累水平不高和技能型人才的短缺。此外,政府在职业技术教育中的角色和功能定位、政绩考核的导向以及有关制度安排都会影响政府对技能型人力资本的投资水平。由于技能型人才培养的特殊性,企业在技能型人力资本投资积累中发挥着不可或缺的

重要作用。企业不仅是招收、培养和使用技能型劳动者的主体，也是技能型人力资本投资的重要主体。企业投资技能型人力资本带来正外部性，这种外部性会影响企业的人力资本投资决策。无论是从经济学理论还是实践经验来看，要提升企业投资技能型人才培养的积极性，就必须综合运用政府和市场两种力量，实现人力资本投资者从个体最优角度实施投资决策时能够同时达到集体或社会层面上的最优，实现技能型人力资本投资外部性的内在化，达到人力资本投资的帕累托最优。在技能型人力资本投资过程中，企业开展不同培训项目的外部性水平不同，“一般项目”培训的外部性要高于“特殊项目”培训的外部性。针对“一般项目”的培训需要探索现有体制环境下企业投资职业技能培训的经费分担机制，避免企业过度承担培训成本，通过多种方式实现企业人力资本投资正外部性的内在化。相较“一般项目”培训，企业开展“特殊项目”培训的外部性水平较低，因此国家对于“特殊项目”培训的政策扶持要低于“一般项目”培训。此外，企业投资技能型人力资本还受到技能传承的“传帮带”机制、信息不对称以及培训周期等因素影响。个人或家庭是技能型人力资本的主要供给方和职业技术教育的投资主体之一，个人或家庭在投资人力资本时从理性和现实出发需要考虑投资成本和收益，实现投资收益的最大化。通过构建教育—年龄—收入曲线发现，就货币收益而言，职业技术教育收益水平位于大学教育和中学教育收益水平之间，属于收益水平相对较低的教育投资。除了货币收益外，非货币收益如社会地位、就业观念、就业条件和职业生涯发展都会对个人或家庭的技能型人力资本投资决策带来不利影响。

通过分析德国经验发现，德国制造业的发展是一个由弱变强和持续转型升级的过程，其成长和发展是多方面因素综合作用的结果。其中，德国较高的技能型人力资本的投资和积累水平、多元化的技能型人力资本投资体系和技能型人才教育培训体系为德国提供了一支规模庞大的高质量的技能型人才队伍，为德国制造业由弱变强转型发展和德国经济腾飞奠定了基础。德国技能型人才培养得益于完善的职业教育系统，尤其是双元制职业教育体系。德国双元制职业教育体系的成功源自政府、企业、行业协会和个人或家庭等各个投资主体的共同参与，共同承担投资成本并获得相应的投资收益。由于技能型人才培养的特殊性，企业在技能型人力资本投资中发挥着不可或缺的重要作用，是德国双元制职业教育体系中的核心因素，尤其在学徒培养和技能培训中承担了主要培养职责和大部分投资成本。企业对技能型人力资本的投资会带来不可避免的外部性。德国双元制职业

教育成功的关键在于创造了一个市场,通过综合运用政府和市场两种力量、法律法规的规范约束、行业协会监督监管以及高效的“教育链”计划和“培训联盟”的一揽子计划等多种手段,实现了企业投资技能型人力资本外部性的内在化,把企业投资的外部收益转化成为企业的自身收益,实现了企业人力资本投资成本与收益的平衡,实现了企业人力资本投资的帕累托最优,保证了企业投资技能型人力资本的积极性和个人、企业、行业乃至整个国家的技术技能水平。

综上,进一步提高技能型人力资本投资积累水平,需要依据人力资本投资理论,全面探析政府、企业、家庭三个主体对技能型人力资本投资积累的途径和机理,探索适合中国国情的技能型人力资本投资激励机制,构建政府、学校、企业、家庭以及社会五位一体的人力资本投资成本分担机制和利益共享机制,提高技能型人才数量和质量,改善技能型人才结构,从而为我国制造业转型升级奠定人才基础。

**关键词:** 技能型人力资本; 投资; 职业教育; 转型升级

## ABSTRACT

Manufacturing industry is the pillar of a nation's economy, but compared with developed countries, China's manufacturing industry is still facing a large gap in the aspects of core technology, innovation, product quality and the international competitiveness. As an important goal of the transformation and upgrading of China's manufacturing industry, it should complete the transition from factor driven to innovation driven, from scale expansion to the promotion of quality and efficiency, catching up with and leading the intelligent manufacturing trend by getting rid of depending on low cost, constantly absorbing the international advanced technology and innovation, and striving to master the core technology. In addition, it should build and perfect the multi-levels training system for multi-types talents including skilled talents, cultivate excellent artisan spirit, promote the fine management and manufacturing.

There have been many researches on human capital development in domestic academic circles, but most of them are about the theory of human capital, about the relationship of the human capital investment and production efficiency, and about

the relationship of the human capital investment and income distribution. Most of them discuss the status quo and the problems, and few of them have combined the skilled human capital investment and the transformation and upgrading of China's manufacturing industry together. Based on the human capital investment theory and under the background of the transformation and upgrading of China's manufacturing industry, this study makes deep analysis on the skilled human capital investment and accumulation problems in China, analyzes the incentive mechanism of the skilled human capital investment, and explores the methods and ways to improve the skilled human capital investment and accumulation level with reference to international experience.

The study found that the skilled human capital investment can improve the per capita GDP and per capita manufacturing output. In fact, there has been lack of skilled human capital supply in many countries of the world in the process of the transformation and upgrading manufacturing industry. It is estimated that the global shortage of the skilled talents has reached 10 million, and the shortage of skilled workers and highly skilled talents is particularly serious. This book will analyze the shortage of the skilled human capital accumulation and investment in China in comparison with the advanced industrialized countries under the background of the world-wide transformation and upgrading of the manufacturing industry. By comparison, the amount of manufacturing industry workers in China is the first of the world, but the proportion of skilled workers is quite low, and the proportion of unskilled workers is comparatively high. moreover, there's a huge gap compared with the developed countries in the aspect of the structure and the quality of the skilled talents. This could be partly the reason why China's manufacturing industry is big in size but not strong in global competition. This also shows that our skilled human capital investment is insufficient, and the accumulation of the skilled human capital does not meet the needs of the manufacturing industry development, which is not conducive to the transformation and upgrading of China's manufacturing industry.

In this book, DEA-Tobit model is used to calculate the effect of the skilled human capital investment on enterprise production efficiency, pure technical

efficiency and scale efficiency. The calculations showed that the vast majority of the transformation and upgrading paths have no significant influence on enterprise production efficiency, pure technical efficiency and scale efficiency. Only the transformation and upgrading path of new products and services development at the level of 5% significance, and the path of reduce the cost at the 1% level of significance have positive influence on enterprise scale efficiency among the 8 kinds of transformation and upgrading paths which this book mainly concerns. Skilled human capital investment has different effects on enterprise production efficiency, pure technical efficiency and scale efficiency through different transformation and upgrading paths. For the enterprise production efficiency, the years of education of skilled talents, the proportion of skilled talents and the proportion of skilled talents in training have positive influence on enterprise production efficiency, but the influence is not significant; the proportion of skilled talents with junior high school or above has negative influence on enterprise production efficiency, but the influence is not significant. On the pure technical efficiency, the proportion of skilled talents and the proportion of skilled talents in training have significant positive influence, the years of education of skilled talents has positive influence on the enterprise pure technical efficiency, but the influence is not significant; the proportion of skilled talents with junior high school or above has negative influence on enterprise pure technical efficiency. The proportion of skilled talents and the proportion of skilled talents in training have negative influence on enterprise scale efficiency.

This book studies the impact of skilled human capital investment on the matching demand of skilled talents in the transformation and upgrading process manufacturing industry of the . The analysis found that the enterprise's training plan, the establishment of the training base and the training investment increase can reduce the shortage of skilled talents, and positively affect the skilled talents' value creation, but the proportion of mid-level or above skilled talents negatively influence enterprise's personnel shortage degree, which means, the larger proportion of the mid-level or above skilled talents, the higher degree of skilled talents shortage in enterprises. In addition, if the enterprises have higher production value, they are more likely to reduce the shortage of skilled talents. With the enterprises' ownership

changing from state-owned, collective-owned and private-owned, the shortage of skilled talents is decreasing. The enterprises have higher shortage of skilled talents if they apply higher technology, have larger number of patents, or provide better pension security.

In order to improve the quantity and quality of skilled talents and to better the structure of skilled talents, the investment on skilled human capital must be raised. The investment on skilled human capital has a limited non-exclusive and limited non-competitive characteristics, so it should be classified as quasi-public goods. The government, enterprises and individuals or families are the subjects of skilled human capital investment. All of them should bear the responsibility of skilled human capital investment and get the appropriate return from their investment. The government has preference on different kinds of human capital investment. The government's preference analysis framework on human capital investment shows that the central government's education supply preference will affect the local government's education supply preference. At the same time, the local government's education investment preferences are also influenced by their own conditions and the spillover effect of education. Based on the analysis of several indicators such as the number of skilled talents and the training institutions, their faculties, the student and teacher ratio and the amount of investment, we can not find the governments' investment preference on skilled human capital. This could be partly the reason of the low level of skilled human capital investment and the shortage of skilled talents. In addition, the governments' role and function in the vocational education will affect the quality of skilled human capital investment, the performance evaluation guidance will affect the governments' incentives on skilled human capital investment, and the institutional arrangements will also affect the governments' efficiency of skilled human capital investment. Because of the particularity of the cultivation of skilled talents, enterprise plays an indispensable role in the accumulation and investment of skilled human capital. Enterprise is not only the main body to recruit, train and use skilled workers, but also an important part of skilled human capital investment. The investment of skilled human capital brings positive externality, which may affect the enterprise's decision on human capital investment. No matter from economic

theory or practical experience, in order to promote enterprise' s enthusiasm on skilled talents training, we must use both the powers of government and the market, to make the enterprise achieve the optimal from the individual aspect as well as from the collective or socially aspect when the decisions on human capital investment is made. So as to internalize the externalities of enterprise' s investment on skilled human capital, and the human capital investment could achieve a Pareto optimality. In the process of the skilled human capital investment, the level of externality of different training programs could be various, and the externality of "general project" training is higher than that of "special project" training. Therefore, for the "general project" training, the appropriate policies and measures should be formulated or the compensation from the benefited third party should be made so as to realize the internalization of the positive externality from the enterprise' s human capital investment. Besides, we should actively explore the funds allocation system of the skilled talents training under the existing mechanism and environment, and try to avoid the enterprise undertake the excessive cost of training so as to earnestly safeguard their benefits. Compared with the "general project" training, the state supporting policy for the "special projects" training should be less. In addition, there are other problems which may influence enterprise' s investment on skilled human capital . Such as the imperfect mentoring mechanism of the skill inheritance, the dynamic information asymmetry and the long-term training cycle, all these factors may affect the enterprise' s investment incentives on the skilled human capital. The individual or the family is one of the main supplier of the skilled human capital and the investor of vocational education. Based on rationality and reality, The individual or the family needs to consider the cost and the future income when they invest on human capital. From the perspective of the individual or the family, the key consideration for the human capital investment is whether this kind of investment can realize the maximization of their benefits, including both monetary benefit and non-monetary benefit. Through the Education - Age - Income curve, we can find that the benefit gained from the vocational and technical education is relatively low. In addition to the monetary benefits the, non-monetary benefits such as social the status, the employment concept, the employment conditions and the occupation

career development will also influence the skilled human capital investment.

The development of German manufacturing industry is a process from weak to strong and continuous transformation and upgrading. "Made in Germany" is an organic link of the industrial chain and the comprehensive economic system. Its growth and development is the result of many factors. For example, the high level of the skilled human capital investment and accumulation, the diversifying systems of the skilled human capital investment and the skilled talents training, provide a large skilled personnel with high quality for German manufacturing industry' s development from weak to strong, and laid the foundation for the taking-off of German economy. The training of the skilled talents in Germany is due to its vocational education system, especially the dual system of vocational education. The success of the dual system of vocational education in Germany comes from the joint participation of the government, the enterprises, the trade associations and the individuals or the families, and so on. Because of the particularity of the skilled talents training, the enterprise plays an important role in the skilled human capital investment, and it' s the core factor of the German dual system of vocational education, besides, it takes the main responsibilities and bears most of the cost especially in the apprentice training and the skills training. The investment on the skilled human capital will bring the externality inevitably. The key factor for the success of German dual system of vocational education is to create a market, through the integrated use of the two powers of government and market, the laws and the regulations, the supervision of the trade associations, the efficient "Education Chain Project" and Training Alliance' s series programs and other means, to achieve the internalization of externalities induced from the enterprise' s investment on skilled human capital, to change the external benefits of enterprise investment into their own benefits, to realize the enterprise' s cost and income balance on the human capital investment, to achieve the Pareto Optimality of the enterprise' s human capital investment, to ensure the enterprise' s initiative on the skilled human capital investment and thus to guarantee the qualification of skills of the individual, the enterprise, the industry and even the nation.

In short, in order to further improve the skilled human capital investment and

accumulation, under the guideline of the human capital investment theory, we need to make a comprehensive analysis of the mechanism and the path for the skilled human capital investment and accumulation with the three investment subject (the government, the enterprise and the individual or the family) to be concerned. In order to improve the quality and the quantity, and better the structure of the skilled talents, we need to take series of approaches such as studying the investment incentive mechanism, exploring the investment cost-sharing and benefit-sharing mechanism, and so on.

**Key words:** skilled talents; investment; vocational education; transformation and upgrading

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# 导 论



## 第一节 研究背景与意义

制造业是国民经济的支柱，从全球范围来看，中国制造在核心技术水平、创新能力、产品质量等方面与发达国家相比依然存在较大差距，国际竞争力较弱。随着我国经济发展进入新常态和工业化进程加速推进，长期依赖低成本战略、以损害资源和环境为代价的粗放式增长的中国制造内外交困，难以为继，急需转型升级和跨越发展。《中国制造 2025》战略规划提出要坚持“创新驱动、质量为先、绿色发展、结构优化、人才为本”的基本方针，为未来中国制造业发展指明了方向。作为转型升级的重要路径，中国制造要完成由要素驱动向创新驱动转变，由规模扩张向质量效益提升转变，赶上并引领智能制造潮流，除了要摆脱低成本依赖并突破要素禀赋的长期制约外，还要不断吸收国际最前沿的技术和创新成果，努力掌握核心技术，构建并不断完善包括技能型人才在内的多层次、多类型人才培养体系，提升创新能力，培育精益求精的工匠精神，推进精细化管理和精品制造。

总体而言，目前我国制造业人力资本积累水平依然薄弱，技能型人力资本投资水平低，投资激励机制不完善，技能型人才综合素质不高，技能型人才结构不合理，这些已经成为我国制造业转型升级的重大制约。提升技能型人力资本的投资积累水平，提高各类技能人才的数量和质量，改善技能型人才结构，对企业而言，是提高市场竞争力和保持基业长青的必然选择；对行业而言，是顺利完成转型升级的必经之路；对整个国家而言，则关系到中国制造和国民经济的健康发展。

国内学术界大都围绕人力资本理论，以及人力资本投资与经济增长、人力资