The Key Driver of China's New Economic Development Pattern: A Major Power's Flying Geese Paradigm

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Abstract: *This paper examines China's flying geese paradigm that serves as a key driver of a new pattern of the country's economic development. Our results suggest that such a major power's flying geese paradigm has taken shape in the aftermath of the global financial crisis in 2008. However, this paradigm has provincial heterogeneity in that industrial relocation varies across provinces. For instance, China's central and western regions have shown differences while serving as destinations for labor-intensive industries and processing trade. This flying geese paradigm evolves in a slow and nonlinear manner, and may be subject to stagnation and even reversal.*

Keywords: *new economic development pattern, flying geese paradigm, industrial relocation, labor-intensive industries, processing trade*

JEL Classification Code: F10; O10; O18

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1. Introduction

China's achievement of its first centennial goal, to build a moderately prosperous society in all respects by 2020, brings with it a brand-new stage in its economic development. In this new stage, China aims to implement the new concepts and creating a new pattern of economic development (Xi, 2021). In the coming three decades, China aims to achieve its second centennial goal, to build "a modern socialist country that is prosperous, strong, democratic, culturally advanced and harmonious."[1] Here, the goal of China's economic development is to foster a new development pattern with domestic circulation as the main body and domestic and international circulations promoting each other.

General Secretary Xi Jinping has said that the new development pattern should be based on a high level of independence and self-reliance.[2] Vice Premier of the State Council Liu He has identified smooth economic circulation and unblocked industrial linkages as the keys to engendering this development pattern.[3] Chinese academics have carried out extensive research on this new pattern's economic implications. For instance, Gao (2021) believes that the new development pattern requires striking a proper balance between development and security, and Huang (2021) identifies the implementation of a

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[1] Refer to Xi Jinping's report delivered at the 19th National Congress of the Communist Party of China (CPC) on Oct. 18, 2017. http://www.xinhuanet.com/english/special/2017-11/03/c_136725942.htm, accessed on: June 30, 2021.

[2] Refer to Xi Jinping's speech at the opening ceremony of the special workshop for key provincial and ministerial leaders on the implementation of the spirit of the Fifth Plenum of the 19th CPC Central Committee: https://www.ccps.gov.cn/xtt/202101/t20210111_147076.shtml, accessed on: June 30, 2021.

[3] Liu He: "Speed up the Shaping of a New Development Pattern with Domestic Circulation as the Mainstay and Domestic and International Circulations Reinforcing Each Other", November 25, 2020, *the People's Daily.*

中国新发展格局的支撑：大国雁阵模式

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摘 要：*中国构建新发展格局的重要支撑是推动形成自身的大国雁阵模式。本文通过现实观察分析中国大国雁阵模式的发展情况。结果表明，中国确实在国际金融危机之后形成了大国雁阵模式。但是这一模式的发生具有省份的异质性，不同省份转出或承接产业的情况不同，而且中部和西部承接劳动密集型产业和加工贸易的情况不同。大国雁阵模式的演进并非是线性的，会出现停滞甚至是逆转的情况，而且其推进速度较慢。中国未来应该更加主动地推进自身的大国雁阵模式。*

关键词：*新发展格局；雁阵模式；产业转移；劳动密集型产业；加工贸易*

JEL 分类号：F10;O10;O18

一、引言

进入新发展阶段后，中国将致力于贯彻新发展理念、构建新发展格局、推动高质量发展。而进入新发展阶段的重要标志是实现第一个百年奋斗目标，全面建成小康社会。未来三十年作为新发展阶段，中国将努力实现第二个百年奋斗目标，即建成富强民主文明和谐美丽的社会主义现代化强国。[1]在新发展阶段，中国经济发展的总体方向是构建以国内大循环为主体、国内国际双循环相互促进的新发展格局。

习近平总书记提出，构建新发展格局最本质的特征是实现高水平的自立自强。[2]国务院副总理刘鹤认为，构建新发展格局，关键在于实现经济循环流转和产业关联畅通。[3]关于新发展格局的内涵，中国学者的研究也很多。如高培勇（2021）认为，新发展格局的核心要义在于统筹发展和安全；黄群慧（2021）认为，新发展格局的战略内涵是推进高质量工业化战略。其实，总结起来看，应该从第二个百年奋斗目标的视角理解新发展格局。要实现第二个百年奋斗目标，中国在新发展阶段必须要保持一定的经济增速。这需要两个条件：一是每年尽可能保持较高的经济增速；二是不会出现经济突然失速的情况。这必然要求中国自己能够掌控自己的经济增速，并且尽可能不受到外部环境的负面影响。为此，中国需要做到以国内大循环为主体、国内国际双循环相互

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[1] 详见习近平代表第十八届中央委员会向党的十九大作报告，http://www.xinhuanet.com/politics/19cpcnc/2017-10/18/c_1121819563.htm，访问日期：2021年6月30日。

[2] 详见习近平在省部级主要领导干部学习贯彻党的十九届五中全会精神专题研讨班开班式上发表的重要讲话，https://www.ccps.gov.cn/xtt/202101/t20210111_147076.shtml，访问日期：2021年6月30日。

[3] 刘鹤.加快构建以国内大循环为主体、国内国际双循环相互促进的新发展格局[N/OL].人民日报，2020-11-25。

high-quality industrialization strategy as a pillar of the new pattern.

To achieve its second centenary goal, China must maintain rapid and stable economic growth and avoid abrupt economic downturn. With these considerations, China's policymakers have called for building a new development pattern.

However, China's economy presently faces a headwind to growth in 2021 and beyond. On the supply side, China's potential economic growth is hampered by diminishing demographic dividends[4] from an aging society, decreasing returns on capital, and a lack of innovation. On the demand side, tepid consumption growth due to unequal income distribution, limited investment potential, and growing uncertainties in external demand impede the realization of potential economic growth, as evidenced in China's slowing growth since the global financial crisis of 2008.

From 2012 to 2019, China's GDP growth fell by 0.2 percentage points on an average annualized basis. If GDP growth continues to follow this trend, China's economic aggregate output will only expand by 90% in 2035 from its 2020 level, falling short of China's goal to double it (Yang, 2021). For this reason, China needs to focus on both the supply and demand sides of its economy to bring its current development pattern in line with its stated goal, and this can happen through various means.

As a large and populous country, China can continue to create a domestic flying geese paradigm. With a similar concept to the product lifecycle theory of Vernon (1966), the flying geese theory was first put forth by Japanese economist K. Akamatsu (1962), which was intended to explain the industrial distribution across countries (Kojima, 2000). According to this theory, more developed countries will relocate their low-end industries to less developed countries, and industries of various levels will exist in countries with disparate levels of economic development.

In China, many provincial jurisdictions are as large as other countries in terms of land area and population. Hence, the flying geese theory may apply to China's regional jurisdictions with disparate levels of development similar to development gaps across countries. Specifically, China's coastal provinces in the eastern region are the most prosperous and may tranfer low-end industries to less-developed central and western regions, forming a major power's flying geese paradigm. In 2008, the average private-sector compensation in China's eastern region stood at 18,980 yuan per year, which was much higher than 13,845 yuan per year average in the central region and 14,751 yuan per year in the western region.[4] Even in 2020, the average private-sector compensation in the eastern region was 63,601 yuan per year, which was still much higher than that of the central region (48,861 yuan per year) and the western region (50,510 yuan per year).[5]

The question is why does a domestic flying geese paradigm matter for China's new economic development pattern? From the supply side, the relocation of labor-intensive industries to central and western regions aims to make better use of local workforces and mitigate the adverse economic impact of diminishing demographic dividends. Labor participation in the manufacturing industry can help address the problem of diminishing returns on capital. Industrial relocation is also conducive to increasing total factor productivity (TFP). From the demand side, labor-intensive industries can increase labor demand in central and western regions, and levels of local income and consumption correspondingly. The development of labor-intensive industries in China's central and western regions can also help boost infrastructure investment in central and western regions.

In addition, China's low-cost, labor-intensive exports contribute to external demand. According to Guo and Peng (2021), China's optimal manufacturing industry as a share of GDP should stay at 28% to 30%. However, this share is only 26.8% in 2019. By relocating labor-intensive industries to central

[4] Source: China's National Bureau of Statistics (NBS).
[5] Source: China's National Bureau of Statistics (NBS).

促进。

其背后的原因在于，中国经济保持一定增速的难度加大。从供给侧来看，人口红利消失和老龄化、资本报酬递减、创新能力不足等制约潜在经济增速。从需求侧来看，收入不平等制约消费增长、投资潜力有限、外需不确定性增强等不利因素影响潜在经济增速的实现。国际金融危机以来，中国经济增速不断下降的事实证明了这一点。2012~2019年，中国国内生产总值（GDP）增速年均下滑0.2个百分点。如果GDP增长延续这个趋势，中国2035年的经济总量将只比2020年增加90%，难以实现翻一番的目标（杨伟民，2021）。为此，中国需要改变原有的发展格局，从供给侧和需求侧两个方面发力。

既然新发展格局可以被理解为目标导向，则中国为了实现新发展格局，其手段必然是多样的，不应局限于某一个方面。其中，利用中国地广人多的特点，布局自身的大国雁阵模式，是新发展格局的重要支撑之一。雁阵理论最早由日本经济学家赤松要（K. Akamatsu）在20世纪30年代提出，类似于Vernon（1966）的产品生命周期理论（Kojima，2000）。该理论的主要内涵是，发展水平高的国家会将低端产业转移至发展水平低的国家，不同发展水平的国家所拥有的产业档次不同。很显然，该理论是用来解释国家之间的产业布局情况的。

由于中国地广人多，许多地区的地域面积和人口规模都相当于一个国家，中国各地区之间的产业安排完全可以实现雁阵理论的预测。中国存在的区域发展不平衡问题，类似于各国之间存在的发展水平差异。具体而言，东部沿海省份最先发展起来，而中西部省份的发展水平还较低，东部地区的低端产业可以转移到中西部地区，从而实现中国的大国雁阵模式。2008年，东部地区的私营单位就业人员平均工资是18980元，明显高于中部的13845元和西部的14751元。[3]2020年，东部地区的私营单位就业人员平均工资是63601元，依旧明显高于中部（48861元）和西部（50510元）（见图1）。

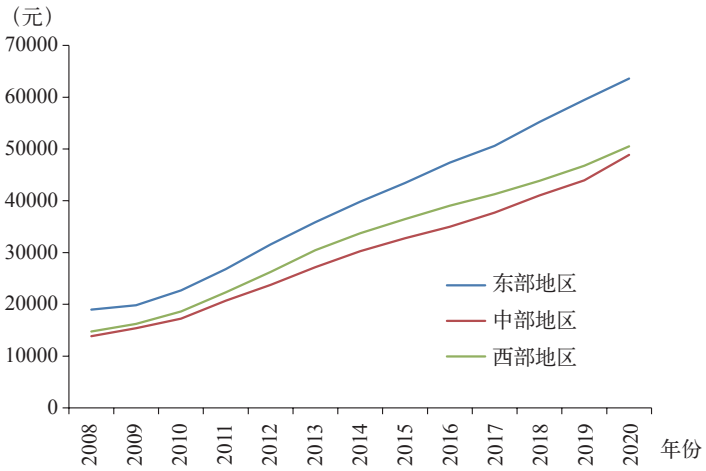

图1 东中西部私营单位就业人员平均工资

资料来源：中国国家统计局。

[4] 数据来自中国国家统计局。

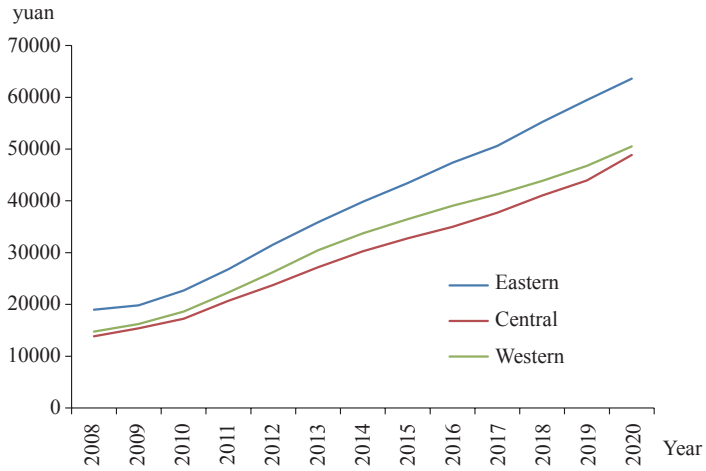

Figure 1: Average Private-Sector Compensation in China's Eastern, Central and Western Regions (yuan per year)

Source: China's National Bureau of Statistics (NBS).

and western regions, China may slow the relocation of such industries to other competing countries and maintain a higher and possible more optimal share of manufacturing in its economy.

Researchers have demonstrated the applicability of the flying geese theory from an empirical perspective, and have conducted many empirical studies on China's flying geese paradigm. For instance, Dowling & Cheang (2000) verified the flying geese theory based on an analysis of industrial development in Asian economies. The period from 1970 to 1995 indeed saw waves of industrial relocation from Japan to emerging industrialized economies such as Hong Kong, South Korea, Singapore, and Taiwan and then to other Asian economies like Indonesia, Malaysia, the Philippines, and Thailand. In addition, based on an analysis of the development of the electronics industry in East Asian economies, China, and the United States from 1978 to 2001, Ginzburg & Simonazzi (2005) found evidence to support the flying geese theory.

There is also an abundance of empirical literature on China's domestic flying geese paradigm specifically. Cai *et al*. (2009) found that TFP growth and contribution rates were higher in China's northeastern and central regions than in the eastern region, allowing China to move toward a domestic flying geese paradigm for industrial upgrades by developing labor-intensive industries in central and western regions. After estimating China's interregional industrial relocation from 1997 to 2007, Liu *et al*. (2011) discovered a significant trend of industrial relocation to northern regions while industrial relocation to central and western regions was insignificant. Ruan & Zhang (2014) found that China's textiles and clothing industry started to migrate from the eastern region to the central and western regions during 1997 and 2007, and based on data from 2000 to 2010, Zhang (2014) discovered the formation of China's own domestic flying geese paradigm. Along similar lines this paper intends to investigate whether a domestic flying geese paradigm has come into existence in China and to discuss its future trends. Existing observations on China's flying geese paradigm have two limitations. First, they are based on data no later than 2010. Second, their use of single indicators cannot reflect the full picture of China's domestic flying geese paradigm. This paper intends to make up for those deficiencies. First, we extend the time series of all observations from 2003 to 2015 to include more recent changes. Second, we offer a more comprehensive model that reflects the migration of labor-intensive industries and trade processing, as well as thedevelopment of value chain.

为何大国雁阵模式对中国构建新发展格局这么重要呢？从供给侧来看，劳动密集型产业转移到中西部地区有助于更充分地利用劳动力，缓解人口红利消失对增长的限制；更多劳动力进入制造业有助于解决资本报酬递减问题；产业在地区间的转移有助于提升全要素生产率。从需求侧来看，劳动密集型产业有助于解决中西部地区就业问题，提升中西部地区收入水平，从而起到扩大消费的作用；为解决中西部承接劳动密集型产业，对中西部地区基础设施的投资可以提升投资潜力；中国在劳动密集型产业的出口有助于维持外需。从维持制造业占GDP的比重这一角度，中国也应该推动大国雁阵模式。根据郭克莎和彭继宗(2021)的研究，中国未来一段时期制造业占GDP比重应保持在28%~30%，但是目前中国已经出现低于这一合理比重的情况。为了延缓劳动密集型产业向外转移，将其尽量留在国内，从而维持适当的制造业比重，中国应该促进劳动密集型产业尽量转移到中西部。

有不少学者从经验分析的角度去讨论雁阵理论的说服力，也有不少关注中国大国雁阵模式的经验分析论文。如Dowling和Cheang(2000)通过对亚洲地区各经济体产业发展的分析证实了雁阵理论。1970~1995年，产业确实存在从日本转到新兴工业化经济体(中国香港、韩国、新加坡、中国台湾)，再转到亚洲代表性经济体(印度尼西亚、马来西亚、菲律宾、泰国)的现象。Ginzburg和Simonazzi(2005)通过分析1978~2001年东亚经济体、中国、美国的电子产业发展，证实了雁阵理论。关注中国雁阵模式的文献也有不少，蔡昉等(2009)发现中国东北和中部地区比东部地区有更快的全要素生产率提高速度和贡献率，中西部地区承接劳动密集型产业，可以实现中国产业升级的大国雁阵模式。刘红光等(2011)测算了中国1997~2007年区域间产业转移，发现产业转移具有明显“北上”特征，产业向中西部地区转移的趋势并不明显。Ruan和Zhang(2014)发现纺织服装产业在2005年左右开始从东部地区转移到中西部地区。张其仔(2014)使用2000~2010年的数据发现了中国大国雁阵模式的形成。

本文旨在通过数据观察分析中国是否形成了大国雁阵模式，并讨论未来的趋势如何。现有对中国大国雁阵模式的观察存在两个局限：一是观察的时间最多到2010年，无法观察2010年以来的变化；二是仅仅使用单一指标进行分析，还无法全面地了解大国雁阵模式。本文旨在弥补上述不足：一是观察的时间序列是2003~2015年，尽可能包括了最近的变化；二是通过分析劳动密集型产业转移情况、加工贸易转移和转型情况、产业链发展情况进行更加全面的观察。

二、观察思路

本文数据来自中国海关和中国区域间非竞争型投入产出表。中国海关数据展示了HS[5]六位码各省对各经济体的进出口额，时间跨度是2003~2015年。中国区域间非竞争型投入产出表来自中国科学院区域可持续发展分析与模拟重点实验室编制的2007年中国30省区市区域间非竞争型投入产出表(刘卫东等，2012)。该表存在6部门和30部门两张表，本文使用30部门的表，以便使研究的产业层次更细。

本文通过三类指标观察中国的大国雁阵模式是否形成。第一类指标旨在观察劳动密集型产业转移情况，

[5] 海关编码协调制度（Harmonized System，简称HS）。

2. Observational Approach

China's customs data present the import and export volumes of each province with each provincial economy listed under the HS[6] 6-digit codes from 2003 to 2015. China's Interregional Non-Competitive Input-Output Tables are of 30 Chinese provincial-level regions for 2007 compiled by the Key Lab for Regional Sustainable Development Analysis and Simulation of the Chinese Academy of Sciences (CAS) (Liu *et al.*, 2012). From the two versions of those input-output tables with six sectors and 30 sectors, respectively, this paper employs the input-output table with 30 sectors.

This paper examines the formation of China's flying geese paradigm based on three types of indicators. The first type of indicator is designed to observe the migration of labor-intensive industries denoted by each region's labor-intensive exports as a share of total exports of each sector. Based on the factor intensity, industrial classification includes labor-intensive, capital-intensive, and technology-intensive industries. We can find evidence that a domestic flying geese paradigm in China has taken shape if the labor-intensive exports from the eastern region as a share of China's total labor-intensive exports decrease and those from the central and western regions as a share of China's total increase.

Referencing Hanson (2021), we identified labor-intensive products as follows: textile yarns and fabrics; sanitation, pipelines, heating and lighting devices and accessories; furniture and components; travel goods, handbags and similar containers; articles of apparel and clothing accessories; shoes; bicycles, scooters and handicap scooters; plastic products; strollers, toys and gaming and sports goods; office and stationery goods. They correspond to textile (yarns) threads, fabrics, and unspecified finished goods and products (65[7]), prefabricated buildings; unspecified sanitation, pipeline, heating and lighting devices and accessories (81), furniture and components; beddings, bed mattress, mattress support, cushion and similar padded furniture (82), travel goods, handbags and similar containers (83), various apparels and accessories (84), shoes (85), and unspecified miscellaneous goods (89). Based on the correspondence between SITC[8] and HS, we identified the corresponding products: 50010010-67049000[9] (apparels, textiles and shoes, etc.), 94060000 (mobile homes), 94011000-94049090 (furniture, beddings, cushions and spring mattresses, etc.), 42010000-43040020 (suitcases and cosmetic bags, etc.; furs and artificial furs), 49030000-49119900 (printed goods); 39231000-39269090 (plastic products); 87150000 (strollers and components), 95030010-95089000 (toys, games and sports goods), and 96011000-96180000 (miscellaneous products).

The second type of indicator observes the relocation and upgrade of processing trade, denoted by processing trade in each region as a share of the total and the ratio of domestic value added (DVAR) of processing trade, respectively. According to trade classification based on the customs database, processing trade includes processing trade with client-supplied materials and processing trade with imported materials. Since the reform and opening up was launched in 1978, processing trade has been an important form of China's participation in foreign trade. As a vehicle of global value chains (GVCs), processing trade once accounted for close to half of China's foreign trade.

After the global financial crisis, however, the share of China's processing trade in total trade has been on the decline, down to less than 25% by 2020. A rising cost of labor in China's eastern region for processing and assembly activities corresponded to this.. With a smaller cost of labor compared with the eastern region, the central and western regions still have potential for developing processing trade. Moreover, China's State Council and ministerial agencies have issued various policy documents and initiatives to encourage processing trade to relocate from eastern region to central and western regions.

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[6] International Convention for Harmonized Commodity Description and Coding System.
[7] SITC code.
[8] Standard International Trade Classification.
[9] HS code.

用各地区劳动密集型产业出口占全国该类型产业总出口比重表示。基于传统的国际分工理论，产业可以被划分为劳动密集型、资本密集型、技术密集型。如果东部地区劳动密集型产业出口比重下降，中西部地区劳动密集型产业出口比重上升，则表明大国雁阵模式的形成。本文对劳动密集型产品的界定参考Hanson(2021)，包括纺织纱线和织物；卫生、管道、供暖和照明设备及配件；家具和零件；旅行用品、手袋和类似容器；服装和服装配件；鞋类；自行车、滑板车和残疾人车厢；塑料制品；婴儿车、玩具、游戏和体育用品；办公室和文具用品。分别对应 SITC(rev4)[6]代码中的纺织(纱)丝、织物、未列明的有关成品及产品(65)，预制建筑物；未另列明的卫生、水道、供暖和照明设备及配件(81)，家具及其零件；床上用品、床垫、床垫支架、软垫及类似填制的家具(82)，旅行用具、手提包及类似容器(83)，各种服装和服饰用品(84)，鞋类(85)，未另列明的杂项制品(89)。然后再根据SITC与HS的对应关系，找出相应的产品：50010010–67049000(服装、纺织、鞋类等)，94060000(活动房屋)，94011000–94049090(家具，寝具、褥垫、弹簧床垫等)，42010000–43040020(提箱、化妆包等，毛皮、人造毛皮等)，49030000–49119900(印刷品)，39231000–39269090(塑料制品)，87150000(婴儿车及其零件)，95030010–95089000(玩具、游戏以及体育用品)，96011000–96180000(杂项制品)。

第二类指标旨在观察加工贸易转移和转型情况，用各地区加工贸易占全国加工贸易比重和加工贸易国内增加值率表示。根据海关数据库对贸易类型的分类，加工贸易包含来料加工装配贸易和进料加工贸易，是全球价值链的形式之一。改革开放以来，中国参与对外贸易的重要形式就是加工贸易，一度占到中国对外贸易总额的将近1/2。但国际金融危机之后，加工贸易比重逐年下降，2020年占外贸总额的比重已不到1/4。加工贸易比重下降的重要原因是东部地区劳动力成本上升，削弱了其在加工组装环节的成本优势。但中西部地区的劳动力成本相对较低，仍具备发展加工贸易的潜力。中国国务院和相关部委多次发布促进加工贸易从东部地区转移到中西部地区的文件，并配套相关政策措施。

与此同时，本文测算了加工贸易转型升级情况，用某省当年加工贸易净出口额除以该省当年加工贸易出口额来估算不同省份加工贸易的国内增加值率。

$$dvar_{i,t}^{p}=\frac{ex_{i,t}^{p}-im_{i,t}^{p}}{ex_{i,t}^{p}} \tag{1}$$

$ex_{i,t}^{p}$ 表示省份 i 在 t 年加工贸易出口额，$im_{i,t}^{p}$ 表示省份 i 在 t 年加工贸易进口额。此方法依赖如下假设：第一，生产加工贸易产品不需要其他的中间投入；第二，每年签订的加工贸易产品订单都在当年完成出口，即不存在存货变动、订单交货滞后等；第三，一个省份加工贸易进口的产品只在本省份组装和出口。

第三类指标旨在观察产业链发展情况，也就是各地区在产业链上的位置。全球价值链分工时代，不同国家往往在产业链的不同环节生产，对于一国各地区也如此。基于不同产业离最终需求的远近，Antras等(2012)构建了产业上游度指标。最终产品的上游度是1。当一个产业离最终需求越远，该指标越高。可以基于此计算一国(地区)在产业链上所处的位置。在制造业中，当一国更多出口中间品或零部件时，处于上游。当发展水平较低时，一国(地区)往往在下游生产。

[6] 国际贸易标准产业分类（Standard International Trade Classification，简称SITC）。

In addition, we have also estimated the transition and upgrade of processing trade. Specifically, the DVAR of processing trade in each province is estimated by dividing the net export volume of processing trade in the province in the current year by the export volume of the province in the same year.

$$dvar_{i,t}^{p} = \frac{ex_{i,t}^{p} - im_{i,t}^{p}}{ex_{i,t}^{p}} \quad (1)$$

$ex_{i,t}^{p}$ is the export volume of processing trade in province *i* and year *t*, and $im_{i,t}^{p}$ is the import volume of processing trade in province *i* and year *t*. This method is subject to the following assumptions: First, the manufacturing of processing trade products requires no other intermediate input; second, the export of processed goods is completed in the same year when the processing trade order is executed, i.e. there is no change in stock or delay in the shipment; third, products imported by each province under processing trade are assembled and exported within the same province.

The third type of indicator examines the development of value chains. That is, the value chain position of each region. Based on the distance of each industry to the place of final demand, Antras *et al*. (2012) created an indicator of industrial upstreamness. While the upstreamness of a final product is 1, this indicator is higher when an industry is more distant from the final demand. This indicator can be used to calculate the position of a country or region on an value chain. In the manufacturing industry, the more a country exports intermediate inputs or components, the more upstream it is. With a relatively low level of development, a country or region tends to be in the downstream.

The following equation can be arrived at based on the row balance of the input-output tables:

$$Y_i^r = \sum_{s=1}^{S} \sum_{j=1}^{J} a_{ij}^{rs} Y_j^s + F_i^r \quad (2)$$

Y_i^r is the total output of industry *i* in province *r*, a_{ij}^{rs} is the direct consumption coefficient of industry *j* in province *s* in relation to industry *i* in province *r*, and F_i^r is the final consumption of industry *i* in province *r*. After continuously iterating this equation and dividing both sides of the equation by Y_i^r, we assign the corresponding weight to each production stage and arrive at the following equation:

$$U_i^r = 1 \times \frac{F_i^r}{Y_i^r} + 2 \times \frac{\sum_{s=1}^{S} \sum_{j=1}^{J} a_{ij}^{rs} F_j^s}{Y_i^r} + 3 \times \frac{\sum_{s=1}^{S} \sum_{j=1}^{J} \sum_{t=1}^{S} \sum_{k=1}^{J} a_{ij}^{rs} a_{jk}^{st} F_k^t}{Y_i^r} + \cdots \quad (3)$$

This equation is the upstreamness of industry *i* in China's province *r*, and $U_i^r \geq 1$. Greater U_i^r suggests higher upstreamness of industry *i* in province *r*. Actual conclusions of the above values are converted into the calculations of matrixes (Antras, *et al*., 2012). The export upstreamness of industry *i* in China's province *r* is obtained by designating the export volume of industry *i* as a share of total export volume as weight.

$$EX\_U_{i,t}^r = \frac{E_{i,t}^r}{\sum_r E_{i,t}^r} \times U_{i,2007}^r \quad (4)$$

$EX\_U_{i,t}^r$ is the export upstreamness of industry *i* in province *r* and year *t*, $E_{i,t}^r$ is the export volume of industry *i* in province *r* and year *t*, and $U_{i,2007}^r$ is the upstreamness of industry *i* in province *r* calculated with China's interregional input-output tables for 2007. With the industrial upstreamness in 2007 as the benchmark, we may identify change in the upstreamness of industry *i* in province *r* resulting from exports. Greater $EX\_U_{i,t}^r$ means higher upstreamness of industry *i* in province *r*.

3. Results and Analysis

We will present the results of three types of indicators and briefly analyze the results in this section.

根据投入产出表的行平衡可以得到：

$$Y_i^r = \sum_{s=1}^{S}\sum_{j=1}^{J} a_{ij}^{rs} Y_j^s + F_i^r \quad (2)$$

Y_i^r表示r省份i产业的总产出，a_{ij}^{rs}表示s省份j产业对r省份i产业的直接消耗系数，F_i^r表示r省份i产业的最终使用。将该式不断进行迭代，再将公式两边同除Y_i^r，把每一生产阶段赋上相应的权重即可得：

$$U_i^r = 1 \times \frac{F_i^r}{Y_i^r} + 2 \times \frac{\sum_{s=1}^{S}\sum_{j=1}^{J} a_{ij}^{rs} F_j^s}{Y_i^r} + 3 \times \frac{\sum_{s=1}^{S}\sum_{j=1}^{J}\sum_{t=1}^{S}\sum_{k=1}^{J} a_{ij}^{rs} a_{jk}^{st} F_k^t}{Y_i^r} + \cdots \quad (3)$$

此式即为中国r省份i产业的上游度，$U_i^r \geq 1$。U_i^r越大表明r省份i产业在中国的产业上游度越高。实际计算时，上述无穷级数的计算转化为矩阵的运算（Antras et al.，2012）。将产业的上游度以相应产业的出口额占总出口额的比重作为权重构造得到中国r省份i产业的出口上游度：

$$EX\_U_{i,t}^r = \frac{E_{i,t}^r}{\sum_r E_{i,t}^r} \times U_{i,2007}^r \quad (4)$$

$EX_U_{i,t}^r$表示r省份i产业在t年的出口上游度，$E_{i,t}^r$表示r省份i产业在t年的出口额，$U_{i,2007}^r$表示以2007年中国区域间投入产出表计算的r省份i产业的上游度。以2007年产业上游度作为基准，可以识别出由出口导致的r省份i产业的上游度变动情况。$EX_U_{i,t}^r$越大，表明r省份i产业由出口导致的上游度越高。

三、观察结果及分析

（一）劳动密集型产业出口比重

图2表明，东部地区劳动密集型产品出口比重从2003年的92.62%下降到2014年的83.47%；中部地区劳动密集型产品出口比重从2003年的4.06%增加到2015年的6.41%，但2012~2015年中部地区劳动密集型产品出口比重增长停滞甚至轻微下滑；西部地区劳动密集型产品出口比重从2003年的不到3.32%增加到2014年的9.42%。也就说，中国的大国雁阵模式确实形成了，开始形成的时间点是2007年。从2007年开始，劳动密集型产业开始明显地转向中西部地区，且转向西部地区的多于中部地区。此外，转移进程并非是线性的。2012年以来，转移进程明显放缓，甚至在2015年出现了逆转的情况。

另外一个需要讨论的问题是：按照现在的转移速度，完成转移需要多少时间？为回答这个问题，需要讨论中西部地区最终承接多少劳动密集型产业是合适的。东部地区劳动密集型产品出口比重最高时超过90%。考虑到东部地区需要继续保留一部分劳动密集型产业，中西部地区的理想目标至少应该是50%，即最终能够承接全国一半的劳动密集型产业。东部地区劳动密集型产业出口比重下降的平均速度是每年下降0.83个百分点。按照现在的速度，大概需要40年左右才能完成产业转移。很显然，这是一个很漫长的过程。

分省份来看，2003年广东省劳动密集型产品出口占中国劳动密集型产品出口的34.70%，在全国各省份中处于绝对领先地位。但是下降的趋势很明显，从2003年的34.70%下降到2015年的27.72%。山东省、上海市均出现了较小幅度的下降，山东省从2003年的8.70%下降到2015年的6.99%，上海市从2003年的11.46%下降

3.1 Share of Labor-Intensive Exports

As shown in Figure 2, the share of labor-intensive exports for China's eastern region fell from 92.62% in 2003 to 83.47% in 2014. From 2003 to 2015, this percentage increased from 4.06% to 6.41% for the central region, but the growth stagnated and even turned slightly negative. From 2003 to 2014, the western region experienced an increase in its share of labor-intensive exports from 3.32% to 9.42%. That is to say, China's domestic flying geese paradigm began to take shape in 2007. Since 2007, labor-intensive industries have started to relocate to central and western regions, especially western regions. This process of relocation has been nonlinear. Since 2012, relocation has substantially slowed and even reversed in 2015.

One important question is how long does it take to complete the process of such industrial relocation at the current speed? To answer this question, we need to discuss the appropriate percentage of labor-intensive industries that can be relocated to the central and western regions. At its peak, the eastern region accounted for 90% of China's labor-intensive exports. Since the eastern region needs to retain a portion of labor-intensive industries, a desirable goal for the central and western regions is to host at least 50% of China's labor-intensive industries. The share of labor-intensive exports for the eastern region decreases by 0.83 percentage points on an annual average basis. At the current rate, it would take about 40 years for China to complete the process of industrial relocation.

By province, Guangdong accounted for 34.70% of China's labor-intensive exports in 2003, which

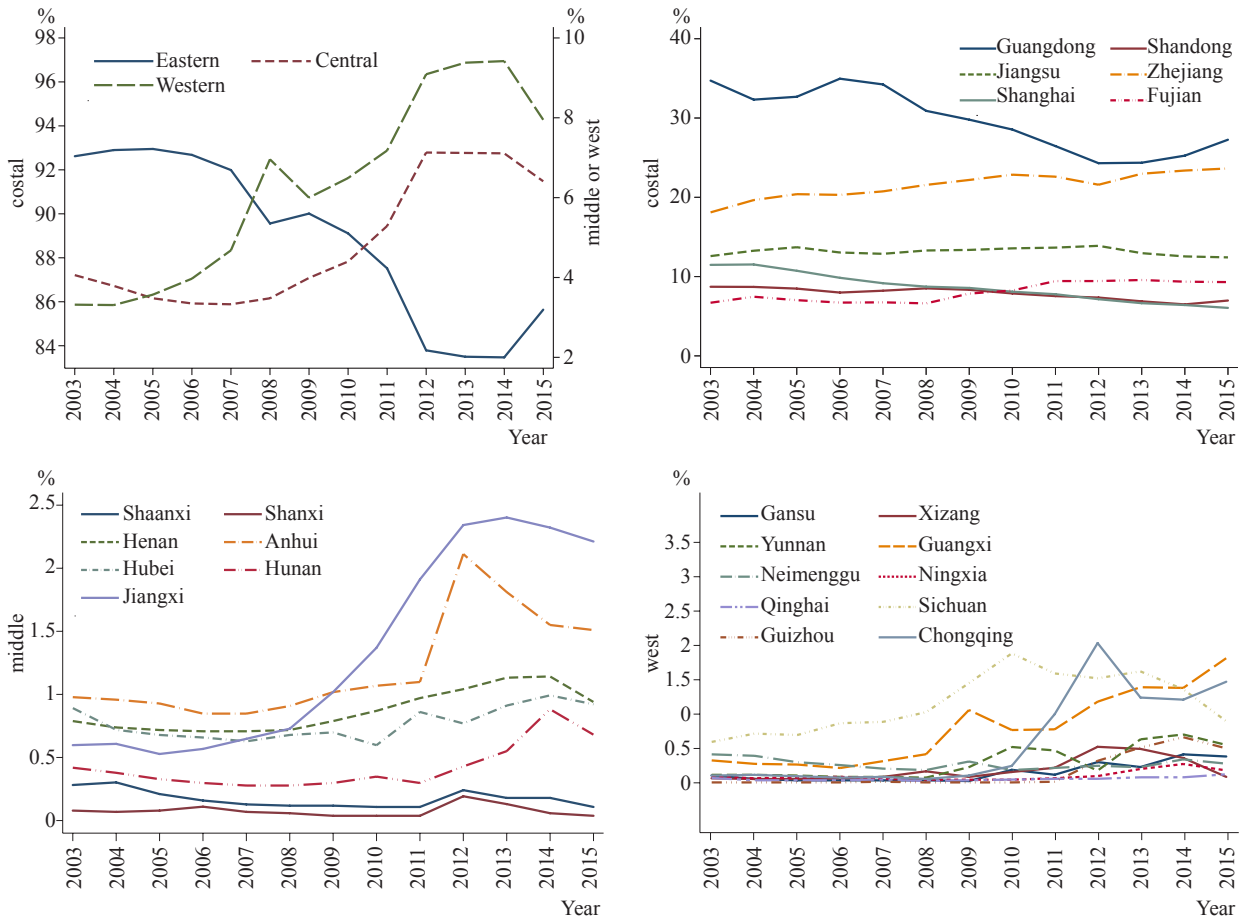

Figure 2: Share of Labor-Intensive Exports for Provincial Jurisdictions across China's Eastern, Central and Western Regions

至2015年的6.07%。福建省出现了较小幅度的上升，从2003年的6.72%上升至2015年的9.29%。江苏省没有明显的变动趋势，一直保持在13%的水平上。

江西省与安徽省的劳动密集型产品出口比重增加最为明显，江西省从2008年开始加速增长，而安徽省则从2011才开始加速增长。河南省、湖北省、湖南省也有较为明显的增长。但是陕西省与山西省有较为明显的下降。具体而言，陕西省劳动密集型产品出口比重从2003年的0.28%下降到2015年的0.11%；江西省从2003年的0.60%上升到2015年的2.21%；安徽省从2003年的0.98%上升到2015年的1.51%。

西部各省份劳动密集型产业出口比重都有明显的增长，但是不同省份之间表现差异较大。比重增加最大的三个省份是四川省、广西壮族自治区、重庆市。四川省和广西壮族自治区这一比重从2008年开始加速增长，但是四川省却在2014年后发生了明显的下降，而广西壮族自治区仍保持明显的增长。重庆市2010年至2012年间发生了极为明显的增长，从2010年的0.25%增长至2012年的2.02%，2012年至2014年发生了明显的下滑之后2015年又开始向上增长。云南省、甘肃省、宁夏回族自治区都有较为明显的增长，但是在2010年之后存在明显的波动。西藏自治区增长趋势不明显。贵州省从2011年开始才有明显的增长趋势，2011年劳动密集型产品

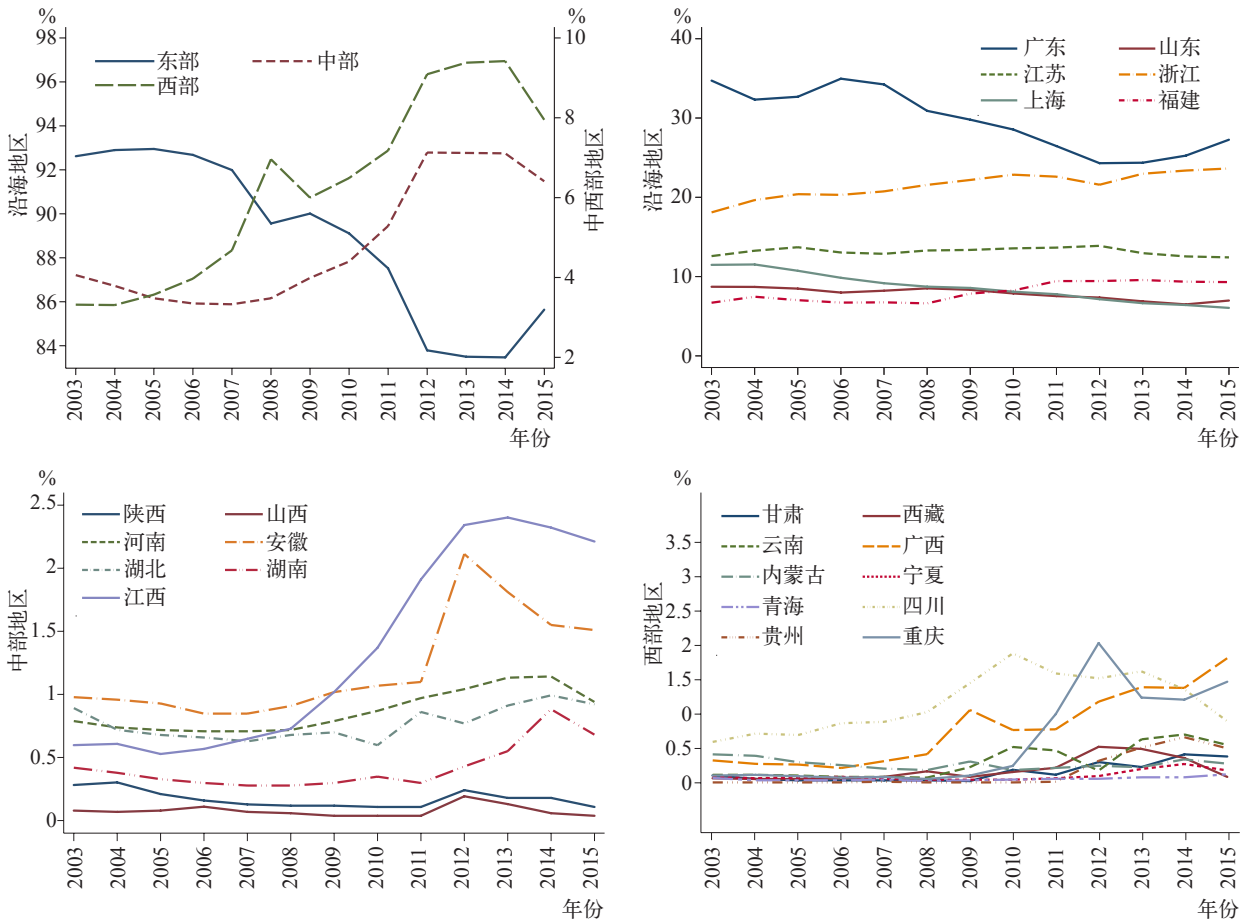

图2 不同地区不同省份劳动密集型产业出口比重

was the highest among all provincial jurisdictions. However, this percentage also decreased sharply from 34.70% in 2003 to 27.72% in 2015. Both Shandong and Shanghai reported decreases in their shares of labor-intensive exports, down from 8.70% to 6.99% for Shandong and from 11.46% to 6.07% for Shanghai from 2003 to 2015. Fujian experienced a minor increase in its share of labor-intensive exports, up from 6.72% in 2003 to 9.29% in 2015. Jiangsu Province experienced no major change in its share of labor-intensive exports, which stayed at the level of 13%.

Jiangxi and Anhui provinces recorded the sharpest increases in their shares of labor-intensive products, which sped up since 2008 for Jiangxi and since 2011 for Anhui. The share of labor-intensive exports increased sharply for Henan, Hubei and Hunan provinces but shrank for Shaanxi and Shanxi. From 2003 to 2015, the share of labor-intensive exports fell from 0.28% to 0.11% for Shaanxi, rose from 0.60% to 2.21% for Jiangxi, and increased from 0.98% to 1.51% for Anhui.

The share of labor-intensive exports increased sharply for all provincial jurisdictions in China's western regions with great inter-provincial differences. Three provincial jurisdictions, including Sichuan, Guangxi and Chongqing, reported the sharpest increases in the share of labor-intensive exports. For Sichuan and Guangxi, the share of labor-intensive exports started to increase apace since 2008, but a sharp decrease occurred after 2014 for Sichuan. From 2010 to 2012, the share of labor-intensive exports increased sharply for Chongqing Municipality, up from 0.25% in 2010 to 2.02% in 2012, followed by a steep fall from 2012 to 2014 and renewed growth in 2015. The share of labor-intensive exports increased sharply for Yunnan Province, Gansu Province and Ningxia Hui Autonomous Region, but started to experience great volatility after 2010. The increase of labor-intensive exports was insignificant for Tibet Autonomous Region, and Guizhou Province did not experience any significant increase in its share of labor-intensive exports until 2011. From 2011 to 2015, the share of labor-intensive exports from Guizhou Province increased from a mere 0.01% to 0.49%.

As can be seen from the above figures, the relocation of labor-intensive industries is heterogeneous across eastern, central, and western regions, and even in the same region, differences exist between provincial jurisdictions. While some provinces in China's eastern region stayed competitive in labor-intensive industries, others had to relocate labor-intensive industries to central and western regions quickly. Some provinces in China's central and western regions did well in attracting labor-intensive industries from the eastern region, but others, especially those in the central region, have yet to attract labor-intensive industries. One reason is the advantages of undertaking labor-intensive industries among provinces are different, due to the disparate cost of labor. In addition, the effects of capital input, infrastructure, human capital, the level of technology, and policy initiatives are also at play, because all of them are important factors affecting the competitiveness of industries.

3.2 Share of Processing Trade and Ratio of Domestic Value Added

In terms of trend, the share of processing exports fell for China's eastern region after 2010, but jumped for the central and western regions after 2009. This percentage, however, shrank for the western region in 2015. Overall, the eastern region still made up the majority of China's processing exports, whose share reached 84.67% in 2015. Despite an upward trend, the central and western regions still accounted for a minor share of China's total processing exports, reaching 9.06% and 6.26% in 2015, respectively. Unlike labor-intensive industries, processing trade started to relocate in 2010, and the western region did not host more processing trade compared with the eastern region. Similar to labor-intensive industries though, a reversal in the relocation of processing trade occurred in 2015. At the current rate, again it would take a long time to complete the process of such relocation.

By province, the share of processing trade changed little for the eastern region with the exception of Guangdong. From 2003 to 2015, the share of processing trade increased from 5.69% to 6.76% for Shandong, from 16.83% to 20.31% for Jiangsu, and from 3.35% to 4.04% for Zhejiang. In the same period, the share of processing trade decreased from 54.34% to 38.60% for Guangdong, from 12.70% to

出口比重只有0.01%，而在2015年增长为0.49%。

因此，东中西部地区的劳动密集型产业转移和承接具有省份的异质性，即便在同一地区，不同省份之间也存在差异。东部地区某些省份仍能保持劳动密集型产业的优势，但是某些省份则需要加速往中西部转移。中西部地区的某些省份在承接东部地区劳动密集型产业方面做得较好，但是某些省份尤其是中部省份并没有有效地承接劳动密集型产业。究其原因，即便处于相同的区域，不同的省份劳动力成本也具有差异。另外，除劳动力成本影响劳动密集型产业的竞争力之外，资本投入、基础设施、人力资本、技术水平、政策措施等也会发挥作用。

（二）加工贸易比重和国内增加值率

从变动趋势来看，东部地区的加工贸易出口比重在2010年以后发生了明显的下降；中西部地区加工贸易出口比重在2009年以后出现了明显的上升，但西部地区这一比重在2015年出现了较大幅度的下滑。从整体比重而言，东部地区加工贸易出口比重仍占据主要地位，2015年东部地区这一比重为84.67%；中西部地区虽然

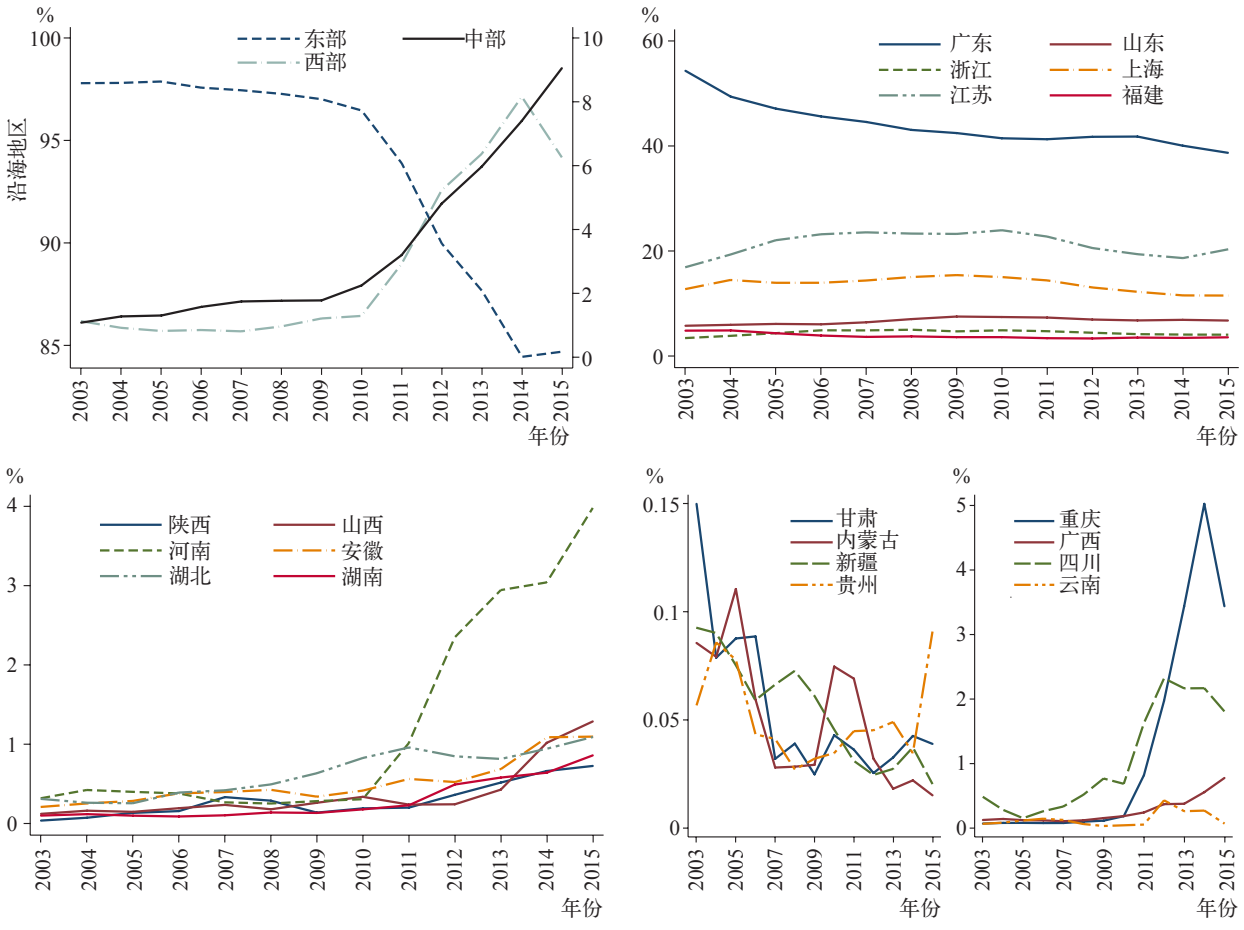

图3 不同地区不同省份加工贸易比重

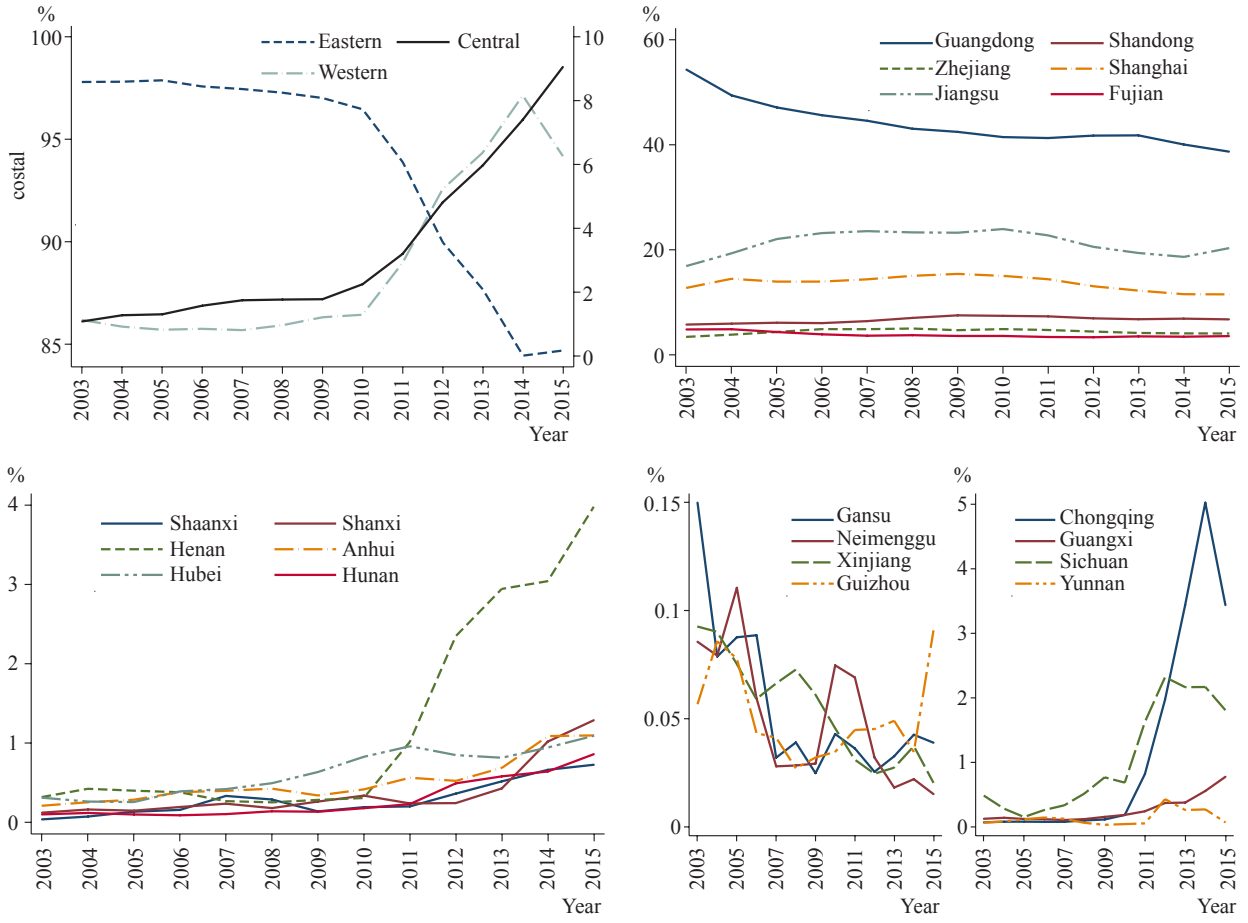

Figure 3: Share of Processing Trade across Provincial Jurisdictions in China's Eastern, Central, and Western Regions

11.44% for Shanghai, and from 4.89% to 3.51% for Fujian. The share of processing trade decreased for provinces in the south of China's eastern region and increased for provinces like Shandong and Jiangsu in the north of China's eastern region.

Provinces in the central region all reported growth in the share of processing exports, which started to accelerate after 2010. The most significant increase occurred for Henan Province, whose share of processing exports was 0.30% in 2010 but rose to 3.98% in 2015. For other provinces, this percentage was 0.12% and 1.29% for Shaanxi, 0.032% and 0.730% for Shanxi, 0.20% and 1.10% for Anhui, 0.30% and 1.01% for Hubei, and 0.095% and 0.863% for Hunan in 2003 and 2015, respectively.

Significant differences exist between provinces of China's western region. As shown in Figure 3, the share of processing exports sharply declined for Gansu Province, Inner Mongolia Autonomous Region, Xinjiang Uygur Autonomous Region and Guizhou Province. Among them, volatility is relatively significant for Guizhou and Inner Mongolia. The share of processing exports increased sharply for Chongqing Municipality, Sichuan Province and Yunnan Province in 2015. The increases are particularly significant for Chongqing Municipality and Sichuan Province. Chongqing's share of processing exports increased from 0.18% in 2010 to 3.44% in 2015. This percentage increased from 0.06% in 2003 to 0.78% in 2015 for Guangxi Zhuang Autonomous Region.

Similar to labor-intensive industries, some provinces in China's eastern region did not experience any decrease in their share of processing trade, and not all provinces in the central and western regions

有明显的上升趋势，但是仍占较小的比重，2015年中部地区的比重为9.06%，西部地区的比重为6.26%。与劳动密集型产业的转移不同，加工贸易转移出现在2010年，而且西部地区相比东部地区并没有明显承接更多的加工贸易。与劳动密集型产业转移相同的是，2015年出现了逆转的情况。而且，按照目前的转移速度，也需要很长时间才能完成转移（见图3）。

从省份来看，东部地区省份除广东省存在明显的下降趋势外，其他东部地区省份趋势不明显。具体而言，山东省这一比重从2003年的5.69%上升至2015年的6.76%，江苏省从2003年的16.83%上升至2015年的20.31%，浙江省从2003年的3.35%上升至2015年的4.04%，山东省、江苏省、浙江省均出现了较小幅度的上升；而广东省从2003年的54.34%下降至2015年的38.60%，上海市从2003年的12.70%下降至2015年的11.44%，福建省从2003年的4.89%下降至2015年的3.51%。东部地区南部省份加工贸易出口比重下降，而东部地区北部省份如山东省、江苏省加工贸易出口比重则上升。

中部地区各省份的加工贸易出口比重都出现了明显的上升趋势，并且都在2010年后开始加速增长。其中上升最明显的是河南省，河南省2010年的加工贸易出口比重为0.30%，但在2015年这一比重为3.98%。具体来看，陕西省2003年与2015年这一比重分别为0.12%与1.29%，山西省的比重分别为0.032%与0.730%，安徽省的比重分别为0.20%与1.10%，湖北省的比重分别为0.30%与1.01%，湖南省的比重分别为0.095%与0.863%。

西部地区各省份之间表现差异较大，图3中甘肃省、内蒙古自治区、新疆维吾尔自治区、贵州省的加工贸易出口比重出现了较为明显的下降，其中贵州省、内蒙古自治区的波动幅度相对较大。重庆市、广西壮族自治区、四川省、云南省的加工贸易出口比重存在明显的上升，但重庆市、四川省、云南省在2015年时出现了明显的下滑。重庆市与四川省这一比重增长极为明显，重庆市2010年加工贸易出口比重为0.18%，但是在2015年时这一比重增长至3.44%。广西壮族自治区也从2003年的0.06%增长至2015年的0.78%。

与劳动密集型产业相同的是，东部地区某些省份并没有出现加工贸易比重下降的情况，中西部地区也不是所有省份都承接加工贸易。但是有所不同的是，中部地区在承接加工贸易方面做得很好。

东部地区的山东省、江苏省、浙江省、福建省加工贸易国内增加值率在不断提高，其中浙江省和江苏省在

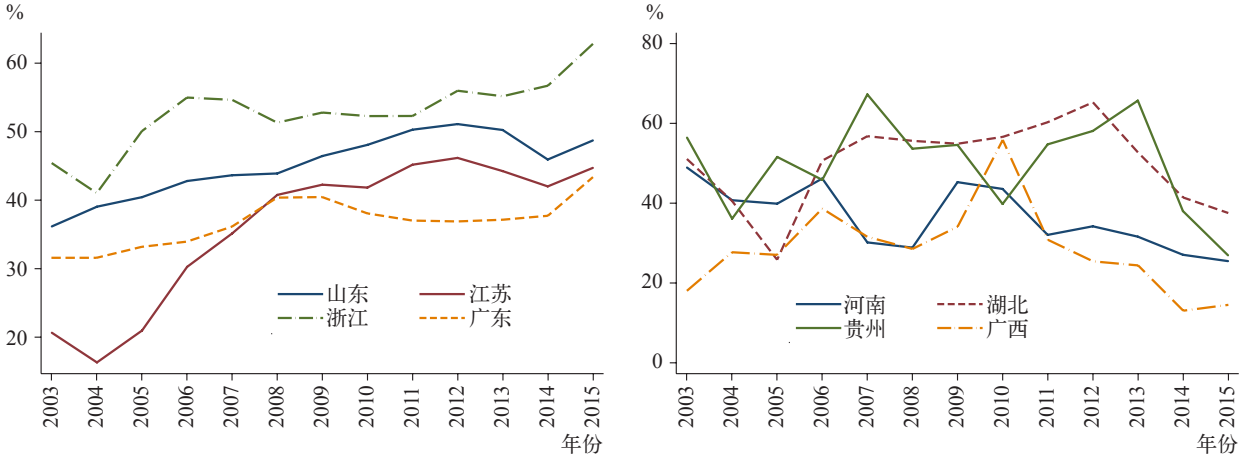

图4 东部4省份与中西部4省份加工贸易国内增加值率

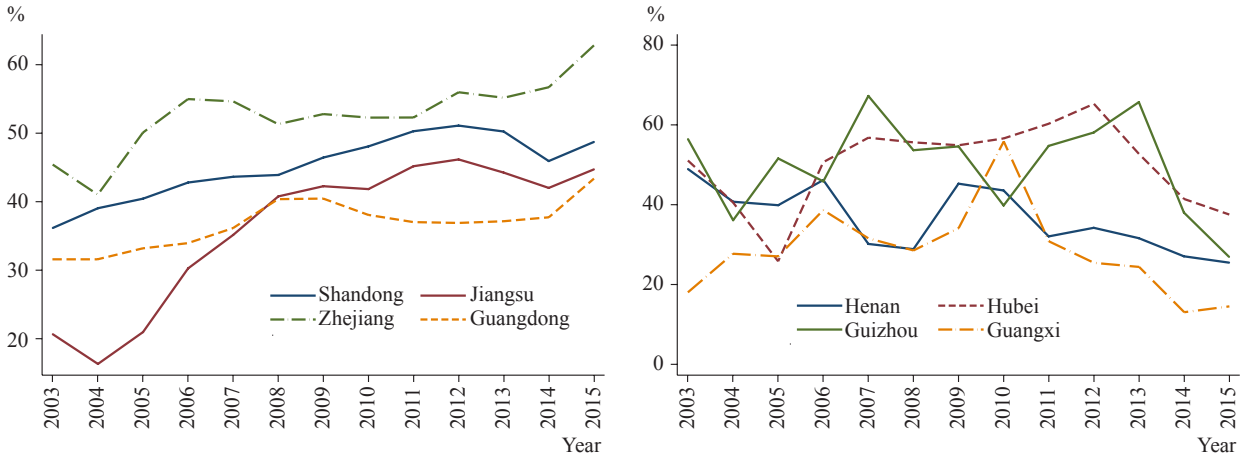

Figure 4: Ratio of Domestic Value Added of Processing Trade in the Four Provinces of China's Eastern Region and the Four Provinces of the Central and Western Regions

saw an increase in processing trade. The difference is that the central region has played a better host to processing trade.

In the eastern region, Shandong, Jiangsu, Zhejiang and Fujian provinces registered increasing DVAR of processing trade, and such increases significantly accelerated for Zhejiang and Jiangsu provinces in 2003 and 2007. Overall, Zhejiang Province recorded the highest DVAR of processing trade, and Guangdong Province had the least. The average DVAR of processing trade for Zhejiang Province was 52.73% in 2003 through 2015, and this percentage was 45.15%, 36.22% and 36.72% for Shandong, Jiangsu and Guangdong, respectively. This indicates an upgrade in the processing trade of China's eastern region for two reasons: Wage increases have yielded higher DVAR, and domestic value chains have been extended. Given the high DVAR of processing trade in Zhejiang Province, other provinces in China's eastern region still have great potentials for upgrading of processing trade.

Provinces in China's central and western provinces showed an insignificant trend of DVAR in processing trade and with high volatilities. After 2012, DVAR in processing trade decreased in central and western provinces. From 2003 to 2015, the annual DVAR of processing trade in Henan Province averaged 36.46%, and this percentage was 49.99%, 49.92%, and 28.40% for Hubei, Guizhou and Guangxi, respectively. Low wages in the central and western regions seem to be reflected in their limited DVAR.

Processing trade is dominated by foreign capital, and most processing trade companies are foreign-funded companies. That is to say, a region must attract foreign capital in order to develop processing trade. China's western regions are evidently less attractive to foreign capital compared with the central region, which explains the relatively undeveloped processing trade in the western region. As competition intensifies in China's domestic and overseas markets and policy preferences begin to be phased out, the eastern region has to increase DVAR to maintain high-quality development.

3.3 Value Chain Position

Here we conduct an analysis of industrial upstreamness, that is, the industry's position in the value chain, for a few representative industries, including labor-intensive, capital-intensive, and technology-intensive industries.

For provinces in China's eastern region, Fujian and Zhejiang saw an upward trend in the upstreamness of the textiles industry while Guangdong, Jiangsu, and Shandong registered a downward trend. In 2015, Zhejiang had the highest export upstreamness among provinces in China's eastern region,

2003~2007年具有明显的加速增长现象。从整体上看，浙江省的加工贸易国内增加值率最高，广东省的加工贸易国内增加值率最低。浙江省2003~2015年的加工贸易国内增加值率平均值是52.73%，山东省、江苏省、广东省的这一数据分别是45.15%、36.22%、36.72%。这表明，东部地区加工贸易确实存在转型升级的情况，原因有两个：一是工资上升获得更高的增加值，二是延伸在国内的产业链。考虑到浙江较高的加工贸易国内增加值率，其他东部省份还有较大潜力进行加工贸易转型升级。

中西部省份的加工贸易国内增加值率总体趋势不明显，存在较大幅度的波动，但在2012年后出现了同步下降的趋势。河南省2003~2015年的加工贸易国内增加值率平均值是36.46%，湖北省、贵州省、广西壮族自治区的这一数据分别是49.99%、49.92%、28.40%。这说明，随着中西部地区承接加工贸易，其工资低的现实情况反映为获得的国内增加值率较低。

加工贸易很重要的特点是外资主导，大部分加工贸易企业属于外资企业。因此，想要发展加工贸易，需要吸引外资。但是西部地区在吸引外资方面明显不如中部地区，因此西部地区承接的加工贸易有限。另外，随着国内外市场竞争压力增大以及政策优惠取消，东部地区不得不选择提升加工贸易国内增加值率。而中西部地区新增的加工贸易仍然延续了东部地区原有的特征。

（三）产业链位置

本文分别选取劳动密集型、资本密集型、技术密集型的几种代表性产业进行产业上游度分析（结果见表1、表2）。

如图5所示，对于纺织业而言，从东部地区来看，福建省、浙江省纺织品产业出口上游度整体趋势是向上的，而广东省、江苏省、山东省纺织品产业出口上游度趋势是向下的。在2015年时，东部地区省份产业出口上

表1 产业上游度的描述性统计

变量	样本数量	平均值	标准差	最小值	最大值
U_i^r	900	1.955	0.519	1	3.74

资料来源：作者根据2007年中国区域间非竞争型投入产出表计算。

表2 中国区域间投入产出表产业与HS2位码产品对应

产业类型	IO部门	HS2位码	产业类型	IO部门	HS2位码	产业类型	IO部门	HS2位码
劳动密集型产业	07纺织品	50–63	资本密集型产业	11石油、炼焦产品和核燃料加工品	27	技术密集型产业	17交通运输设备	86–89
	08纺织服装鞋帽皮革羽绒及其制品	41–43；64–67		12化学产品	28–40		19通讯设备、计算机其他电子设备	85
	09木材加工品和家具	44–46；94		14金属冶炼和压延加工品	72		20仪表仪器	91–92

Table 1: Descriptive Statistics of Industrial Upstreamness

Variable	Sample size	Average value	Standard deviation	Min.	Max.
U_i^r	900	1.955	0.519	1	3.74

Source: Calculated by authors by using China's interregional input-output tables for 2007 .

Table 2: Correspondence between Sectors in China's Interregional Input-Output Tables and HS 2-Digit Code Products

Sector type	IO sector	HS 2-digit code	Sector type	IO sector	HS 2-digit code	Sector type	IO sector	HS 2-digit code
Labor-intensive sectors	07 Textiles	50-63	Capital-intensive sectors	11 Petroleum and coking products and nuclear fuel processed goods.	27	Technology-intensive sectors	17 Transportation equipment	86-89
	08 Textiles, clothing, shoes, hats, leather, down, fur and their products	41-43; 64-67		12 Chemical products	28-40		19 Communication devices, computers and other electronic devices	85
	09 Timber products and furniture	44-46; 94		14 Metal smelting and rolling	72		20 Instruments and apparatuses	91-92

followed by Guangdong, Jiangsu, and lastly Shandong and Fujian. Notably, Guangdong's upstreamness of textile exports experienced a sharp decline in 2007 while Fujian and Zhejiang's upstreamness of textile exports increased at a quickening pace after 2007. This divergence suggests that the value chain division of labor also exists within China's eastern region.

Among provinces in the central region, Henan, Anhui, and Hubei had the highest upstreamness of textile exports, followed by Shaanxi and Hunan. Before 2010, various provinces experienced a downward trend in the upstreamness of textile exports, but after 2010, the trend turned upward. This suggests that China's central region may have received some textile industries relocated from the eastern region.

In the western region, the upstreamness of textile exports was significantly higher in the Xinjiang Uygur Autonomous Region than in other provincial jurisdictions. The upstreamness of Xinjiang's textile exports increased rapidly from 2005 to 2008 but decreased sharply after 2008. The upstreamness of textile exports from Chongqing Municipality, Guizhou Province, and the Guangxi Zhuang Autonomous Region showed no obvious trend until after 2008, whereas the upstreamness of Sichuan's textile exports started to rise sharply beginning in 2003. Provinces in China's western region, however, saw big decreases in their export upstreamness in 2015, which means they are expanding to the downstream of the value chain.

Overall, we have identified the following characteristics of textile export upstreamness across various regions in China: (i) Significant differentiation exists within each region. In the eastern region, Zhejiang boasts the highest upstreamness of textile exports, followed by Guangdong and Jiangsu at the second tier and Shandong and Fujian at the third tier. In the central region, Henan, Anhui and Hubei have the highest upstreamness of textile exports, followed by Shaanxi and Hunan at the second tier. In the western region, Xinjiang has the highest upstreamness of textile exports, followed by other provinces at the second tier. (ii) From a temporal dimension, the year 2007 is a turning point in the upstreamness of textile exports from China's eastern region. The upstreamness of textile exports from the central region started to increase apace since 2009. With the exception of Xinjiang, China's western region did not

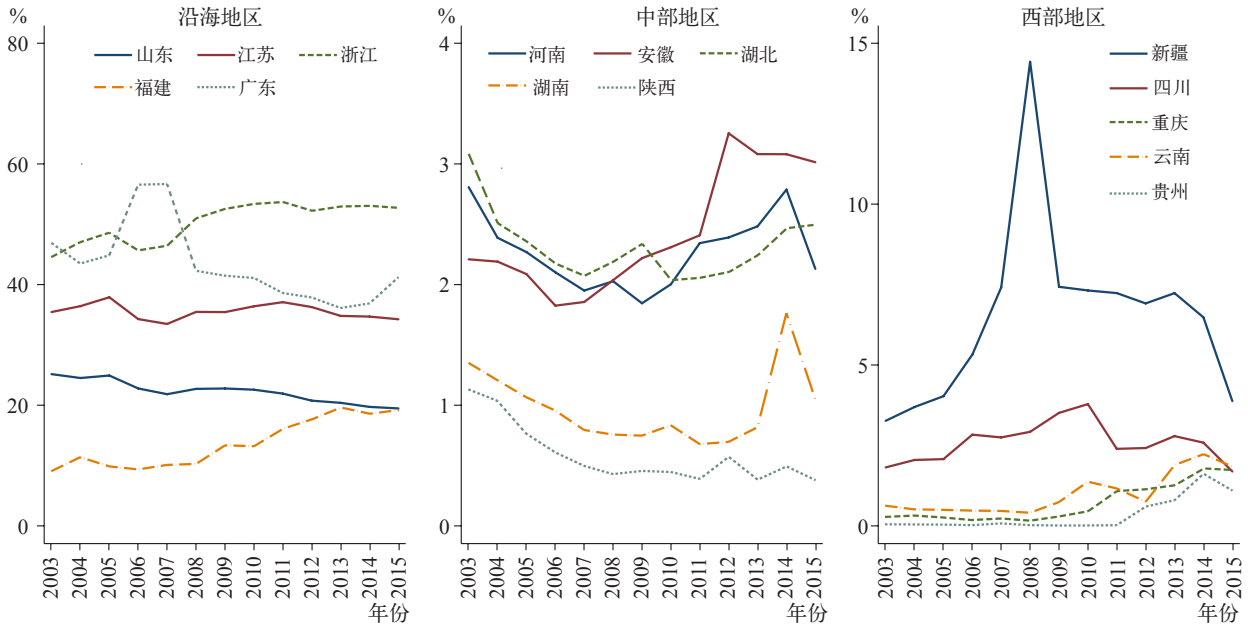

图5 三大地区各省份纺织品产业出口上游度

游度明显分成了三个档次，浙江省的出口上游度最高，其次是广东省和江苏省，最后是山东省和福建省。需要注意的是，广东省的出口上游度在2007年后发生了明显的加速下降情况，而福建省、浙江省在2007年后发生了明显的加速上升趋势。此现象说明了东部地区内部也存在产业链的分工。

从中部地区来看，中部地区省份的纺织品产业出口上游度明显分成了两个档次，河南省、安徽省、湖北省属于第一档次，陕西省、湖南省属于第二档次。2010年之前各省份纺织产业出口上游度整体趋势是向下的，而2010年之后整体趋势是向上的。此现象说明了中部地区可能承接了来自东部地区省份的部分纺织产业。

从西部地区来看，新疆维吾尔自治区的纺织产业出口上游度明显高于其他省份，其纺织产业出口上游度在2005年至2008年加速上涨，而在2008年之后又加速下降。重庆市、贵州省、广西壮族自治区纺织产业出口上游度在2008年之前没有明显的趋势，在2008年之后才出现了明显的上升趋势，而四川省的纺织产业出口上游度从2003年开始就有明显的上升趋势。但西部地区各省份出口上游度在2015年都出现了明显的下降。

总结起来看，纺织产业出口上游度呈现如下特点：(1)每个地区内部档次分化明显。东部地区中浙江省属于第一档次，广东省和江苏省为第二档次，山东省和福建省为第三档次。中部地区中河南省、安徽省、湖北省属于第一档次，陕西省、湖南省属于第二档次。西部地区中新疆属于第一档次，其他省份属于第二档次。(2)从时间节点来看，东部地区纺织品产业出口上游度加速上涨或下跌的时间节点是2007年，中部地区纺织品产业出口上游度加速上涨的时间节点是2009年以后，而西部地区除新疆维吾尔自治区外，纺织品产业出口上游度发生明显上升趋势的时间节点是2011年以后。这表明纺织品产业在发生转移时，东部地区内部的产业转移可能早于东部地区向中、西部地区的转移。(3)东部地区纺织品产业出口上游度整体而言仍占据主要地位，但中西部地区纺织品产业出口上游度在2009年之后发展迅速。

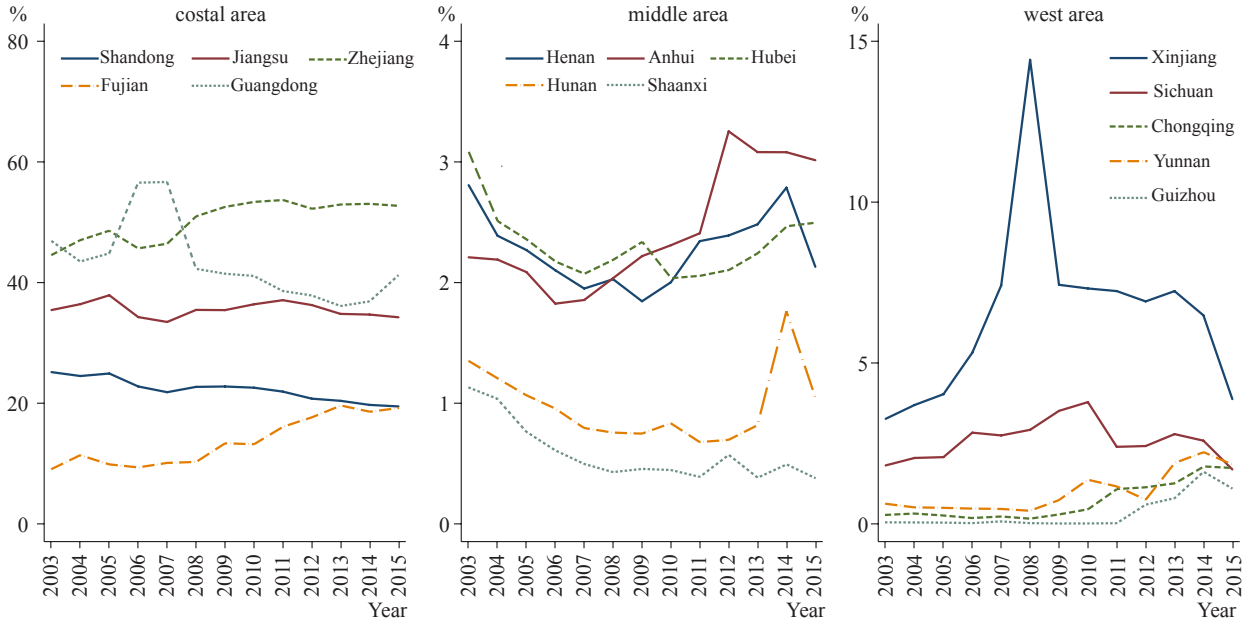

Figure 5: Export Upstreamness of the Textile Industry across Provincial Jurisdictions in China's Eastern, Central, and Western Regions

experience any significant increase in the upstreamness of textile exports until after 2011. That is to say, the textiles industry may have relocated initially within the eastern region before relocating to central and western regions. (iii) China's eastern region still boasts the highest upstreamness of textile exports, but the upstreamness of industrial exports from central and western regions increased rapidly after 2009.

For the chemical industry, the upstreamness of chemical exports increased for Zhejiang, Jiangsu, and Shandong provinces in China's eastern region but decreased for Guangdong and Fujian, and Guangdong's upstreamness of chemical exports decreased sharply from 2003 onward. The upstreamness of chemical exports from China's eastern region also diverged with Jiangsu at the first tier, Zhejiang, Guangdong and Shandong at the second tier and Fujian at the third tier.

In the central region, Anhui and Hubei experienced sharp increases in their upstreamness of chemical exports, which started to accelerate since 2006. In comparison, Henan, Hunan and Shaanxi provinces experienced insignificant change in their upstreamness of chemical exports. In 2015, China's central region also recorded an increase in the upstreamness of chemical exports with Anhui and Hubei at the first tier, Henan and Hunan at the second tier and Shaanxi at the third tier.

Provincial jurisdictions in China's western region shared an upward trend in their upstreamness of chemical exports, but volatility was significant. The upstreamness of chemical exports from Chongqing Municipality started to increase at an accelerating pace after 2010. In 2015, the upstreamness of chemical exports from provincial jurisdictions in China's western region diverged with Chongqing, Sichuan and Yunnan at the first tier and Guizhou and Xinjiang at the second tier.

For the electronics industry, Guangdong Province experienced decreasing upstreamness of communication and electronic equipment exports from 2003 to 2015 but also remained dominant nationwide. Other provinces in China's eastern region went through insignificant change in their upstreamness of communication and electronic equipment exports, which increased at first and then declined during 2003 and 2015.

Provinces in China's central region all experienced sharp increases in their upstreamness of communication and electronic equipment exports. However, their upstreamness increased at different

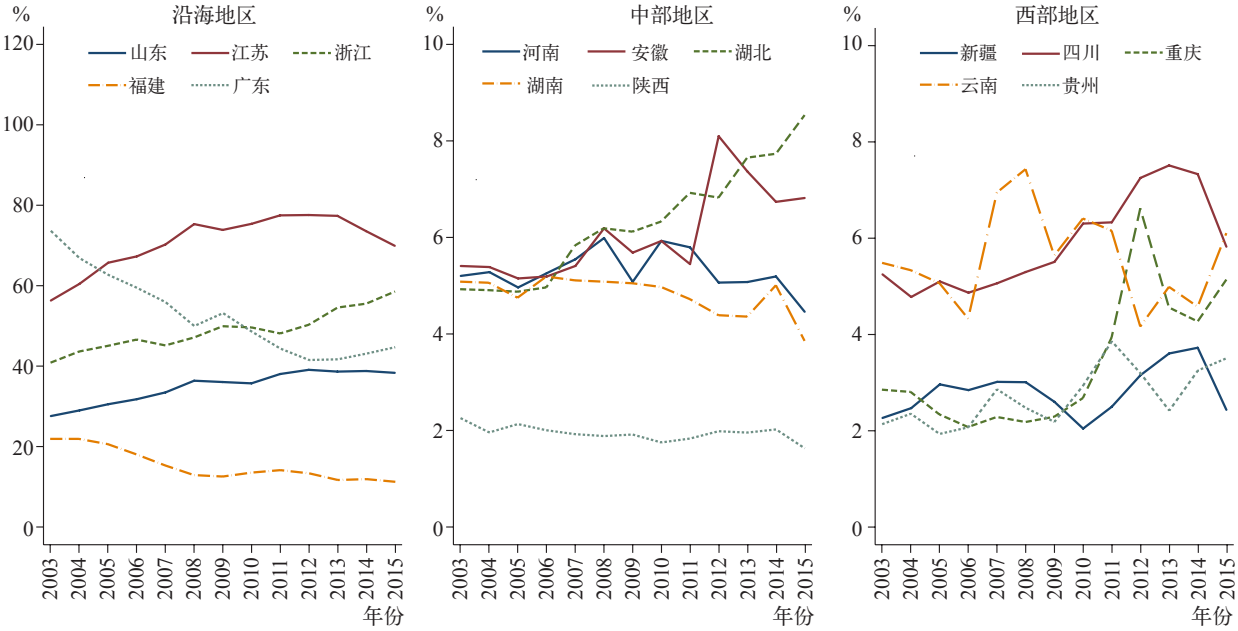

图6 三大地区各省份化学产品产业出口上游度

如图6所示，对于化工产业而言，从东部地区来看，浙江省、江苏省、山东省化学产品产业出口上游度趋势是向上的，广东省、福建省化学产品产业出口上游度趋势是向下的，其中广东省从2003年开始就出现明显的加速下降。从整体上看，东部地区省份化学产品产业出口上游度也呈现出明显的档次差异，江苏省属于第一档次，浙江省、广东省、山东省属于第二档次，福建省属于第三档次。

从中部地区来看，安徽省和湖北省的化学产品产业出口上游度有明显的上升趋势，开始加速上升的时间节点是2006年，而河南省、湖南省、陕西省的变化趋势不明显。2015年时，中部地区的化学产品产业出口上游度也出现了明显的三个档次，安徽省和湖北省属于第一档次，河南省和湖南省属于第二档次，陕西省属于第三档次。

西部地区各省份化学产品产业出口上游度的基本趋势都是向上的，但是呈现出较大的波动幅度。重庆市的化学产品产业出口上游度在2010年后出现了明显的加速增长的情况。2015年时，西部地区的化学产品产业出口上游度出现了明显的两个档次，重庆市、四川省、云南省属于第一档次，贵州省和新疆维吾尔自治区属于第二档次。

如图7所示，对于通信电子设备产业而言，从东部地区来看，广东省通信电子设备产业出口上游度从2003年至2015年出现明显的下降趋势，但是仍在全国范围内占绝对地位。东部地区中其他省份的通信电子设备产业出口上游度变化趋势不算明显，但是整体趋势是先上升后下降。

中部地区各省份通信电子设备产业出口上游度全都出现明显的上升趋势，但是各省份出现加速增长的时间节点不同，湖北省、湖南省、陕西省从2005年开始明显的加速增长，河南省、安徽省从2009年开始有明显的加速增长。中部地区通信电子设备产业出口上游度也呈现出明显的档次，河南省和安徽省是第一档次，湖

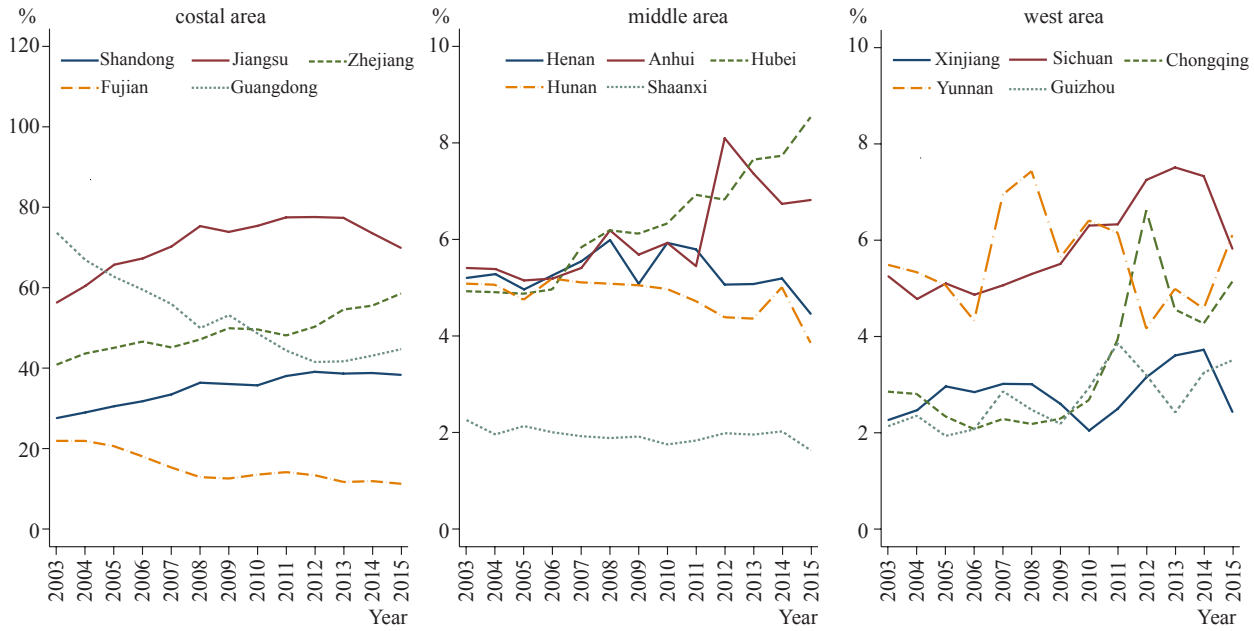

Figure 6: Upstreamness of Chemical Exports from Provincial Jurisdictions across China's Eastern, Central and Western Regions

time points. While Hubei, Hunan and Shaanxi started to experience sharp increases in their upstreamness of communication and electronic equipment exports since 2005, Henan and Anhui provinces recorded accelerated growth in their upstreamness since 2009. Meanwhile, the central region also experienced significant differentiation in the upstreamness of communication and electronic equipment exports with Henan and Anhui provinces at the first tier and Hubei, Hunan and Shaanxi provinces at the second tier.

All provinces in China's western region registered sharp increases in their upstreamness of communication and electronic equipment exports, and the increase was the biggest for Chongqing. Volatility was significant for Sichuan and Xinjiang. Various provinces experienced accelerating growth at different time points. The upstreamness increased apace for Sichuan since 2006, for Chongqing since 2009, and for Guizhou and Yunnan provinces since as late as 2011.

Indeed, the eastern region is at the upstream of the value chain while central and western regions are at the downstream. Though some industries and provinces in China's eastern region started to move further upstream, the trend of such movement was not particularly evident. Meanwhile, the central and western regions did not fall downstream as a result of hosting industries relocated from the eastern region. This finding suggests that industrial relocation to China's central and western regions is conducive to China's value chain upgrade. That is to say, the interregional reallocation of China's domestic flying geese paradigm may serve as a driver of China's industrial upgrade.

The underlying reason is that China's central and western regions showed different characteristics from the eastern region in integrating into GVC. Instead of manufacturing and exporting at the downstream of GVCs and specializing in simple processing and assembly for end consumers, China's central and western regions have actively moved up the GVC ladder while integrating into GVCs.

4. Conclusions and Policy Implications

It is vitally important for China to create a domestic flying geese paradigm, because this will benefit for domestic circulation. This paper presents evidence for the formation of a flying geese paradigm in

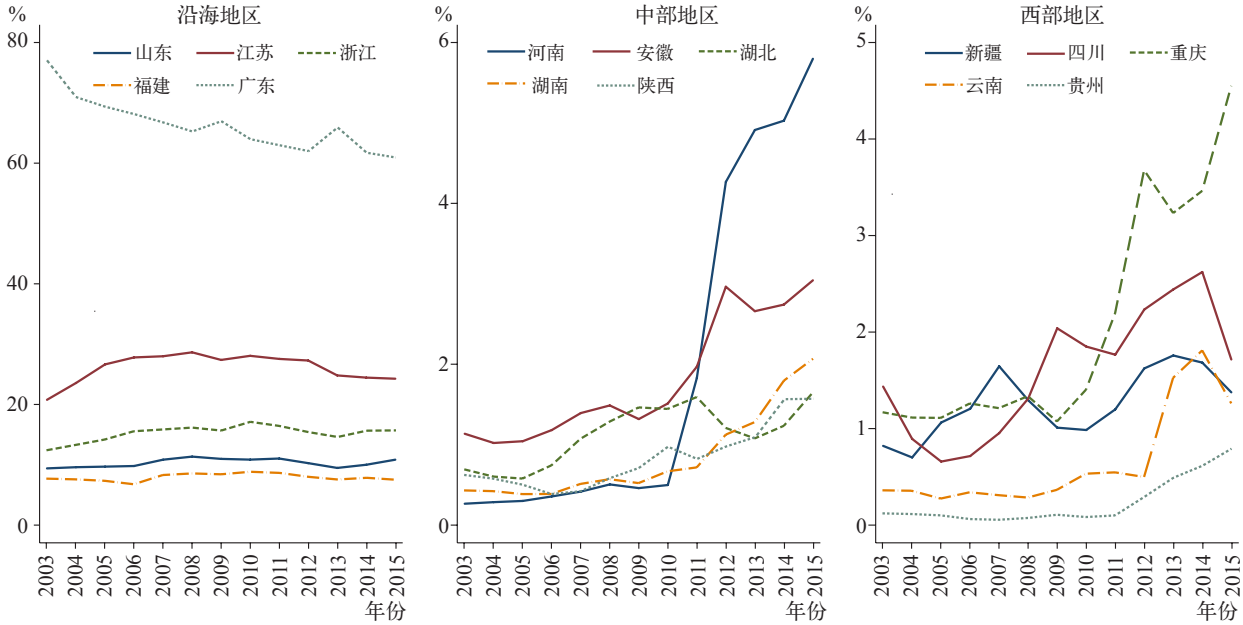

图7 三大地区各省份通信设备、计算机和其他电子设备[6]产业出口上游度

北省、湖南省、陕西省属于第二档次。

西部地区各省份通信电子设备产业出口上游度也全都呈现明显的上升趋势，增长最明显的是重庆市，四川省和新疆维吾尔自治区的波动比较明显。各省份出现加速增长的时间节点也不同，四川省从2006年开始出现加速增长，重庆市从2009年开始加速增长，贵州省和云南省从2011年才开始加速增长。

从产业上游度的分析来看，东部地区确实处于产业链的上游，中西部地区处于产业链的下游。尽管东部地区某些产业某些省份出现了向上游攀升的趋势，但是并没有特别明显的趋势。中西部地区并没有因为承接东部地区产业而降低了自身产业链所处的位置。这表明，中西部地区承接东部地区产业有助于中国整体产业链位置的提升。也就说，大国雁阵模式这一产业链在区域间的重新配置，可以成为中国产业升级的驱动因素。

其背后的原因在于，中西部地区在融入全球价值链分工时，表现出与东部地区初始阶段不同的特征。中西部地区并非简单地在全球价值链的下游进行生产并出口，也并非简单地加工组装，面向终端消费者，而是试图在提升融入全球价值链程度的同时，提升在全球价值链中的位置。

四、结论及启示

在中国致力于构建新发展格局的过程中，推动形成自身的大国雁阵模式至关重要。本文通过劳动密集型产业转移情况、加工贸易转移和转型情况、产业链发展情况等三个方面观察中国大国雁阵模式的发展进程。观察结果表明：

[6] 下文简称为通信电子设备产业。

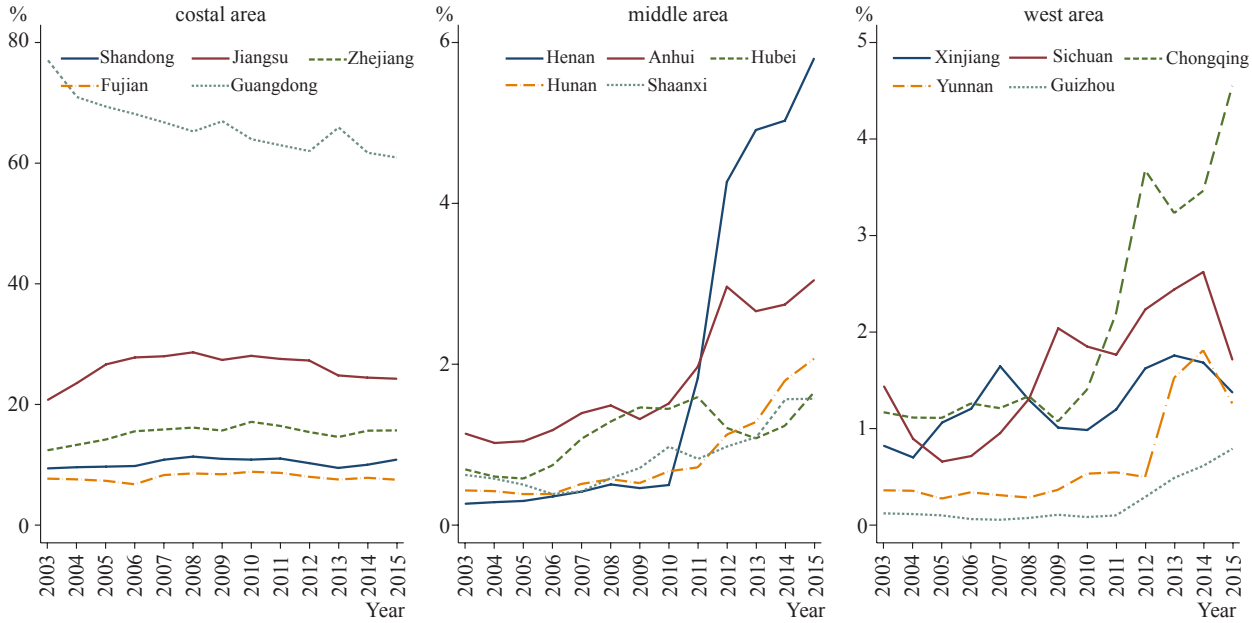

Figure 7: Export Upstreamness of Communication Equipment, Computers and Other Electronic Devices[10] from Provinces in China's Eastern, Central and Western Regions

China from three aspects: the relocation of labor-intensive industries, the relocation and upgrading of processing trade, and the development of value chains. We conclude the following.

First, we find that a flying geese paradigm has indeed taken shape in China. Industrial relocation started to occur for labor-intensive industries in 2007 and for processing trade in 2010. Processing trade continued to increase in China's eastern region where DVAR continued to rise, and the central and western regions followed the path of the eastern region with falling DVAR in processing trade. While the eastern region is at the upstream of value chains, the western region is at the downstream.

Second, China's domestic flying geese paradigm is characterized by provincial heterogeneity. In the eastern region, not all provinces are relocating industries to the central and western regions. Similarly, not all central and western provinces have hosted industries from the eastern region. In the eastern region, Guangdong has relocated the most industries to the central and western regions. Compared with the eastern region, China's western region has received more labor-intensive industries, but the central region did better in hosting processing trade. In terms of value chain positions, China's eastern, central, and western regions are in such an value chain pattern that the eastern region is at the upstream, the central region at the mid-stream, and the western region at the downstream.

Third, China's domestic flying geese paradigm has developed slowly. At the current pace, it would take many years for China's labor-intensive and processing trade to complete the process of relocation. Crucially, this pace cannot meet China's development goals in the coming three decades. Besides, there is a nonlinear trend and even stagnation or reversal of industrial relocation.

Hence, we may say that the flying geese paradigm of China does not evolve naturally and so needs to be driven by the initiative of the Chinese government. In China's market economy, firms are motivated to relocate industries to central and western regions where the cost of labor is lower. However, labor cost is a necessary but not sufficient condition for industrial relocation. Infrastructure, business climate, and productivity are all considerations behind the relocation of firms. The Chinese government should

[10] Referred to collectively as communication and electronic equipment exports in the remainder of this paper.

第一，中国确实形成了大国雁阵模式。劳动密集型产业转移大概发生于2007年，加工贸易转移大概发生于2010年。东部地区加工贸易持续转型升级，其国内增加值率在不断上升；中西部地区沿着东部地区曾经的路径演进，其加工贸易国内增加值率在不断下降。东部地区处于产业链的上游，西部地区处于产业链的下游。

第二，中国的大国雁阵模式具有省份的异质性特征。东部地区不是所有省份都有向中西部地区转移的趋势，中西部地区也不是所有省份都承接了东部地区的产业。在东部地区，广东省向中西部地区的产业转移最突出。西部地区相比中部地区承接了更多的劳动密集型产业，但是中部地区在承接加工贸易方面做得更好。从产业链所处位置来看，东中西部依次呈现出递进的状态，即东部地区上游、中部地区中游、西部地区下游。

第三，中国的大国雁阵模式发展的速度较慢。按照现在的速度，无论是劳动密集型产业转移，还是加工贸易转移，都需要很多年才能完成。这显然无法满足中国未来三十年的发展目标。更令人担忧的是，产业转移并非是线性的，可能会出现停滞甚至是逆转的情况。

上述研究结论的启示如下：

第一，大国雁阵模式并非自然演进的，需要中国政府主动去推动。在市场经济环境下，由于中西部地区的劳动力成本更低，企业确实有动力将产业转移到中西部地区。但是，劳动力成本只是产业转移的必要条件而非充分条件。基础设施、营商环境、劳动生产率等都会成为企业考虑转移的因素。为了推动构建新发展格局，中国政府应该出台相关政策措施加快大国雁阵模式的演进速度。

第二，中国政府在推动大国雁阵模式演进时，应注意到同一地区的省份异质性。东部地区有的省份仍有潜力维持劳动密集型产业、加工贸易的竞争力，并在此基础上进行转型升级。中西部地区有的省份具备了承接低端产业的条件，但是许多省份仍无力承接。因此，中国在布局大国雁阵模式时，应该针对不同省份出台相关针对性的政策。不同省份的政府也应该因地制宜，根据本省的情况推动转型升级或者承接产业。

第三，劳动密集型产业和加工贸易、产业链发展具有不同的特征。劳动密集型产业和加工贸易以及产业链低端并非完全对应。加工贸易有许多是资本密集型、技术密集型产业，技术密集型产业也有产业链的低端环节。现实观察表明，虽然这三类情况的大国雁阵模式呈现出许多共性，但也具有不同的特点。因此，需要更加细致地区分大国雁阵模式，并且定制个性化的政策。

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enact policy measures to speed up the evolution of its domestic flying geese paradigm and create a new development pattern.

Furthermore, in developing a flying geese paradigm, the Chinese government should pay attention to provincial heterogeneity within the same region. Some provinces in the eastern region still have the potential to stay competitive in price in labor-intensive industries and processing trade and to pursue transition and improvement. Not all provinces in China's central and western regions have the conditions for hosting low-end industries. In deploying the flying geese paradigm, China should adopt targeted policies for different provinces. Provincial governments should also upgrade or attract industries according to their local conditions.

Finally, labor-intensive industries, processing trade, and value chain development have different characteristics. Labor-intensive industries and processing trade may not fully correspond to low-end processes of an value chain. While many processing industries are capital- and technology-intensive, technology-intensive industries also have low-end processes. Data suggest that despite commonalities in the flying geese paradigm between labor-, capital-, and technology-intensive industries, differences also exist.

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