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Business Environment and Resource Allocation Based on the Perspective of the National Value Chain*

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Abstract China is actively upgrading its industrial structure through industries transferring between developed and undeveloped areas; however, the overall level of the national value chain is still not high, and the asymmetric competition pattern between the upstream and the downstream has not been broken. Therefore, this paper establishes a competitive equilibrium model for the production of manufacturing enterprises, with factor price distortion, under the condition of constant returns to scale. The authors derive the relative distortion coefficients of each factor price, calculate the misallocation indices of capital and labor, and construct an industry resource misallocation measure. Furthermore, this paper applies the regional value-added decomposition model to calculate the national value chain index and matches the market index of the China Market Index Database with the Chinese Industrial Enterprises Database and the Inter-Regional Input-Output Tables through quantitative analysis. From the perspective of the national value chain, the authors study the improvement effect and mechanism of the business environment on the resource allocation in industry. The study shows that industry resource allocation will be improved by 17.89% if the business environment level is improved by one standard deviation. This effect is most prevalent in the eastern and central regions, not so much in the west; the effect of downstream industries in the national value chain is higher than that of upstream industries; the improvement effect on capital allocation is higher in downstream industries than in the upstream industries; and the improvement effect on labor misallocation is basically the same in both the upstream and the downstream. Compared with labor intensive industries, capital intensive industries are more influenced by the national value chain, while the effect of upstream industries is weaker. At the same time, it is well documented that participation in the global value chain can improve the efficiency of regional resource allocation, and the construction of high-tech zones can improve resource allocation for both upstream and downstream industries. Based on the results of study, the authors propose suggestions for optimizing business environments, suiting the national value chain construction, and improving resource allocation in the future.

Keywords Business environment, national value chain, resource misallocation.

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1 Introduction

Since the reform and opening of the Chinese markets, with Chinese characteristics, China has actively integrated itself within the global value chain (GVC). By taking advantage of the abundance of available cheap labor, China has gradually transformed into a global manufacturing base with low-end embedding, making great progress in all domains and creating a miracle of national economic growth.

We have seen that, with the rapid development of national industries, foreign trade has become an important part of the national economy, in which China's foreign trade dependence ratio has increased from 9.7% in 1978 to 39.2% in 2000, and from 38.1% in 2001 to a peak value of 64.2% in 2006. China's trade surplus has also increased, reaching 7.5% of GDP in 2007. In short, the process of joining the global value chain and opening up the Chinese economy to the outside world is also part of deepening China's internal reforms, promoting the upgrading of the national value chain, and improving resource allocation efficiency.

For large economies, expanding openness and integration into the global value chain is always accompanied by the national value chain. An export-oriented development strategy emphasizes the expansion of overseas markets through exports, which may mean excluding and substituting products from other countries, thus negatively affecting the interests of those countries, and leading to increased competition and conflicts in the international markets. Therefore, the implementation of an export-oriented strategy requires a relatively free international trade environment, and when international trade frictions intensify, and trade protectionism rises, the implementation of the outward-oriented development strategy will be seriously affected. For example, China-U.S. trade frictions intensified in March 2018, when the United States signed a memorandum imposing tariffs on a total of $60 billion worth of Chinese imports. Over the past four years, China and the United States have conducted numerous negotiations and consultations, even reaching a consensus on reconciliation at one point, but the unilateral destruction of negotiations by the U.S. has sown hidden dangers for the future of China-U.S. trade relations, and China's external trade environment is now undergoing profound changes.

In addition, the new coronavirus pandemic, beginning in 2020, continues to run rampant across the globe, leading to a two-way squeeze on foreign trade enterprises from both the supply and demand sides. On the one hand, demand in the international market has dropped sharply, and foreign trade enterprises are receiving significantly fewer export orders; on the other hand, the global supply chain has been damaged, and there are now significant difficulties in supplying raw materials and obtaining spare parts. As a result, we can now expect that, for a considerable period into the future, China's foreign trade situation will be under ongoing pressure, leading to pressures on trade and development. China initially created a large, open economy, based on the domestic economic cycle, in which the international and domestic economic cycles promoted each other. Against this background, China advocates multilateralism and insists on developing global trade and investment, while at the same time further expanding the domestic market and making full use of its regional advantages to make up for its shortcomings, thereby accelerating the construction of the national value chain (NVC), which relies on domestic demand and

provides sustained momentum for the domestic economic cycle.

As globalization advances, cross-border factor flows of capital and labor, trade in goods and services, and cross-border business activities, are growing. The World Bank launched the "Doing Business" project in 2003 and, since then, has published annual Doing Business reports to assess the business regulatory environment faced by companies in an economy over its life cycle. These reports show a high correlation between the wellbeing of the business environment and the growth of an economy. In recent years, after accelerating the implementation of initiatives to optimize the business environment, China has achieved remarkable results, in part seen by Chinas rising business environment ranking: In 2017, China ranked 78th out of 190 economies; in 2018, China entered the top 50 for the first time; and in 2019, China rose to 31st place. Given China's ongoing practice of market-oriented reforms to promote the improvement in resource allocation and upgrades in the industry chain, it is both important and necessary to conduct quantitative research which assesses the impact of business environment reforms on resource allocation and the upgrading of the value chain.

This paper uses the 2010 and 2012 market index of each province nationwide from the China Market Index Database as proxy variables for the business environment. At the same time, the Chinese Industrial Enterprises Database for the same time period is used to measure the degree of resource misallocation in each industry, across all national provinces, by calculating the industry factor distortion index. The data from China's inter-regional input-output table for the same time period are used to measure indicators related to the national value chain. Finally, the business environment data for each province in 2010 and 2012 are correlated with the industry resource misallocation data and matched with the NVC related indicators. Furthermore, this paper incorporates the NVC into our research of the business environment on resource allocation.

The purpose of this paper is to answer the following research questions:

1) Can the optimization of the business environment have an impact on industry resource allocation and enterprise operations?

2) If there is an impact, how much does the optimization of the business environment contribute to alleviating resource misallocation?

3) Considering the division of labor in the national value chain, is there consistency in the effect of the business environment on resource allocation for industries at various positions within the national value chain?

4) What is the mechanism of the impact of the business environment on resource allocation between the upstream and downstream industries, based on the perspective of the national value chain, for different regions, different industries, and diverse types of misallocations?

5) How will initiatives, such as constructing high-tech zones and joining the international economic cycle, affect the resource allocation throughout the national value chain and across industries?

To the best of our knowledge, the domestic and international literature on the business environment tends to focus on the national or provincial level, using industry data to measure and assess changes in resource misallocation. Compared to the existing studies, the marginal

contribution of this paper is threefold. First, this paper provides a new perspective to assess the effect of the business environment by matching the Chinese Industrial Enterprises Database and measuring the misallocation index of each industry in the provinces using micro-level data. Second, this paper selects two sets of business environment measures to conduct robustness tests; one is the business environment indicators from the previous period, and the other is the history of opening up ports for business. These two datasets are then used as instrumental variables to overcome possible endogeneity and omission of variables in the analysis. Third, we incorporate the national value chain into the research of business environment on resource allocation, then further study the effect of the business environment on the upstream and downstream industries.

China needs to address the vulnerabilities of the export-oriented economic development model that have arisen due to the sudden change of external conditions, namely the trade friction between China and the United States, and the recurrence of the coronavirus pandemic, and pay more attention to promoting both the domestic general circulation and dual circulation. It is therefore of strong practical significance to study the relationship between the business environment and resource allocation from the perspective of the national value chain.

The remainder of the paper is structured as follows. Section 2 is a review of relevant literature. Section 3 is the calculation of indicator measures. Section 4 is the characterization of the facts, and the model setting. Section 5 is the empirical analysis and robustness testing. Section 6 is the discussion of heterogeneity and further analysis for international economic circulation, high-tech zone establishment, and consideration of the Western region of China. Section 7 is a brief conclusion, with some suggestions on setting up the business environment and resource allocations in the future, based on our results.

2 Literature Review

2.1 Definition of the Business Environment and Its Impact

The business environment can be seen as the sum of the institutional background and market conditions in which economic agents engage in economic activities. However, it is customary in neoclassical growth theory to take institutions as a given, thus ignoring their role in economic growth. This concept was not considered until economic historians systematically discussed the relationship between institutions and economic growth, and pointed out that institutions are a key factor in economic growth[1]. Since then, institutions and the business environment have been inextricably linked in the literature, and taken on a broader connotation, as the definition of institutions varies from time to time, from school to school, and even by different researchers within the same school of thought, based on different starting points or research objectives.

With regard to the macro level of national governance, Easterly and Levine[2] constructed the Global Institutional Quality Index. For the micro business level, in addition to the Doing Business reports released by the World Bank, the World Economic Forum (WEF), headquartered in Geneva, have released the annual Global Competitiveness Report every year since 1979, which is also a reflection of the institutional environment of each country. Regarding the busi-

ness environment in China's provinces and cities, the China Market Index Database, published every year since 2000, provides multi-year evaluations; in addition, the Business Environment Index for Chinas Provinces has provided a comprehensive tracking analysis and evaluation comparison of the business environment since 2006.

In addition to focusing on the construction of business environment indicators, some studies have been focusing on the economic performance resulting from optimizing the business environment, and the impact on factor allocation and mobility. Dong, et al.[3], Shi and Liang[4], and Nguimkeu[5] confirmed that a good business environment significantly contributes to urban economic development, import expansion and gross margin growth, respectively. The factor flow perspective can be broadly divided into three categories.

1) The impact of the business environment on industrial relocation. Zhang, et al.[6] argued that the optimization of the business environment can drive labor-intensive enterprises to move to lower-cost regions, or to locations in closer proximity to industrial terminals.

2) The impact of the business environment on capital allocation. Jiang, et al.[7] and Zhou, et al.[8] confirmed that enhancing the business environment of host countries has a positive impact on promoting Chinese outbound foreign direct investment (FDI).

3) The impact of the business environment on labor allocation. Gabriel and Stuart[9], Wei and Dong[10] found that improving the business environment reduces wage distortions, suppresses wage deviation, and improves the urban labor force.

2.2 Analysis of Factors Affecting Resource Allocation

Resource allocation is related to the efficiency of market operations[11,12,13] and there are several threads to follow when considering the causes of resource misallocation. One such thread is to study the impact of company-specific reform measures on resource misallocation. For example, Jin, et al.[14], Han and Zheng[15] argued that market entry barriers and market prices regulated by government can lead to misallocations of capital and labor. A second is to study the impact on resource allocation of export and foreign opening policies. Some articles adopt the heterogeneous firm trade framework, as developed by Melitz[16] and explore the impact of export trade on resource misallocation at the micro-firm level. For example, Wang, et al.[17] found that reducing the export tax rebate rate enables exporting firms to increase productivity, as well as allocate resources efficiently. A third thread to explore is the impact of industrial structures on resource misallocation. Based on Krugman[18]'s imperfect competition and industry perspective, some researchers have pointed out that features such as industrial agglomeration have an impact on resource misallocation. For example, Ji, et al.[19] found that industrial agglomeration can improve resource allocation when capital is over-allocated and labor is under-allocated, but it can exacerbate resource misallocation when capital is under-allocated, and labor is over-allocated. The final thread is to study the impact of macro policies and government services on resource misallocation. Adamopoulos, et al.[20] used the ratio of Total Factor Productivity (TFP) and actual TFP under maximization conditions to measure the degree of misallocation, and finds that land is severely under-allocated among Chinese farmers, and the equal land access brings greater misallocation to farmers with higher productivity levels.

2.3 Analysis of the National Value Chain

The concept of the national value chain (NVC) originates from the concept of the global value chain (GVC). In recent years, the research around the national value chain has attracted a lot of attention. Since there is a correlation between the national value chain and the global value chain, Zhang and Liu[21], Chai and Yang[22] found that the advanced level of a national value chain will significantly improve the level of the global value chain, realizing the positive interactions between the global value chain and the national value chain, and completing the industrial upgrading and the coordinated regional development. In addition, many studies have also focused on the impact of the national value chain on regional economic growth, economic integration, interregional trade, and heterogeneous business competition. Li[23, 24] for example, argued that the NVC position, NVC participation, and NVC returns in coastal regions are lower than those of inland regions, which are subject to a low-level integration of domestic resources only, for achieving large-scale production. Shao, et al.[25] developed a detailed study on the impact of NVC on regional economic cycle correlation and find that NVC trade deepens the inter-regional economic cycle correlation in China; after NVC trade is under control, inter-regional trade reduces the level of inter-regional output correlation. Other researchers have examined the factors that have an impact on value chains, especially institutional factors. Using Inter-Regional Input-Output Tables for 30 Chinese provinces for 2002, 2007 and 2010, Su, et al.[26] investigated the spillover effects of economic growth under a dual-dimensional region-industry NVC division of labor network and found that, as the market index increases, the NVC spillover mechanism also increases, which amplifies the economic growth through the NVC division of labor network and, consequently, the spillover effect of economic growth through the NVC division of labor network is amplified.

Studies show that the business environment of a country or region will have an impact on the performance of an enterprise or industry, that it will have an impact on the flow of factor resources in a region or industry, and that resource misallocation may be affected by various policies. Finally, the improvement in the level of the national value chain will directly benefit economic performance. Modern China has taken a large number of measures to create a healthy business environment, and the state has accelerated the transfer of industries from the Eastern region to the Central and Western regions to enhance the level of the national value chain, but the gap between regions in terms of resource allocation efficiency and economic development is still too big, and it is therefore necessary to explore the mechanisms by which the national value chain can provide sustainable impetus for economic growth.

However, there are no studies that match the provincial business environment index with the corresponding micro-enterprise data for multiple years to measure the degree of resource misallocation for industries in each Chinese province. Meanwhile relevant studies confirm that the Chinas current industry behaves in two kinds of states: One where the monopoly is in the upstream, and the other where the competition is in the downstream. It is necessary to conduct research into the relationship between the business environment and industry resource allocation from the perspective of the national value chain. Therefore, this paper uses data from the

Chinese Industrial Enterprises Database to measure the degree of resource misallocation in each industry at the provincial level by calculating the factor distorted factor index. Furthermore, this paper uses data from the Inter-Regional Input-Output Tables to measure the national value chain positioning index in each industry at the provincial level, matching the resource misallocation measure with the national value chain positioning index, and then correlating it with the business environment index. It also reveals how to interact with national and international economic cycles, and how the regional factors that are closely related to the business environment differ in the allocation of resources to industries at various locations in the national value chain.

3 Methodology

3.1 The National Value Chain: Concepts and Measurement

The model of the national value chain is derived from the global value chain, and the research object shifts from different countries in the global value chain to regions in the national value chain. Referring to the value-added structure of gross exports and global production network developed by Koopman, et al.[27] and the regional value-added decomposition model by Li[23], the value-added decomposition framework of the national value chain outflow is constructed with regions as an example. Considering the general case of n regions, A is the direct consumption coefficient matrix, Leontief inverse matrix $B = (I - A)^{-1}$, and the expression is as follows:

$$B = \begin{bmatrix} B_{11} & B_{12} & \cdots & B_{1n} \\ B_{21} & B_{22} & \cdots & B_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ B_{n1} & B_{n2} & \cdots & B_{nn} \end{bmatrix} = \begin{bmatrix} I - A_{11} & -A_{12} & \cdots & -A_{1n} \\ -A_{21} & I - A_{22} & \cdots & -A_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ -A_{n1} & -A_{n2} & \cdots & I - A_{nn} \end{bmatrix}^{-1} = (I - A)^{-1}. \quad (1)$$

The Inter-Regional Input-Output Table adapting inter-regional trade data is constructed carefully. The table and data are classified by sector and region with respect to the inflow and outflow of goods and services, in addition to the use of them between the intermediate and the end use, and the table satisfies the following basic constant equation:

$$\begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_n \end{bmatrix} = \begin{bmatrix} B_{11} & B_{12} & \cdots & B_{1n} \\ B_{21} & B_{22} & \cdots & B_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ B_{n1} & B_{n2} & \cdots & B_{nn} \end{bmatrix} \begin{bmatrix} \sum_{r=1}^{n} Y_{1r} + O_1 + E_1 \\ \sum_{r=1}^{n} Y_{2r} + O_2 + E_2 \\ \vdots \\ \sum_{r=1}^{n} Y_{nr} + O_n + E_n \end{bmatrix}, \quad (2)$$

where X is the output matrix, Y is the final demand matrix, O is the other terms and E is the export matrix.

Let V be the rate of value added of output in each region and H be the total outflow matrix,

denoted respectively as:

$$V = \begin{bmatrix} V_1 & 0 & \cdots & 0 \\ 0 & V_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & V_n \end{bmatrix}, \tag{3}$$

$$H = \begin{bmatrix} H_1 & 0 & \cdots & 0 \\ 0 & H_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & H_n \end{bmatrix}. \tag{4}$$

The decomposition of gross value-added outflows by region in the national value chain can be expressed as:

$$\begin{aligned} VBH &= \begin{bmatrix} V_1 & 0 & \cdots & 0 \\ 0 & V_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & V_n \end{bmatrix} \begin{bmatrix} B_{11} & B_{12} & \cdots & B_{1n} \\ B_{21} & B_{22} & \cdots & B_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ B_{n1} & B_{n2} & \cdots & B_{nn} \end{bmatrix} \begin{bmatrix} H_1 & 0 & \cdots & 0 \\ 0 & H_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & H_n \end{bmatrix} \\ &= \begin{bmatrix} V_1B_{11}H_1 & V_1B_{12}H_2 & \cdots & V_1B_{1n}H_n \\ V_2B_{21}H_1 & V_2B_{22}H_2 & \cdots & V_2B_{2n}H_n \\ \vdots & \vdots & \ddots & \vdots \\ V_nB_{n1}H_1 & V_nB_{n2}H_2 & \cdots & V_nB_{nn}H_n \end{bmatrix}, \end{aligned} \tag{5}$$

where each element in VBH has a specific meaning, $V_sB_{sr}H_r$ represents the value added of outflows in region r originating in region s. In addition, based on the backward and forward correlation of product inflows and outflows, observed from the perspective of both production and use, respectively, the horizontal summation in the table indicates the total flow of the regional outflows and the vertical summation indicates the source of total regional inflows[28]. To further refine the decomposition, we make a division by the destination of outflows, $H_r = [\ H_{r1} \quad H_{r2} \quad \cdots \quad H_{rn}\ ]$.

Referring to the method of Li[23] the regions participate in the national value chain to generate value added into the domestic cycle. Taking Region 1 as an example, the product outflow is mainly manifested in three scenarios: First, it is directly consumed by the inflowing location, generating direct value-added outflow, and the direct value-added outflow of Region 1 is $dv = \sum_{r \neq 1} V_1B_{11}H_{1r}$. Second, the intermediate goods flow out again to a third region at the inflow place and the value added, in this case, is through the reprocessing outflow at the inflow place, resulting in the indirect value-added outflow, and the indirect value-added outflow

of Region 1 is $iv = \sum_{r\neq 1}\sum_{m\neq 1} V_1 B_{1r} H_{rm}$. Third, the intermediate goods are processed in the inflow area and then returned to the initial area; in this case, the initial area generates value-added returns home, and the value-added returns of Region 1 is $vr = \sum_{r\neq 1} V_1 B_{1r} H_{r1}$. It is worth noting that the Region 1 outflow product contains the added value of Region r, $V_r B_{r1} H_1$. Therefore, the outflow of the region requires consideration of the added values of all other regions (foreign value-added), and the Region 1 outflow product contains the added values of other regions as $fv = \sum_{r\neq 1}\sum_{m\neq 1} V_r B_{r1} H_{1m}$.

By means of the above specific division of regional value added, the NPO (NVC Position), a statistical indicator of the national value chain position, is constructed to measure the degree and manner of embedding of each sector in the domestic value chain, expressed as follows:

$$NPO_{si} = \ln\left(1 + \frac{iv_{si}}{H_{si}}\right) - \ln\left(1 + \frac{fv_{si}}{H_{si}}\right). \tag{6}$$

iv_{si}, fv_{si} and H_{si} denote the value added of indirect outflows realized by Sector i of Region s in the national value chain, value added in other regions and total outflows to other regions, respectively. Where, $IV_{si} := \ln(1 + \frac{iv_{si}}{H_{si}})$ denotes the forward linkage, and the larger the value is, the more the sector provides intermediate goods to other regions; $FV_{si} := \ln(1 + \frac{fv_{si}}{H_{si}})$ denotes the backward linkage, and the larger the value is, the more the sector is dependent on intermediate goods provided by other regions. Overall, the larger the value of NPO is, the more the sector is upstream of the national value chain, while the smaller the value of NPO is, the closer the sector is to the downstream of the national value chain.

3.2 Status of the National Value Chain

Using the formula (6) to calculate the national value chain position index of the manufacturing sector, the national value chain positioning of each industry slightly increased between 2010 to 2012. That is, the average value chain positioning index of each industry rose from 0.51 to 0.57, but there were significant differences in the national value chain position for the same sector in different provinces.

The most prominent increase in industry national value chain positioning within the two-year period was in the leather, fur, and feather manufacturing industry: From 0.36 to 0.88, an increase of 144.44%. The greatest decline in industrys national value chain positioning within the two-year period was the transportation equipment manufacturing industry: From 0.77 to 0.22, a decrease of 71.43%. According to the eight regions in China (as shown in Figure 1), the processing industry on the eastern and southern coasts, and in the Beijing-Tianjin region, has a higher share and lower NPO value than other regions; the national value chain position for the northern coast has increased the most, from 0.50 in 2010 to 0.88 in 2012. According to the position of the national value chain, upstream industries are resource and energy supply, R&D, branding and marketing, while the downstream industries are processing and assembly. Industries located upstream of the national value chain have higher value-added products. The change in NPO indicators indicates that China has actively adjusted its industrial layout to encourage industries to move upstream in the national value chain. Exhibits 2 and 3 show the NPO of the industry for each province in 2010 and 2012.

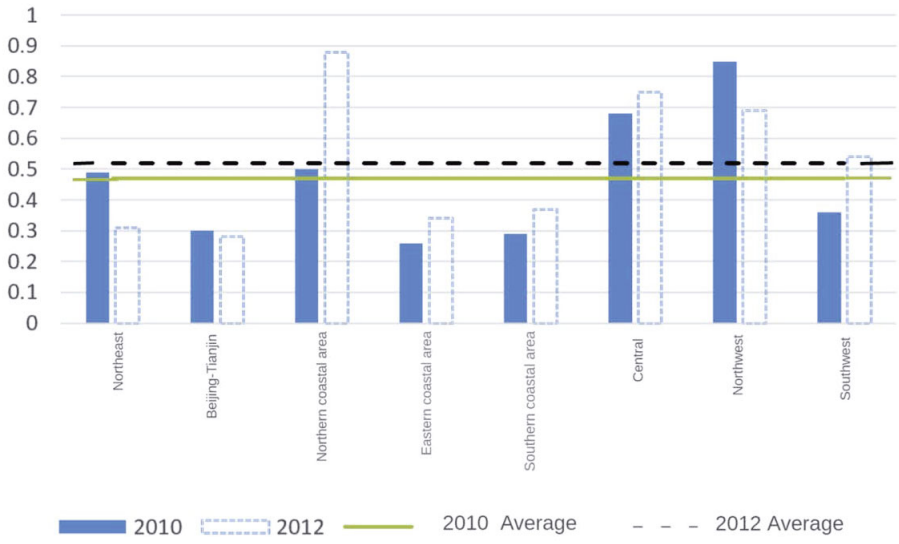

Figure 1 National value chain position of eight regions in China

3.3 Resource Misallocation Index

To measure the efficiency of resource allocation, we construct resource misallocation using the implicit resource misallocation framework created by Hsieh and Klenow[11]. This is used to study factor misallocation among regional industries, with reference to Ji, et al.[19] who illuminated the idea of setting the same product function for the same industry and different product functions for different industries. Firms produce by investing in the two factors of production, namely capital and labor, where firms are price takers in the factor market. We establish a competitive equilibrium model of manufacturing enterprise production with factor price distortion under the condition of constant returns to scale and derive the relative distortion coefficients of each factor price, calculating the misallocation indices of capital and labor, then quantitatively analyze the degree and mechanism of the business environment to influence factor resource allocation.

1) Basic assumptions

Construct a Cobb-Douglas product function for firms in regional industry:

$$Y_i = TFP_i K_i^{\beta_{K_i}} L_i^{\beta_{L_i}} = TFP_i K_i^{\beta_{K_i}} L_i^{1-\beta_{K_i}}. \tag{7}$$

Y_i represents output for industry i, TFP_i is the total factor productivity of industry, K_i, L_i denote the capital and labor inputs of the industry, respectively. β_{K_i}, β_{L_i} are the output elasticities of the capital and labor factors respectively, assuming that this product function is under the condition of constant returns to scale, i.e., it satisfies $\beta_{K_i} + \beta_{L_i} = 1$. To maximize the profit of the firm, the equation can be expressed as:

$$\max_{K_i, L_i} \left\{ p_i Y_i - (1 + \tau_{K_i}) p_K K_i - (1 + \tau_{L_i}) p_L L_i \right\}, \tag{8}$$

p_i, p_K and p_L are the product price for industry i, the prices of the two basic factors of capital and labor, respectively. Assuming that there is no distortion in the product market price, τ_{K_i}, τ_{L_i} denote the degree of distortion in the capital factor price and the labor factor price. The first-order condition for the optimal solution of the above problem is:

$$\beta_{K_i} p_i TFP_i \cdot K_i^{\beta_{K_i}-1} L_i^{\beta_{Li}} = (1+\tau_{K_i})\, p_K, \tag{9}$$

$$\beta_{L_i} p_i TFP_i \cdot K_i^{\beta_{K_i}} L_i^{\beta_{L_i}-1} = (1+\tau_{L_i})\, p_L. \tag{10}$$

2) Aggregate product function

The gross regional product is the sum of the output of each industry and the aggregate product function is:

$$Y = \sum_{i=1}^{N} p_i Y_i. \tag{11}$$

Y is the total production, as a social final product, valued at 1. $\partial Y/\partial Y_i = p_i$ indicates that the aggregate product function satisfies constant returns to scale.

3) Resource constraints

Assuming that both regional capital and labor factors are exogenously given, there are the following constraints:

$$\sum_{i=1}^{N} K_i = K, \quad \sum_{i=1}^{N} L_i = L. \tag{12}$$

4) Competitive equilibrium

By setting the conditions above, we can establish the competitive equilibrium with factor price distortions as follows: Assuming that there are N industries in the region and the total factor productivity TFP_i, capital factor price distortion τ_{K_i}, labor factor price distortion τ_{L_i}, regional capital factor K and labor factor L are given for each industry, this competitive equilibrium $\{K_i, L_i; p_i, p_K, p_L; Y\}$ satisfies as follows:

a) Optimization of the first-order condition for N industries in the region, i.e., (9) and (10).

b) Aggregate product function satisfies constant returns to scale, i.e., (11).

c) Constraints on the product factor resources, i.e., (12).

It can be derived that K_i and L_i in competitive equilibrium conditions are:

$$K_i = \frac{\frac{p_i \beta_{K_i} Y_i}{(1+\tau_K) p_K}}{\sum_{j=1}^{N} \frac{p_j \beta_{Kj} Y_j}{(1+\tau_{K_j}) p_K}} K \quad \text{and} \quad L_i = \frac{\frac{p_i \beta_{L_i} Y_i}{(1+\tau_{L_i}) p_L}}{\sum_{j=1}^{N} \frac{p_j \beta_{L_j} Y_j}{(1+\tau_{Lj}) p_L}} L. \tag{13}$$

5) Resource distortion index and resource misallocation index

The absolute capital distortion index and the absolute labor distortion index for industry i are defined as:

$$\gamma_{K_i} = \frac{1}{1+\tau_{K_i}} \quad \text{and} \quad \gamma_{L_i} = \frac{1}{1+\tau_{L_i}}. \tag{14}$$

In competitive equilibrium, note that the share of industry i in the regional output is: $S_i = \frac{p_i Y_i}{Y}$. The capital and labor factor elasticities can be expressed in output-weighted terms as:

$$\beta_K = \sum_{i=1}^{N} s_i \beta_{K_i} \quad \text{and} \quad \beta_L = \sum_{i=1}^{N} s_i \beta_{L_i}. \tag{15}$$

Combining the equations (13) and (15) can be rewritten as:

$$K_i = \frac{s_i \beta_{K_i}}{\beta_K} \frac{\gamma_{K_i}}{\sum_{j=1}^{N} \left(\frac{s_j \beta_{K_j}}{\beta_K} \right) \gamma_{K_j}} K \quad \text{and} \quad L_i = \frac{s_i \beta_{L_i}}{\beta_L} \frac{\gamma_{L_i}}{\sum_{j=1}^{N} \left(\frac{s_j \beta_{L_j}}{\beta_L} \right) \gamma_{L_j}} L. \tag{16}$$

The relative capital distortion index and the relative labor distortion index for industry i are defined as:

$$\widehat{\gamma}_{K_i} = \frac{\gamma_{K_i}}{\sum_{j=1}^{N} \left(\frac{s_j \beta_{K_j}}{\beta_K} \right) \gamma_{K_j}} \quad \text{and} \quad \widehat{\gamma}_{L_i} = \frac{\gamma_{L_i}}{\sum_{j=1}^{N} \left(\frac{s_j \beta_{L_j}}{\beta_L} \right) \gamma_{L_j}}. \tag{17}$$

Substitute $\widehat{\gamma}_{K_i}$ and $\widehat{\gamma}_{L_i}$ into the equation (16), we obtain:

$$\widehat{\gamma}_{K_i} = \left(\frac{K_i}{K} \right) \Big/ \left(\frac{s_i \beta_{K_i}}{\beta_K} \right) \quad \text{and} \quad \widehat{\gamma}_{L_i} = \left(\frac{L_i}{L} \right) \Big/ \left(\frac{s_i \beta_{L_i}}{\beta_L} \right). \tag{18}$$

It is worth noting that there is a significant difference between the absolute and relative distortion coefficients. Taking capital as an example, we can find that: Absolute distortion reflects the absolute value level of the degree of resource, when there is no distortion in the capital price of industry i, $\tau_{K_i} = 0$, $\gamma_{K_i} = 1$; when the capital price of industry i is below the normal level, $\tau_{K_i} < 0$, $\gamma_{K_i} > 1$; when the capital price of industry i is higher than the normal level, $\tau_{K_i} > 0$, $\gamma_{K_i} < 1$. However, the relative distortion is compared to the average level of all industries in the region and reflects the relative level of the degree of resource use. When $\widehat{\gamma}_{K_i} > 1$, it means that the capital price of industry i is lower than the industry-wide average; when $\widehat{\gamma}_{K_i} < 1$, it means that the capital price of industry i is higher than the industry-wide average.

We can define the capital misallocation index and the labor misallocation index, respectively, as follows:

$$\widehat{\tau}_K = \frac{1}{\widehat{\gamma}_K} - 1 \quad \text{and} \quad \widehat{\tau}_L = \frac{1}{\widehat{\gamma}_L} - 1. \tag{19}$$

This paper focuses on the impact of optimizing the business environment on the basis of resource allocation, which requires a comprehensive analysis of capital misallocation and labor misallocation. If we simply sum up the capital misallocation index and labor misallocation index, we see that it obviously does not meet requirements. The capital misallocation index and labor misallocation index both have positive and negative values, and their economic meanings are completely different, but we can measure the deviation from the average by taking the absolute values of the indices and then summing the absolute values of the two misallocation indices to indicate the degree of resource misallocation in the industry, i.e.,

$$\tau = \left| \widehat{\tau}_K \right| + \left| \widehat{\tau}_L \right|. \tag{20}$$

4 Empirical Model and Stylized Facts

4.1 Analytical Framework and Data Description

To test the impact of the business environment on resource allocation from the perspective of the national value chain, the regression equation used in this paper is set as:

$$\begin{aligned}\tau_{ist} = {} & \alpha_0 + \alpha_1 ENV_{st} + \alpha_2 ENV_{st} \times NVC_{ist} + \alpha_3 \ln EX_{ist} + \alpha_4 \ln HHI_{ist} \\ & + \alpha_5 \ln YR_{ist} + \alpha_6 \ln SAL_{ist} + \alpha_7 \ln GDP_{st} + \alpha_8 \ln UE_{st} + \varepsilon_{ist}, \end{aligned} \tag{21}$$

i,s and t denote the observed industry, the province where the industry is located, and the time, respectively. τ_{ist} indicates resource misallocation, ENV_{st} is the business environment, NVC_{ist} represents the national value chain, HHI_{ist} is the Herfindahl index. EX_{ist}, YR_{ist} and SAL_{ist} represent exports, length of time and sales respectively. GDP_{st} and UE_{st} indicate the GDP and urban registered unemployment rate.

The explanatory variable τ_{ist} denotes the degree of resource misallocation. Using matched data from the Chinese Industrial Enterprises Database, the Chinese database covers the period from 1998 to 2013, including basic information and financial statements of state-owned industrial enterprises and non-state-owned industrial enterprises that are above a certain scale, the LP method is used to first measure the output elasticity of capital and labor, and then we apply the equations (17) to (20) to calculate the resource misallocation index. Unlike previous studies, which commonly employ total factor productivity distribution of enterprises in specific industries[30,31] to portray their degree of misallocation, this paper considers the price distortion in factor markets, and uses factor price distortion to establish the absolute factor distortion index, then further estimates the relative distortion index of factors through the absolute factor distortion index, and finally, uses the relative factor distortion index to construct the resource misallocation measure. Industries are defined according to the National Economic Classification and Codes (GB/T4754-2011) standard and 30 two-digit manufacturing industries are selected.

Regarding the measurement of capital output elasticity and labor output elasticity, the methods that can be used are ordinary least squares, fixed effects estimation, OP estimation, the stochastic frontier method, and LP estimation. The ordinary least squares and fixed effect estimation methods suffer from both association bias and sample selection bias, and the stochastic frontier method relies heavily on the assumption of total factor productivity; the OP estimation method and the LP estimation method can overcome all of these problems. However, the OP estimation method uses investment as a proxy variable for unobservable technology shocks, and the investment variable is missing from the provincial and municipal statistics. In order to effectively circumvent this problem, this paper adopts the LP estimation method to measure factor output elasticity.

The core explanatory variable ENV_{st} is the business environment indicator of the province where the industry is located. The concept of business environment originated from the World Bank's Doing Business report; however, there is no authoritative data involving multi-year measures for the business environment in each of the provinces within China. The World Bank's Doing Business reports focuses on national (regional) levels of business rather than domestic,

provincial, and municipal levels of business environment, and most of the indicators cover only individual cases of the largest business cities in each economy. The collection of data is extended to the second largest business city only for the 11 economies with populations over 100 million. The World Bank published a Doing Business report on 30 cities in China only in 2008, however, the data from a single year is not enough to reflect the dynamic changes in the business environment. We select the market index from the China Market Index Database to evaluate the business environment in any given province. The market index is synthesized by the weighting of five indicators, which is a dynamic portrayal of the level of the business environment in each province, namely the relationship between the government and the market, the development of the non-state economy, the development of product markets, the development of factor markets, the development of market intermediary organizations and the legal environment. There are also secondary sub-indicators below each indicator, for a total of 18 secondary basic indicators. This paper also adopts the business environment index from the Business Environment Index for Chinas Provinces as a proxy variable for the business environment to verify the robustness of the results.

The variables measuring the level of the national value chain (NVC_{ist}), namely position indicator NPO_{ist}, forward linkage IV_{ist}, and backward linkage FV_{ist}. We capture the interaction effect of the business environment and the national value chain on resource misallocation by using $ENV_{st} \times NVC_{ist}$. Given that many studies suggest industry agglomeration may be a factor affecting resource allocation[19,32], we adopt the Herfindahl index HHI_{ist} to reflect the degree of industry agglomeration. Its formula is $HHI = \sum_{k=1}^{n} (y_k/y)^2$, where y_k is the production value of the enterprise and y is the gross product of the industry. The larger the HHI index, the higher the degree of industry agglomeration. In addition, the control variables for the industry in which the enterprises operate include EX_{ist}, YR_{ist} and SAL_{ist}, which measure the average level of exports of enterprises in the industry, the average length of time since they were established, and the average sales of enterprises in the industry, respectively. The export index represented by EX_{ist} is calculated by using the design from Commander and Jan[33] (1 + export value/total output value) and we take the average value of regional industries to measure the above variables. The original data of the above variables are from the Chinese Industrial Enterprises Database. The control variables for the geographical location of the firm include GDP_{st} and UE_{st}, which represent the GDP and urban registered unemployment rate of the province where the firm is located, respectively. The data obtained are from the China Statistical Yearbook for the corresponding year, and ε_{ist} denotes the random errors.

In this paper, we select the data of industrial enterprises from 2010 and 2012 and draw on the methods of Brandt, et al.[34] and Yang[35] to match the data from the two years to obtain an unbalanced panel dataset with a sample size of over 450,000 industrial enterprises. To further study the impact of the business environment on resource allocation, the sample of enterprises is divided according to the geographical area and the type of industry in which the enterprises are located. Specifically, the enterprises are divided into two regions, East Central, and West. Furthermore, the enterprises are divided by type, into labor-intensive and capital-intensive industries. Therefore, using the unbalanced panel data obtained above, the industry-level data

are measured by LP estimation, then matched with the China Market Index Database, adding the national value chain position index with the forward linkage and backward linkage that is measured by using the Inter-Regional Input-Output Table, thereby obtaining the data set for our empirical research, with a total of 1,020 observed samples. The descriptive statistics of the main variables are shown in Table 1.

Table 1 Descriptive statistics of the main variables

	Observation	Mean	Std. dev.	Min	Med	Max
τ	1020	3.12	9.73	0.06	1.21	218.37
$\widehat{\tau_K}$	1020	0.66	4.41	−52.45	0.13	54.77
$\widehat{\tau_L}$	1020	0.17	8.84	−217.89	−0.13	48.21
NPO	1020	0.54	0.79	−1.14	0.29	5.6
IV	1020	0.72	0.87	−0.13	0.47	7.75
FV	1020	0.18	0.32	0	0.07	2.56
ENV	1020	6.03	1.65	2.53	6.01	9.95
lnHHI	1020	−2.8	1.32	−6.4	−2.7	−0.07
lnEX	1020	0.08	0.1	0	0.04	0.57
lnYR	1020	2.36	0.23	1.23	2.36	3.24
lnSAL	1020	11.51	1.04	9.36	11.29	15.46
lnGDP	1020	9.55	0.74	7.21	9.58	10.95
lnUE	1020	1.23	0.22	0.24	1.28	1.47

4.2 Stylized Facts

The evaluation of the business environment covers the whole business cycle, and objectively reflects the standard of business operations which, in turn, is closely related to the mobility of factor resources and whether enterprises can effectively obtain and use such resources. Theoretically, improving the business environment can both promote the flow of factor resource and reduce resource misallocation. By observing and analyzing the business environment indicators (market index) of each province for 2010 and 2012, we find that, on the one hand, the business environment of each province in 2012 has improved to a certain extent compared with that in 2010, and the average value of the business environment across 30 provinces in 2012 is 6.18, which is 10.16% higher than the average value of 5.61 in 2010. On the other hand, regional differences are still obvious, with the Eastern region having the highest business environment level, with an average of 7.48 in the two-year period; the Central region is mid-range, with an average of 5.66 over the period; and the Western region is the lowest, with an average of 4.49.

The Levinsohn-Petrin (LP) method[29] is used to estimate the elasticity coefficients, and the industry resource misallocation index is derived through further calculation. We take the average of the resource misallocation index of all industries in each province to represent the degree of resource misallocation in that province. After these calculations, we find that the average value of the resource misallocation index in each province increased from 2.85 in 2010

to 3.16 in 2012, and the degree of misallocation increased slightly. If we divide the provinces into East, Central and West, there is a significant gap between them, in which the Eastern region has the lowest average resource misallocation at 1.81 over the two- year period; the Central region has the second highest, at 2.53; and the Western region has the highest average resource misallocation at 4.54. The highest misallocation is in the tobacco products industry, with a misallocation index of 34.9; the lowest is in the non-metallic mineral products industry, with a misallocation index of 0.99. The average level of resource misallocation for all industries is 2.9.

In 2010 and 2012, the level of the business environment in the Eastern, Central and Western regions decreased in turn, and the degree of resource misallocation in the industry is aggravated sequentially by geography. It is initially confirmed that the level of the business environment is negatively related to resource misallocation in industry. Through a simple fitting, we summarize the relationship between the market index and the industry resource misallocation in the different regions, as shown in Figure 2. It is clear that there is a more obvious negative correlation between the market index and the industry resource misallocation in China as a whole, and in the Eastern and Central regions. However, in the Western region, the fitted straight line is relatively flat and the negative correlation is not significant, which needs further verification. Figure 2 is only a preliminary characterization of the facts. In order to draw more convincing conclusions, it is necessary to conduct a comprehensive examination of the various factors affecting resource misallocation and incorporate them into the research framework to refine the analysis of the effect of the business environment on resource misallocation.

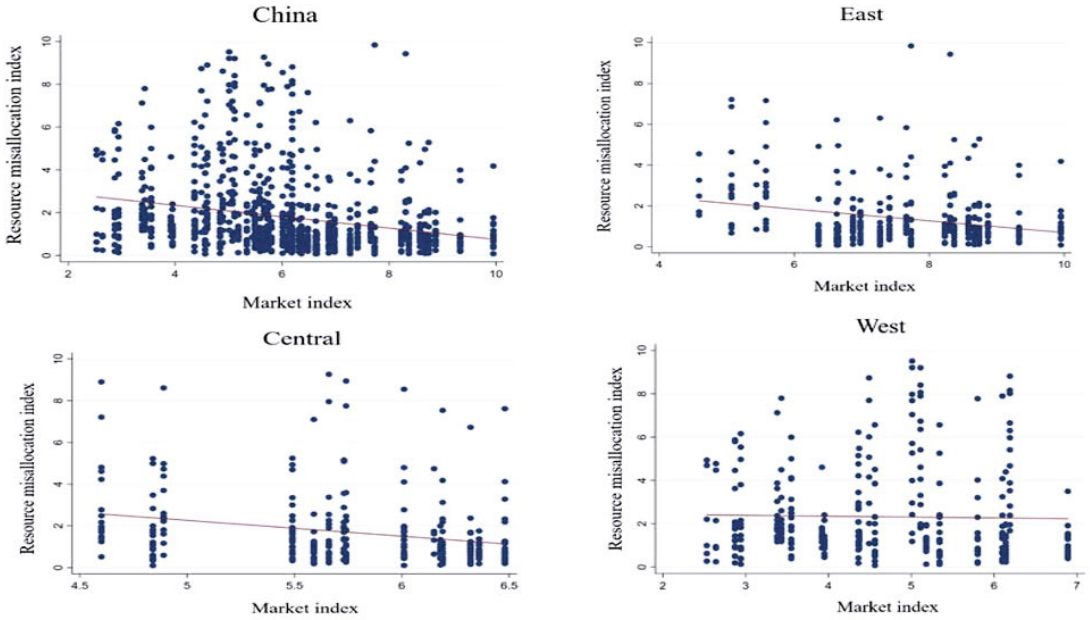

Figure 2 Market index and resource misallocation for the whole nation and in three regions

5 Empirical Analysis and Robustness

5.1 The Impact of the Business Environment on Resource Misallocation from the Perspective of the National Value Chain

The level of the business environment in different regions of China may have heterogeneous effects on resource allocation in industries at different positions of the national value chain. Therefore, this paper incorporates the national value chain into the analytical framework of business environment and resource allocation, focusing on the effect of the business environment on resource allocation under the condition of the national value chain specialization.

Table 2 The impact of the business environment on resource misallocation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ENV	−0.793***	−0.795***	−0.775***	−0.737***	−0.778***	−0.744***	−0.793***	−0.805***
	(0.162)	(0.225)	(0.163)	(0.223)	(0.163)	(0.223)	(0.162)	(0.226)
ENV×NPO			0.135**	0.170**				
			(0.066)	(0.068)				
ENV×IV					0.131**	0.181***		
					(0.063)	(0.066)		
ENV×FV							0.007	0.173
							(0.187)	(0.212)
lnEX		7.692*		7.303*		7.246		7.663*
		(4.445)		(4.427)		(4.420)		(4.444)
lnHHI		−0.575		−0.713		−0.757		−0.608
		(0.626)		(0.630)		(0.638)		(0.640)
lnYR		4.235		4.153		4.218		4.302
		(3.234)		(3.230)		(3.226)		(3.271)
lnSAL		2.039**		2.137**		2.187**		2.080**
		(0.911)		(0.919)		(0.928)		(0.929)
lnGDP		−1.019		−1.317		−1.348		−1.029
		(0.829)		(0.846)		(0.860)		(0.834)
lnUE		1.09		0.849		0.913		1.167
		(1.115)		(1.121)		(1.107)		(1.156)
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Cons.	5.605***	−21.395	5.263***	−20.281	5.173***	−21.074	5.600***	−22.223
	(0.884)	(13.233)	(0.903)	(13.183)	(0.916)	(13.184)	(0.908)	(13.633)
Obs.	1020	1020	1020	1020	1020	1020	1020	1020
R-squared	0.186	0.212	0.189	0.216	0.189	0.216	0.186	0.212

Note: Robust standard errors in parenthesis; ***p<0.01, * *p<0.05, *p<0.1.

Table 2 reports the effect of the business environment on resource allocation from the perspective of the national value chain. We find that, under the national value chain specialization, the improvement of the business environment reduces resource misallocation; however, it is less effective in improving resource misallocation in the upstream than in the downstream of the national value chain. Under the two conditions of no inclusion and of inclusion of other control variables, a one standard deviation increase in the level of the business environment (0.162 and 0.225) will improve the industry resource allocation by 12.85% and 17.89%, respectively. By analyzing and combining the results of the model regressions in columns (2) and (4) of Table 2, we find that the cross product of the indicators of the business environment and the national

value chain positioning can explain 7.3% of the marginal effect of the business environment on resource allocation. The regression results in columns (5)–(8) of Table 2 show that the greater the forward linkage of the industry, the weaker the improvement effect of the business environment on resource allocation in the corresponding industry. However, the relationship between the backward linkage of the industry and the effect of the business environment on resource allocation in the corresponding industry is not significant. The above results confirm the fact that private enterprises dominate the competition within the downstream market, while large and medium-sized state-owned enterprises dominate parts of the upstream market, thus constituting asymmetric competition among enterprises of different ownership structures[36]. We find that the business environment does not significantly improve the resource allocation efficiency in the upstream industries of the national value chain division that is dominated by large and medium-sized state-owned enterprises. However, for the downstream markets of the national value chain division that is dominated by private enterprises, optimization of the business environment will help improve the resource allocation in the corresponding industries due to the level of competition.

5.2 Robustness Tests

The above panel regression results verify that there is a correlation between the business environment and resource misallocation of industrial enterprises nationwide. However, such results do not yet prove that the enhancement of the business environment can effectively improve industry resource allocation. The reason is that there may be factors that contribute to improving the efficiency of resource allocation that happen to be positively correlated with the business environment, and these may lead to an inverse relationship between the business environment and resource misallocation. Therefore, further precise analysis of the impact of the business environment on resource allocation requires the use of instrumental variables to effectively address the endogeneity of the possible two-way feedback mechanism between the business environment and resource allocation efficiency. We use the history of opening ports and trading ports as an instrumental variable of the business environment. As institutional are path-dependent, the business environment is more or less influenced by the history of the opening of ports and trading ports. Furthermore, cities that are more influenced by the West have a stronger commercial and market awareness and consciousness. The longer the history of the opening of ports and trading ports are, the longer the time of learning from the West is. As a result, the greater the amount of Western influence is permeated throughout these. This influence is likely to produce a good business system and a good business environment. The history of the opening of ports and trading ports indirectly affects resource allocation by influencing the business environment. While resource allocation cannot affect the history of the opening of ports and trading ports, it is feasible to use the history of the opening of ports and trading ports as an instrumental variable.

The history of opening ports and trading ports in each province is calculated by taking the logarithm of the years between the opening date up to December 31, 2010, and December 31, 2012, respectively. We use the open port and trade history instrumental variables approach

to first run the first-stage regression of the business environment on the open port and trade history instrumental variables, then introduce the fitted values of the business environment into the second-stage regression as its proxy; finally, use the values found to estimate the elasticity index to resource misallocation. The measured results are shown in columns (1)–(6) of Table 3, where the Kleibergen — Paap rk LM tests all reject the null hypothesis of under-identification of the instrumental variables at the 1% level and the Kleibergen-Paap Wald rk F test satisfies a critical value greater than the Stock-Yogo test at the 10% level, confirming a strong correlation between instrumental and endogenous variables. We also find that the estimated coefficients of the business environment in columns (1)–(6) of Table 3 show a significant increase in absolute value, compared to the corresponding estimated coefficients in columns (3)–(8) of Table 2, indicating that the least squares estimation may underestimate the efficiency extents of enhancing the business environment to improve resource misallocation due to the endogeneity problem.

Table 3 2SLS estimation of the business environment on resource misallocation

	(1)	(2)	(3)	(4)	(5)	(6)
ENV	−1.058***	−1.679**	−1.057***	−1.629**	−1.082***	−1.714**
	(0.282)	(0.733)	(0.282)	(0.734)	(0.279)	(0.706)
ENV×NPO	0.129*	0.147**				
	(0.066)	(0.072)				
ENV×IV			0.125**	0.164**		
			(0.062)	(0.069)		
ENV×FV					0.018	0.208
					(0.186)	(0.211)
lnEX		12.711*		12.337*		12.855**
		(6.516)		(6.526)		(6.347)
lnHHI		−0.806		−0.844		−0.722
		(0.627)		(0.634)		(0.638)
lnYR		4.222		4.274		4.372
		(3.180)		(3.175)		(3.217)
lnSAL		2.006**		2.062**		1.975**
		(0.913)		(0.923)		(0.921)
lnGDP		−0.035		−0.146		0.174
		(1.197)		(1.212)		(1.155)
lnUE		−0.225		−0.113		0.109
		(1.274)		(1.275)		(1.323)
Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Kleibergen - Paap rk LM	170.777***	47.305***	169.943***	46.778***	173.720***	49.545***
Kleibergen-Paap Wald rk F	632.159	55.574	630.271	55.084	653.039	58.916
	{16.38}	{16.38}	{16.38}	{16.38}	{16.38}	{16.38}
Cons.	6.865***	−24.807*	6.753***	−25.230*	7.214***	−26.639*
	(1.615)	(13.452)	(1.629)	(13.390)	(1.571)	(13.745)
Obs.	1020	1020	1020	1020	1020	1020
R-squared	0.187	0.207	0.187	0.209	0.184	0.204

Note: Robust standard errors in parenthesis; ***$p<0.01$, * *$p<0.05$, *$p<0.1$; values in parentheses in the Kleibergen-Paap Wald rk F statistic are critical values at the 10% level of the Stock-Yogo test.

Note that, as the business environment changes, the market then sends a corresponding signal to the market subject enterprises. Even after they receive the signal, it still takes a lengthy period of time for enterprises to make decisions, and the resource factors to achieve the flow and integration cannot be deployed overnight, which results in a potential lag in the allocation of resources within the business environment. At the same time, the speed of flow of the different factors of production varies. For this reason, we select the China market index of the previous period (2008 and 2010 instead of 2010 and 2012) as a proxy variable for the business environment, which excludes the lagging factors from the above-mentioned possible cases and makes the test of the improvement effect of enhancing the business environment on resource misallocation successful. Columns (1)–(6) of Table 4 show the regression results of the previous period's business environment on resource misallocation. The measurement shows that the elasticity index of the previous period's business environment on resource misallocation is comparable to the regression coefficient of the current period's business environment index under the condition that both with and without other control variables as well as without other control variables are added, thus confirming that an enhanced business environment can effectively optimize resource allocation, and that the effect on the downstream industries within the national value chain is stronger than on the upstream industries.

The China market index focuses on the supply-side business environment, and we further adopt the business environment index, which focuses on the demand-side, as a proxy variable for the business environment to examine its effect on resource misallocation. Columns (7)–(12) of Table 4 show the regression results of the business environment index as a proxy for the business environment on resource misallocation. We find that the regression coefficients of the business environment index on resource misallocation with or without other control variables reject the null hypothesis at the 1% significance level, indicating that there is still an inverse relationship between the business environment and resource allocation on the demand side.

6 Further Discussion

6.1 Heterogeneity Analysis

As the Eastern, Central, and Western regions of China are at different stages of economic development, there are significant differences in the level of the business environment, and in the mobility of production factors, the supply-demand dynamic, and inter-industry allocation. The differences between East-Central and West are particularly prominent, and it is therefore necessary to discuss them separately. At the same time, the demand for production factors differs by industry, thus the resource misallocation index used in this paper is jointly determined by the degree of misallocation of capital and labor factors required by enterprises, so the difference in the dependence of industries on capital and labor factors can be divided into capital-intensive and labor-intensive industries, thereby allowing further analysis of resource misallocation and labor misallocation respectively.

Table 4 Indicator transformation test of the business environment on resource misallocation

	Previous Period Market Index						Business Environment Index					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ENV	−0.741***	−0.448***	−0.745***	−0.466***	−0.772***	−0.546***	−9.324***	−8.009***	−9.180***	−7.825***	−10.163***	−8.869***
	(0.140)	(0.168)	(0.140)	(0.168)	(0.141)	(0.173)	(2.334)	(2.693)	(2.399)	(2.699)	(2.421)	(2.725)
ENV×NPO	0.149**	0.191***					0.259**	0.334***				
	(0.068)	(0.073)					(0.120)	(0.126)				
ENV×IV			0.141**	0.200***					0.238**	0.337***		
			(0.063)	(0.070)					(0.114)	(0.123)		
ENV×FV					0.013	0.165					−0.013	0.228
					(0.174)	(0.205)					(0.351)	(0.383)
lnEX		5.493		5.501		6.015		6.722		6.664		6.787
		(3.918)		(3.906)		(3.961)		(4.418)		(4.422)		(4.455)
lnHHI		−0.692		−0.738		−0.577		−0.797		−0.845		−0.634
		(0.623)		(0.633)		(0.630)		(0.652)		(0.662)		(0.658)
lnYR		4.057		4.144		4.186		4.705		4.772		4.905
		(3.226)		(3.228)		(3.279)		(3.331)		(3.326)		(3.373)
lnSAL		2.198**		2.251**		2.132**		2.448**		2.506**		2.322**
		(0.940)		(0.950)		(0.946)		(1.015)		(1.027)		(1.019)
lnGDP		−1.812*		−1.821*		−1.504		−2.112**		−2.116**		−1.860*
		(1.006)		(1.016)		(0.979)		(1.043)		(1.051)		(1.025)
lnUE		1.204		1.266		1.484		1.196		1.256		1.514
		(1.254)		(1.245)		(1.290)		(1.129)		(1.119)		(1.158)
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Cons.	5.012***	−18.111	4.924***	−19.151	5.448***	−19.808	28.984***	1.695	28.452***	−0.032	31.771***	3.221
	(0.862)	(12.622)	(0.860)	(12.694)	(0.847)	(13.191)	(6.911)	(10.521)	(7.135)	(10.864)	(7.212)	(11.317)
Obs.	1020	1020	1020	1020	1020	1020	1006	1006	1006	1006	1006	1006
R-squared	0.184	0.212	0.184	0.213	0.181	0.208	0.19	0.224	0.19	0.225	0.187	0.219

Note: Robust standard errors in parenthesis; ***p<0.01, * *p<0.05, *p<0.1.

6.1.1 Regional Heterogeneity Analysis

Table 5 reports the impact of the business environment on the East-Central and Western regions from the perspective of the national value chain division. The business environment has a significant inverse effect with the misallocation of industry resources in the East-Central region. Considering the national value chain division, the coefficients of the cross-products of the business environment and the national value chain position indicators, as well as the coefficients of the cross-products of the business environment and forward linkage, are all positive and significant, indicating that the degree of industry misallocation in the upstream market is higher in the East-Central region. However, the effect of promoting the entry of other enterprises and improvements in resource allocation is smaller due to the existence of certain access barriers. The coefficient of the cross product of the business environment and backward linkage is not significant, indicating that the shift of industries from the relatively upstream portion of the value chain to the downstream portion does not cause misallocation, which proves that the downstream market is fully competitive. It is worth noting that the coefficients of the urban registered unemployment rate are negative and significant in all three regression models with control variables added for the East-Central region, suggesting that this region has a labor surplus. For the Western region, the role of the business environment in improving resource misallocation is not significant. However, the coefficients of the export index are found to be positive, and we reject the null hypothesis at the 1% level in all three cases, indicating that exporting exacerbates resource misallocation in the Western region, which is inconsistent with Melitz[16] who stated that export trade reduces the degree of resource misallocation in the industry. This contrast in findings may be due to factors specific to exports in China. Zhang, et al.[37] pointed out that factor market distortions are an important driver of Chinese exports, which implies that low-productivity companies can export by depressing factor income, which in turn exacerbates industry resource misallocation.

6.1.2 Industry Heterogeneity Analysis

Table 6 demonstrates the impact of the business environment on resource allocation in capital-intensive and labor-intensive industries from the perspective of the national value chain division. The regression results show that improving the business environment reduces resource misallocation in capital-intensive and labor-intensive industries, and a one standard deviation improvement in the business environment (0.266 and 0.067) will improve resource allocation in capital-intensive industries by an average of 24.76%, and in labor-intensive industries by 4.47%. Based on the above analysis, we further confirm that optimizing the business environment improves resource allocation in different types of industries. Looking at the coefficients of the cross-products of the business environment and national value chain position indicators, as well as the coefficients of the cross-products of the business environment and forward linkage, we find that the entry barrier to the upstream market for capital-intensive industries is higher than that of the upstream market for labor-intensive industries, which prevents enterprises from entering and optimizing resource allocation and reducing resource misallocation. Therefore, the upstream market of capital-intensive industries urgently needs to lower the entry threshold,

Table 5 The impact of the business environment on resource misallocation in different regions

	East-Central						West					
ENV	−0.520***	−0.308***	−0.531***	−0.329***	−0.620***	−0.445***	0.5	−0.483	0.506	−0.435	0.502	−0.484
	(0.111)	(0.116)	(0.115)	(0.117)	(0.145)	(0.133)	(0.331)	(0.563)	(0.332)	(0.563)	(0.334)	(0.558)
ENV×NPO	0.203**	0.217**					0.107	0.11				
	(0.082)	(0.088)					(0.070)	(0.092)				
ENV×IV			0.201***	0.210**					0.103	0.186*		
			(0.076)	(0.082)					(0.071)	(0.109)		
ENV×FV					0.048	−0.006					0.028	0.68
					(0.194)	(0.194)					(0.388)	(0.427)
lnEX		−3.266		−3.247		−2.831		44.034***		44.214***		44.722***
		(2.569)		(2.569)		(2.585)		(12.352)		(12.293)		(12.656)
lnHHI		0.287*		0.255		0.468***		−1.387		−1.499		−1.577
		(0.158)		(0.162)		(0.159)		(1.058)		(1.077)		(1.115)
lnYR		−2.357*		−2.267*		−1.744		6.912*		7.095**		7.150**
		(1.378)		(1.350)		(1.256)		(3.523)		(3.566)		(3.625)
lnSAL		0.786**		0.841**		0.556		4.322**		4.382**		4.493**
		(0.395)		(0.406)		(0.344)		(1.869)		(1.879)		(1.921)
lnGDP		−0.257		−0.244		0.117		1.012		0.858		0.967
		(0.382)		(0.378)		(0.314)		(0.868)		(0.892)		(0.879)
lnUE		−1.849***		−1.745***		−1.598***		7.488		7.008		7.327
		(0.473)		(0.441)		(0.456)		(6.209)		(6.117)		(6.090)
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Cons.	3.731***	4.685	3.579***	3.397	4.781***	3.939	−0.55	−84.804**	−0.629	−84.636**	−0.421	−87.408**
	(0.668)	(4.227)	(0.637)	(4.098)	(0.982)	(4.247)	(1.613)	(34.400)	(1.620)	(34.221)	(1.592)	(34.874)
Obs.	665	665	665	665	665	665	355	355	355	355	355	355
R-squared	0.267	0.302	0.268	0.3	0.229	0.26	0.427	0.499	0.427	0.5	0.427	0.501

Note: Robust standard errors in parenthesis; ***p<0.01, * *p<0.05, *p<0.1.

Table 6 The impact of the business environment on resource misallocation in different industries

	Capital-Intensive						Labor-Intensive					
ENV	−0.931***	−1.053***	−0.931***	−1.049**	−0.954***	−1.128***	−0.538***	−0.388***	−0.544***	−0.402***	−0.541***	−0.402***
	(0.266)	(0.407)	(0.268)	(0.407)	(0.267)	(0.407)	(0.067)	(0.112)	(0.068)	(0.113)	(0.068)	(0.114)
ENV×NPO	0.171*	0.208*					0.083**	0.086**				
	(0.103)	(0.110)					(0.036)	(0.033)				
ENV×IV			0.169*	0.240**					0.068**	0.069**		
			(0.099)	(0.106)					(0.035)	(0.032)		
ENV×FV					0.023	0.297					−0.137	−0.170*
					(0.282)	(0.315)					(0.092)	(0.096)
lnEX		10.758		10.552		11.467		4.115		4.106		4.121
		(8.808)		(8.784)		(8.781)		(3.380)		(3.396)		(3.434)
lnHHI		−1.355		−1.433		−1.218		0.369**		0.371**		0.458**
		(0.951)		(0.963)		(0.967)		(0.178)		(0.179)		(0.186)
lnYR		6.601		6.684		6.972		−0.757		−0.757		−0.829
		(4.813)		(4.790)		(4.865)		(0.867)		(0.870)		(0.885)
lnSAL		2.765**		2.848**		2.726**		0.365		0.362		0.261
		(1.213)		(1.225)		(1.226)		(0.350)		(0.351)		(0.352)
lnGDP		−1.668		−1.735		−1.337		−0.162		−0.13		0.019
		(1.133)		(1.157)		(1.126)		(0.342)		(0.343)		(0.336)
lnUE		0.191		0.277		0.711		0.374		0.401		0.428
		(1.373)		(1.338)		(1.412)		(0.469)		(0.469)		(0.472)
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Cons.	39.644*	−1.862	39.539*	−3.008	40.108*	−5.42	4.203***	2.837	4.182***	2.575	4.500***	3.113
	(20.703)	(12.802)	(20.730)	(12.760)	(20.665)	(13.062)	(0.532)	(4.993)	(0.538)	(4.981)	(0.544)	(5.028)
Obs.	602	602	602	602	602	602	418	418	418	418	418	418
R-squared	0.183	0.222	0.183	0.223	0.181	0.219	0.22	0.243	0.217	0.239	0.211	0.235

Note: Robust standard errors in parenthesis; ***p<0.01, * *p<0.05, *p<0.1.

form higher levels of mixed competition, and improve resource allocation efficiency through the promotion of the business environment.

6.1.3 Misallocation Heterogeneity Analysis

Table 7 The impact of the business environment on capital misallocation

	(1)	(2)	(3)	(4)	(5)	(6)
ENV	−0.340***	−0.302***	−0.346***	−0.317***	−0.356***	−0.344***
	(0.053)	(0.086)	(0.054)	(0.087)	(0.057)	(0.089)
ENV×NPO	0.144**	0.151**				
	(0.058	(0.060				
ENV×IV			0.123**	0.129**		
			(0.054)	(0.056)		
ENV×FV					−0.154	−0.163
					(0.141)	(0.143)
lnEX		0.52		0.549		0.893
		(2.629)		(2.642)		(2.624)
lnHHI		0.008		0.002		0.161
		(0.146)		(0.145)		(0.141)
lnYR		−0.942		−0.881		−0.933
		(0.664)		(0.660)		(0.669)
lnSAL		0.537**		0.556**		0.411*
		(0.230)		(0.237)		(0.212)
lnGDP		−0.254		−0.223		0.02
		(0.203)		(0.199)		(0.191)
lnUE		−0.754**		−0.665**		−0.612*
		(0.354)		(0.336)		(0.341)
Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Cons.	2.465***	1.583	2.422***	0.822	2.950***	1.375
	(0.375)	(2.498)	(0.377)	(2.533)	(0.419)	(2.664)
Obs.	1020	1020	1020	1020	1020	1020
R-squared	0.129	0.135	0.125	0.131	0.114	0.12

Note: Robust standard errors in parenthesis; ***p<0.01, * *p<0.05, *p<0.1.

We divide resource misallocation($\tau = |\widehat{\tau_K}| + |\widehat{\tau_L}|$) into capital misallocation and labor misallocation , and Tables 7 and 8 show the effects of the business environment on capital misallocation and labor misallocation, respectively. The regression results show that the improvement of the business environment has an ameliorating effect on both capital misallocation and labor misallocation. The effect is slightly higher on labor misallocation than on capital misallocation. The improvement effect of the business environment on capital misallocation in upstream industries within the national value chain is smaller than that in downstream industries, and the improvement effect on labor misallocation is not affected by the national value chain division. The reasons for this are that the upstream market is dominated by state-owned enterprises who have taken restrictive measures on the entry of private enterprises, making it difficult for private enterprises to participate in capital allocation in the upstream market. In addition, there are both labor shortages and surpluses in China, depending on which region is under

consideration. Although the labor flow will not be restricted by the access threshold of the upstream market of the value chain, different regions have different labor quality requirements. The Eastern region, with mainly high-quality labor, can transfer labor-intensive industries to the Central and Western regions to alleviate the problem of labor surpluses in those regions, and gradually form a technology-intensive industrial pattern. Through the enhancement of the business environment, we improve the development of factor markets, stimulate market vitality, and smoothen the circulation channels of factors, so that the regional human capital endowment matches the characteristics of the regional industrial structure.

Table 8 The impact of the business environment on labor misallocation

	(1)	(2)	(3)	(4)	(5)	(6)
ENV	−0.435***	−0.435**	−0.433***	−0.427**	−0.437***	−0.461**
	(0.152)	(0.206)	(0.152)	(0.205)	(0.150)	(0.207)
ENV×NPO	−0.008	0.019				
	(0.022)	(0.022)				
ENV×IV			0.008	0.053*		
			(0.025)	(0.029)		
ENV×FV					0.161	0.335**
					(0.110)	(0.147)
lnEX		6.783*		6.697*		6.770*
		(3.567)		(3.549)		(3.578)
lnHHI		−0.721		−0.758		−0.768
		(0.615)		(0.623)		(0.625)
lnYR		5.095		5.099		5.234
		(3.202)		(3.201)		(3.233)
lnSAL		1.599*		1.631*		1.669*
		(0.891)		(0.899)		(0.905)
lnGDP		−1.063		−1.125		−1.049
		(0.815)		(0.831)		(0.806)
lnUE		1.603		1.578		1.779
		(1.060)		(1.054)		(1.106)
Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Cons.	2.798***	−21.864*	2.750***	−21.897*	2.650***	−23.598*
	(0.796)	(13.194)	(0.812)	(13.196)	(0.774)	(13.595)
Obs.	1020	1020	1020	1020	1020	1020
R-squared	0.193	0.222	0.193	0.223	0.193	0.225

Note: Robust standard errors in parenthesis; ***p<0.01, * *p<0.05, *p<0.1.

6.2 Analysis of the Path to Optimizing the Business Environment

The previous sections confirm that optimizing the business environment can improve the efficiency of resource allocation. To further optimize the business environment, is it necessary to increase the opening up of the Chinese economy and participating even more in the international economic circulation during this period of high uncertainty in the external environment? In the face of asymmetric competition in upstream and downstream industries, can we find a way

to solve this problem? In order to answer these two questions, we will adopt two perspectives, namely participation in the international grand cycle, and the construction of high-tech zones.

6.2.1 The Impact of FDI on Resource Misallocation

China has moved to create a new development dynamic that focuses on domestic economic flow and features positive interplay between domestic flow and international engagement. In this process, the importance of the business environment has become increasingly prominent. Whether it is a market player rooted in the local cycle, or a foreign trade enterprise focusing overseas, looking to actively participate in the international division, they both require the support of a high-quality business environment, which is closely related to the stability of foreign investment and foreign trade. To estimate the impact of international circulation on resource misallocation, we choose foreign direct investment (FDI) as an indicator to measure the level of regional participation in international circulation and test its effect on resource misallocation from the perspective of the national value chain division.

Table 9 The impact of FDI on resource misallocation

	(1)	(2)	(3)	(4)	(5)	(6)
lnFDI	−0.942***	−1.005***	−0.969***	−1.053***	−0.908***	−1.057***
	(0.153)	(0.233)	(0.154)	(0.232)	(0.154)	(0.233)
lnFDI×NPO	0.262**	0.281**				
	(0.107)	(0.113)				
lnFDI×IV			0.265***	0.304***		
			(0.098)	(0.106)		
lnFDI×FV					0.208	0.413
					(0.270)	(0.295)
lnEX		5.824		5.885		5.676
		(3.675)		(3.681)		(3.761)
lnHHI		−0.628		−0.671		−0.529
		(0.620)		(0.627)		(0.621)
lnYR		3.916		3.964		4.045
		(3.250)		(3.248)		(3.277)
lnSAL		2.251**		2.283**		2.243**
		(0.928)		(0.932)		(0.931)
lnGDP		−0.811		−0.835		−0.504
		(1.156)		(1.163)		(1.126)
lnUE		1.728		1.723		2.199*
		(1.247)		(1.229)		(1.263)
Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Cons.	3.937***	−27.345**	3.894***	−27.749**	3.976***	−30.454**
	(0.605)	(11.923)	(0.602)	(11.883)	(0.596)	(12.227)
Obs.	1020	1020	1020	1020	1020	1020
R-squared	0.191	0.217	0.191	0.218	0.187	0.213

Note: Robust standard errors in parenthesis; ***$p<0.01$, * *$p<0.05$, *$p<0.1$.

The regression results in Table 9 show that resource misallocation can be alleviated by participating in the international circulation. Column (1) of Table 9 shows that a one standard deviation increase in FDI will improve the industry resource allocation by 14.41%. The upstream industries in the national value chain division have entry barriers to foreign investment, a higher degree of misallocation, and are less affected by foreign investment. In order to reduce resource misallocation and improve resource allocation efficiency, Chinese enterprises still need to firmly participate in the international economic circulation.

6.2.2 The Impact of High-Tech Zones on Resource Misallocation

The establishment of high-tech zones to promote high-tech industries is an important national decision, accelerating the transformation of traditional industries, adjusting the industrial structure, and enhancing the national value chain. There have been studies focusing on the role of high-tech zones in providing preferential policies such as tax incentives, access to capital and credit, preferential land, and talent introduction[38]. As a result, high tech zones have become the catalyst for peak, world leading, R&D innovation and policy innovation, forming clusters of high-tech enterprises that are testing grounds for industrial and market-oriented reform policies.

Does the establishment of high-tech zones play a demonstrably leading and driving role in the construction of the business environment? To this end, this paper examines whether the establishment of high-tech zones has brought about a radiating effect on the allocation of resources in regional industries.

There have been two peak periods in the establishment of national high-tech zones; the first was when the State Council approved 52 "mature" national high-tech zones in 1991 and 1992, and the second was the "growth" national high-tech zones built since 2000. As of June 2022, the number of high-tech zones approved by the State Council was 173. These are not exclusively located in first-tier cities; they are also found in second and third-tier cities, indicating that the approval process is not solely determined by the economic growth and political status of provinces and cities. In addition, since the number of high-tech zones varies greatly among provinces and given that there are "one zone in one province" and "many zones in one province" situations, it is necessary to consider the influence of the area of provinces. For this reason, this paper uses the period of time since the high-tech zones were approved by the State Council to December 31, 2010 (December 31, 2012) and categorize each zone by province. For each province, these time periods, measured in years, are then added together to give the total number of years that all the zones have been operational on a per-province basis. This is then divided by the total area of corresponding province, expressed in square kilometers, before finally estimating the natural logarithm for the above results. If we use Beijing as an example, in May 1988, Beijing received approval from the State Council for a new national high-tech industrial development zone, known as Zhong Guan Cun Science Park (which was the first high-tech zone in China). From its approval to December 31, 2010, is a period of 22.58 years. Dividing this by the area of Beijing (16,800 square kilometers), and then taking the natural logarithm, we get 2.60.

The regression results in each column of Table 10 show that the establishment of national

high tech industrial development zones improves the resource allocation of industries in China. The estimation results in columns (1)–(4) of Table 10 show that the effect of high-tech zones on improving resource misallocation is weak for industries upstream in the national value chain and for industries with large forward linkage when no control variables are added. However, when control variables are added, the effect of high-tech zones on resource allocation is not affected by the national value chain-related indicators, which indicates, at least to some extent, that the establishment of high-tech zones has a positive effect on overcoming industry barriers and improving the overall efficiency of regional industry resource allocation.

Table 10 The impact of high-tech zones on resource misallocation

	(1)	(2)	(3)	(4)	(5)	(6)
lnHi-Tech	−0.677***	−0.889***	−0.686***	−0.922***	−0.616**	−0.823***
	(0.239)	(0.235)	(0.242)	(0.248)	(0.252)	(0.231)
lnHi-Tech ×NPO	0.123	0.232**				
	(0.121)	(0.109)				
lnHi-Tech ×IV			0.101	0.215**		
			(0.108)	(0.101)		
lnHi-Tech ×FV					0.02	0.249
					(0.382)	(0.357)
lnEX	4.777		4.808		4.677	
	(4.188)		(4.179)		(4.235)	
lnHHI	−0.564		−0.561		−0.579	
	(0.641)		(0.642)		(0.636)	
lnYR	4.95		4.96		4.982	
	(3.465)		(3.461)		(3.452)	
lnSAL	2.353**		2.349**		2.365**	
	(1.013)		(1.014)		(1.009)	
lnGDP	−1.862*		−1.855*		−1.874*	
	(0.960)		(0.961)		(0.956)	
lnUE	0.902		0.927		0.998	
	(0.990)		(0.980)		(0.952)	
Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Cons.	−22.325	1.625***	−22.389	1.627***	−22.595	1.599***
	(14.285)	(0.418)	(14.266)	(0.417)	(14.186)	(0.411)
Obs.	1006	1006	1006	1006	1006	1006
R-squared	0.214	0.182	0.214	0.182	0.214	0.182

Note: Robust standard errors in parenthesis; ***p<0.01, * *p<0.05, *p<0.1.

6.3 A Re-Examination of the Western Region

The previous test finds that the effect of the business environment on resource misallocation in the Western region is not significant, while the export factor is found to aggravate the situation. For this reason, we add the multiplier term of export and the national value chain division index for the Western region to test whether there is heterogeneity in the effects of exports on resource allocation within industries in different positions in the national value chain.

The local tax rate borne by enterprises is also considered, because there are certain differences in the level of taxes and fees, depending on the regions where the enterprises are located, leading to a difference in operating costs, which has an impact on resource allocation. The impact of the local tax rate as an exacerbating factor on resource misallocation in the industry is tested by dividing business tax by total income, then calculating the average value (expressed as a percentage) of all enterprises in the region as the local tax rate of enterprise.

Table 11 Western region re-examination

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
lnEX	49.626***	41.304***	51.616***	41.325***	50.418***	43.821***	36.864***	33.098***
	(16.607)	(13.347)	(17.054)	(13.480)	(15.286)	(12.462)	(12.754)	(10.781)
lnEX×NPO	−2.105	2.841						
	(4.053)	(3.909)						
lnEX×IV			−3.692	2.287				
			(3.690)	(3.907)				
lnEX×FV					−13.695	−0.562		
					(9.845)	(9.812)		
TAX							39.521***	42.518***
							(7.695)	(7.190)
lnHHI		−1.227		−1.239		−1.179		−0.842
		(1.004)		(1.026)		(1.015)		(0.892)
lnYR		6.936*		6.919*		6.774*		5.737*
		(3.557)		(3.597)		(3.543)		(3.145)
lnSAL		4.326**		4.336**		4.312**		4.706**
		(1.877)		(1.887)		(1.894)		(1.829)
lnGDP		0.664		0.665		0.677		−1.263
		(0.881)		(0.884)		(0.876)		(0.909)
lnUE		6.32		6.332		6.436		0.075
		(5.311)		(5.290)		(5.330)		(4.406)
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Cons.	−0.565	−81.771**	−0.59	−81.901**	−0.495	−81.445**	−29.131***	−88.283***
	(1.181)	(32.300)	(1.183)	(32.465)	(1.148)	(32.574)	(6.228)	(31.661)
Obs.	355	355	355	355	355	355	355	355
R-squared	0.444	0.498	0.444	0.498	0.444	0.498	0.495	0.547

Note: Robust standard errors in parenthesis; ***$p<0.01$, * *$p<0.05$, *$p<0.1$.

Table 11 reports the regression results of the retest for the Western region. The results show that exports significantly exacerbate resource misallocation in the region, and that this effect is not influenced by the national value chain position in which the industry is located. In addition, an increase in the local tax rate, which burdens enterprises significantly, further exacerbates resource misallocation. According to the World Bank's Doing Business 2020 report, China ranks only 105th in the area of taxation. Although the design of the indicators does not take into account the differences in social systems and economic taxation systems, such as China's VAT retention and refund system and preferential policies to encourage R&D, there is still

room for reform in the area of taxation in China. In recent years, China has launched a series of measures to reduce taxes and fees to help the development of the real economy, but it still needs to address the problem of high nominal tax rates, as well as gradually narrowing the gap between nominal and effective tax rates and optimizing the allocation of market resources.

7 Conclusions and Suggestions

The world economy is confronted with dramatic changes and challenges, the likes of which we have not experienced in over a century, and the global value chain has ushered in a new round of major adjustments. The external environment of China's development has changed profoundly; uncertainty, instability and unpredictability have become the norm. The industrial upgrading and economic structural transformations are now facing a real test. In order to cope with the new challenges and opportunities, the Party Central Committee has made a strategic decision to accelerate the formation of a new development paradigm that can ensure domestic circulation as the mainstay, where domestic and international circulations reinforce one another, and with a focus on the medium- to long-term economic development. This paper focuses on the national value chain, conducting empirical research on optimizing the business environment, building the national value chain, and reducing resource misallocation in industry.

This paper uses a competitive equilibrium model with factor price distortions to estimate the degree of resource misallocation in industry. The study offers three important findings.

1) The improvement of the business environment by one standard deviation will improve resource allocation by 17.89%. By region, the effect is most obvious in the Eastern and Central regions, and not significant in the West.

2) The effect is higher in the downstream industries of the national value chain than in the upstream industries. Distinguished by misallocation type, the improvement effect on capital misallocation is higher in the downstream industries than in the upstream industries, while the improvement effect on labor misallocation is basically the same for both upstream and downstream. Comparing the different types of industries, we see that the capital-intensive industries are influenced more by the division of the national value chain than the labor-intensive industries, and the effect on upstream industries is weaker.

3) The region's participation in the international circulation can improve the efficiency of resource allocation. The establishment of high-tech zones to improve the regional value chain means that both upstream and downstream industries can produce a radiating effect, improving resource allocation. For the Western region specifically, exports will intensify the resource misallocation issue, and the increase in the local tax rate burden on enterprises will further intensify it.

Based on the empirical research of this paper, a number of suggestions can be made.

1) The business environment should be focused on promoting mutually reinforcing domestic and international economic flows. The economic cycle cannot be separated from the free flow of elemental resources and the effective allocation of factor resources. Research shows that optimizing the business environment can improve the efficiency of resource allocation, which

means that the business environment is indispensable in its role as a booster of the economic cycle. In the domestic market, private enterprises especially may suffer from unequal treatment, which raises the cost of doing business for them. It will therefore be helpful to enhance the business environment, which will gradually solve problems such as expensive financing, high taxes and fees, inadequate government services, and information asymmetry. Enhancing the business environment will further promote the quality and efficiency of enterprises, reduce operating costs, and facilitate the operation of the domestic cycle. As for the international cycle, there needs to be an emphasis on stable foreign investment, stable foreign trade, and a continuation of opening up the country to international trade, through further optimization of the business environment. In order to more effectively attract multinational enterprises, it will be necessary to deeply assimilate into the global value chain specialization. It could be said that the improvement of the business environment can make the two cycles run more smoothly and efficiently; it will certainly add confidence and courage market players to overcome difficulties in the current environment.

2) Insisting on high-tech zones and free trade zones (ports) to encourage innovation. This paper demonstrates that the establishment of high-tech zones has a positive effect on overcoming industry barriers and improving the overall efficiency of resource allocation in regional industries. High-tech zones and free trade zones are the highpoints of institutional innovation, which gradually form a new form of open economy by deepening the reform of the government-market relationship, building an internationalized, market-oriented, legalized nomocracy, and facilitating an improved business environment while highlighting the function of regional synergy and industrial linkage, and forming a radiating effect on regional economic development.

3) Breaking through the upstream and downstream asymmetric competition pattern and enhancing the level of the NPO is highly advisable and profitable. Research shows that China has achieved the upgrading of the NPO by accelerating the transfer of industries to the Central and Western regions. However, the overall level of the national value chain position is not high and has not yet broken the asymmetric competition pattern between upstream and the downstream. Private enterprises dominate the competitive downstream market while large and medium-sized state-owned enterprises dominate parts of the upstream markets, thereby constituting asymmetric competition among enterprises of different ownership structures. The government should commit itself to further deepening the reform of state-owned enterprises, breaking the industry monopoly in the upstream link of the national value chain, enhancing competitiveness and openness, and then realizing the optimal allocation of resources through market competition. In response to the serious structural contradictions of regional market segmentation, it is necessary to create a reasonable industrial layout, guiding the orderly transfer of industries between regions, shaping the economic geography that helps enhance the national value chain, promoting and supporting various forms of inter-regional economic collaborations, technology spillovers and factor flows, while maintaining regional competitiveness.

4) Finally, it is necessary to explore new methods of regional cooperation and development, to fully mobilize the domestic market, and to strengthen the industry players and the national value chain linkages between industry players and geographic units.

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