An Analysis of the Regional EconomicImpacts of FDl Fluctuations in China

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Abstract :

FDI has played a crucial role in boosting China's economic growth, promoting technological progress, expanding employment opportunities and enhancing international competitiveness. However, due to changes in the global economic landscape and geopolitical factors, there has recently been a negative net inward FDI on a balance-of-payments basis. Given the significant differences in natural resources, geographic location and level of economic development among China's provinces, the distribution of FDI in China shows a significant heterogeneous pattern with more in the east and less in the west, and more in the south and less in the north. This distribution pattern implies that changes in FDI will have different impacts on the patterns of economic activities and factor flows of Chinese provinces, and that the roles and participation of China and its provinces in global value chains will also change.

In order to deeply analyze the heterogeneous impacts of FDI in different Chinese provinces, we construct a global computable general equilibrium (CGE) model embedded with 31 Chinese provinces. In terms of database construction, we embed China's 2017 interregional input-output tables into the GTAP11 database, and the above work equips the model with the ability to analyze economic interactions and trade flows among Chinese provinces. We distinguish the capital elements in the model and the database into domestic and foreign capital, and nest the two elements through the CES equation to more precisely analyze the impact of foreign capital reduction on the Chinese and regional economies. Meanwhile, in terms of technology spillovers, we draw on Van Meijl and Van Tongeren (1999), and Das (2002, 2007, 2015) to analyze the role of FDI on the technological progress of recipient countries, and Mehdi Nejati and Fateme Taleghani (2022) to analyze the impact of FDI on the technological progress of recipient countries by setting the technology absorptive capacity index for 31 provinces in China in order to further analyze the impact of FDI decline on regional industrial output in China.

Based on the modeling work, we design three different scenarios (which need to be redesigned): scenario 1 is a 1% decline in China's FDI, scenario 2 is a 3% decline in China's

FDI, and scenario 3 is a 5% decline in China's FDI. Through these three scenarios, our study focuses on two issues: first, the different impacts of the rate of net FDI decline on China's economy, analyzing the impacts of different rates of net FDI decline on China's macroeconomic and regional economies; and second, how the decline in net FDI triggers the changes in the industrial structure of the different inter-regional regions within China, and its impacts on the position of China and its regions in the global value chain.

This thesis is divided into six parts. The first part serves as an introduction to the historical importance of FDI to the Chinese economy and the background of the current net fluctuations. Part II discusses in detail the main reasons for the decline in net FDI and the potential impact it may have on China's regional economy. Part III provides an overview of the model and data, and describes the setting of the baseline scenario and policy scenarios. Part IV demonstrates, through simulation analysis, the specific impacts of the decline in net FDI on the Chinese regional economy and major global economies under different scenarios. The fifth section assesses the effects of the decline in net FDI on the regional industrial structure and the adjustment of global value chains. The last part presents conclusions and policy recommendations.

I. Introduction

FDI has played a crucial role in driving China's economic growth, promoting technological progress, expanding employment opportunities and enhancing international competitiveness. However, due to changes in the global economic landscape and geopolitical factors, the phenomenon of negative net inward FDI on a balance-of-payments basis has recently emerged. Given the significant differences in natural resources, geographic location and level of economic development among China's provinces, the distribution of FDI in China shows a significant heterogeneous pattern with more in the east and less in the west, and more in the south and less in the north. This distribution pattern implies that changes in FDI will have different impacts on the patterns of economic activities and factor flows of Chinese provinces, and that the roles and participation of China and its provinces in global value chains will also change.

In order to deeply analyze the heterogeneous impacts of FDI in different Chinese provinces, we construct a global computable general equilibrium (CGE) model embedded with 31 Chinese provinces. In terms of database construction, we embed China's 2017 interregional input-output tables into the GTAP11 database, and the above work equips the model with the ability to analyze economic interactions and trade flows among Chinese provinces. We distinguish the capital elements in the model and the database into domestic and foreign capital, and nest the two elements through the CES equation to more precisely analyze the impact of foreign capital reduction on the Chinese and regional economies. Meanwhile, in terms of technology spillovers, we draw on Van Meijl

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Based on the modeling work, we design three different scenarios (which need to be redesigned): Scenario I shows that foreign investment in electronics and communication equipment manufacturing grows by 12.2%, foreign investment in automobile manufacturing grows by 6.5%, and foreign investment in scientific R&D services grows by 8.9%, while all other foreign industries decline by 8%. In Scenario 2, foreign investment in electronics and communications equipment manufacturing grows by 12.2%, foreign investment in automobile manufacturing grows by 6.5%, foreign investment in scientific R&D services grows by 8.9%, while all other foreign industries decline by 8%. Scenario 3 shows that investment in foreign-owned industries in China declines by an average of 8%. This scenario aims to explore the impact of the overall decline in foreign investment on Chinese regions and industries. Through these three scenarios, our study focuses on two issues: first, the different impacts of the rate of net FDI decline on China's economy, analyzing the impacts of different rates of net FDI decline on China's macroeconomic and regional economies; and second, how the decline in net FDI triggers the changes in the industrial structure of the different inter-regional regions within China, and its impacts on the position of China and its regions in the global value chain.

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II. Status of FDI in China (Status of foreign investment in China)

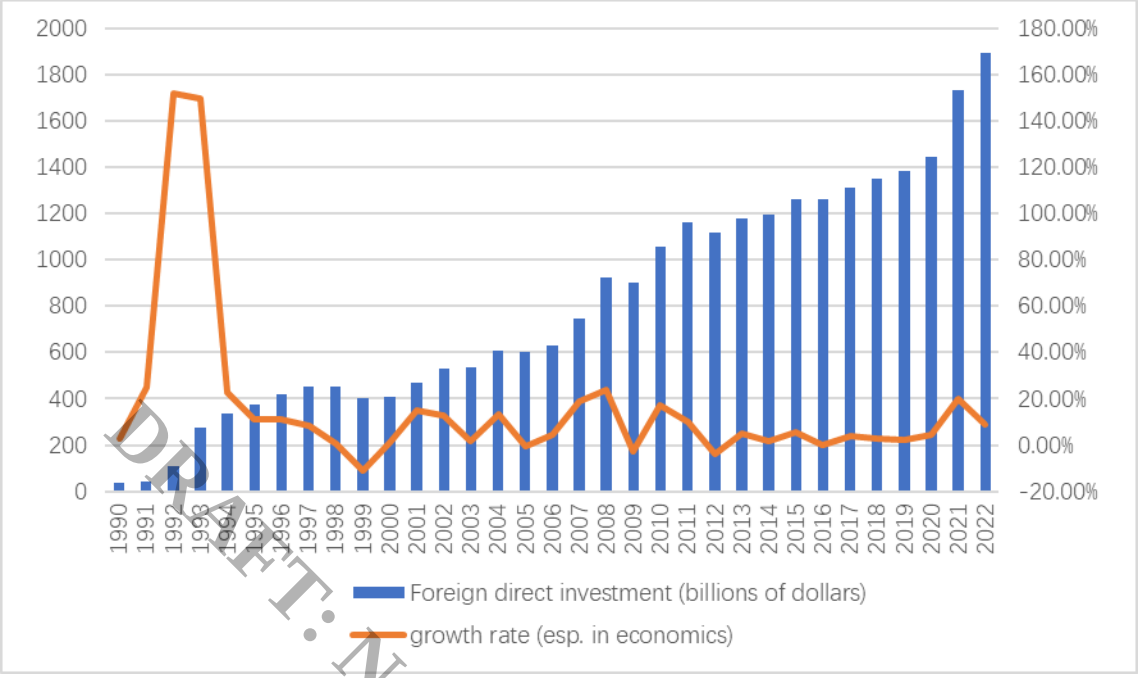

Figure 1 Trend of FDI in China, 1990-2022

In terms of the total amount of FDI, since 1990, China's foreign direct investment (FDI) has shown an overall upward trend, and has experienced phased fluctuations along with the global economic cycle, domestic and foreign policy environments, and unexpected events. In order to present a clearer picture of the stage-by-stage characteristics of FDI and its impact on China's macroeconomy, regional economy and key industries, the period from 1990 to 2022 is divided into four periods. The analysis finds that the period from 1990 to 2000 was the fastest-growing phase of China's FDI. As the Chinese government gradually opened up the coastal and riverine areas as well as the inland cities, the confidence of foreign investors in the Chinese market increased significantly, and the overall scale of FDI in this period increased by 13 times, from US$3.487 billion in 1990 to US$45.463 billion in 1998. Affected by the Asian financial crisis, China's FDI showed a short-term decline in 1999-2000. The second period started with China's accession to the WTO in 2001, and until the end of the financial crisis in 2008, China's FDI as a whole still maintained a relatively fast growth, with FDI amounting to US$92.395 billion in 2008, about twice as much as in 2001. The third stage starts with 2009, and although the financial crisis had an unfavorable impact on the global economy and China's FDI briefly fell back in 2009, FDI quickly resumed growth, reaching $131.035 billion in 2017. The fourth stage starts with the trade friction between China and the United States in 2017 and China's release of policies to promote the growth of foreign investment, and China's FDI maintains rapid growth, climbing to $189.132 billion in 2022, and then FDI declines in 2023, about 10.8% year-on-year.

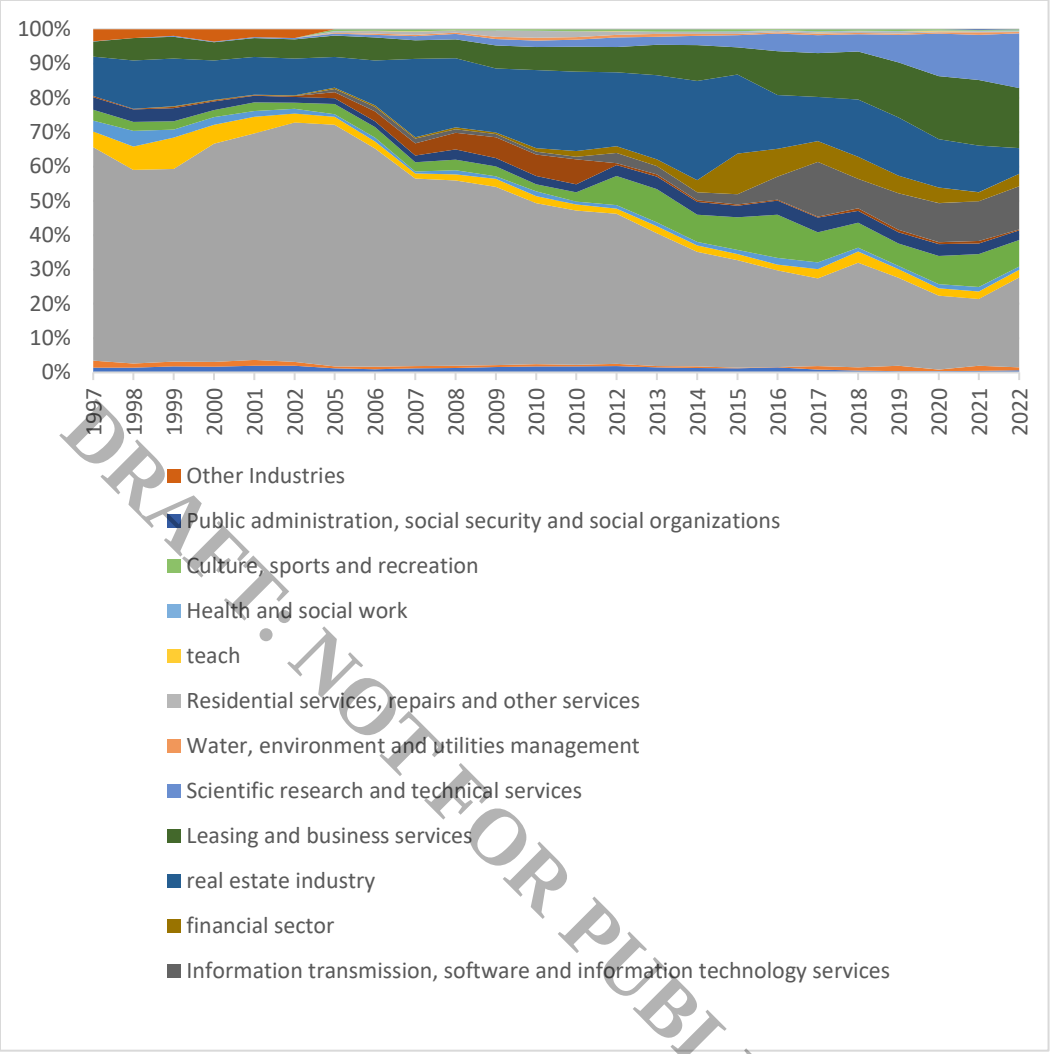

Figure 2 Trend chart of FDI distribution changes in China's industries (1997-2022)

At the industry level, the proportion of FDI attracted by each industry shows significant changes, with FDI gradually shifting from manufacturing to diversified fields such as real estate, finance, information technology, scientific research, business services, etc. Before 2005, China's manufacturing industry demonstrated a strong attraction to foreign investment, accounting for about 70% of all FDI, and the share of manufacturing industry in attracting FDI declined rapidly after 2005, and by 2022, the share of manufacturing industry in attracting FDI will have declined by about 10.5% year-on-year. After 2005, the share of FDI attracted by the manufacturing industry declined rapidly, falling to 26% by 2022.

At the same time, China's high-tech industries and scientific research and development fields continue to increase the level of attracting FDI. For example, the information transmission, software and information technology services industry has gained foreign attention since 2012, with its FDI share reaching 10.46% by 2017 and rising to about 20.10%

by 2022, reflecting China's strong growth momentum in the digital economy and high-tech services. FDI investment in scientific research and technology services shows a similar growth trend, with the sector's share of FDI attraction surging from less than 3% in 2012 to nearly 16% in 2022, underscoring the importance of R&D-intensive industries and China's rising position in the global innovation network. This has been influenced by the changing dynamics of the global economy and the Chinese government's economic regulation strategy on the one hand, and on the other hand, it has led to the transformation of China's industrial structure from labor- and capital-intensive to a high-tech and service-oriented economy.

With the advancement of urbanization and infrastructure projects in China, the ability of real estate to attract FDI has been increasing after 2005, and its share has remained around 20% for a long period of time, especially in 2014, when real estate accounted for about 33% of all FDI. Subject to real estate control policies, foreign investment in real estate began to decline rapidly in 2017, accounting for only 7% in 2022.

III.Model setup and data description

1. Database construction

First, match the industries and products in the ANME-OECD input-output table with the GTAP11 database, merge the corresponding industries and products, and ensure that the merged industries and products correspond to the GTAP11 data one by one. Extract coefficients from the merged GTAP database, including intermediate inputs (VIFA, VDFA), final demand (VIGA, VDGA, VIPA, VDPA), factor use (EVFA), as well as production taxes PTAX and excise taxes. Use this information to construct non-competitive input-output tables for each country. The OECD-AMNE input-output table is also used to calculate and analyze the ratio of domestic and foreign input-output and the ratio of trade flows in each industry in each country. Adjusting the non-competitive input-output table of each country in the GTAP database according to the above ratios, and applying the cross-entropy method to ensure the consistency of the international trade and intermediate input data, the non-competitive input-output table distinguishing between foreign and domestic capitals in each country under the macroaccounting based on GTAP is constructed.

On this basis, the Chinese inter-regional input-output table distinguishing between domestic and foreign investment and Hong Kong, Macao and Taiwan investment compiled by CHNEN (2023) is used to further refine the Chinese regional data. The Chinese national input-output table distinguishing between domestic and foreign capital in the above work is further subdivided into 31 Chinese interprovincial tables distinguishing between domestic and foreign capital. To match the structure of the internal and external investment database, the information of Hong Kong, Macao, Taiwan and foreign investment in the table is merged and considered as foreign investment. The shares of intermediate inputs,

final demand, and factor use are calculated for each province, and the structure of intermediate inputs and factor use as well as the total trade volume are controlled to ensure that the consolidated provincial data are consistent with the original database information. Eventually, the Chinese non-competitive input-output tables distinguishing between domestic and foreign capital are converted into Chinese interregional input-output tables distinguishing between domestic and foreign capital.

After completing the above work, the main problem faced is that when converting the data containing China's regional internal and external capital into the standard GTAP format, there are two scenarios of the sources of foreign capital used for imports: first, imported goods produced by foreign-funded firms from outside China; and second, goods produced by foreign-funded firms in China and entered through interregional trade. There are significant differences in the nature of these two types of goods, but if the two types of products are combined according to the format of the traditional GTAP database the two types of products will be merged so that the two types of products mentioned above will be regarded as homogeneous, which will not be suitable for this study. Therefore, the balanced database is further refined to construct an MRIO database that distinguishes between internal and external capital. Due to the lack of information on the import and export flows of domestic and foreign products at the inter-provincial level in China, it is assumed that the regional import structure is the same as the import and export flow structure of OECD-AMNE China, according to which the regional import and export data are subdivided and the local RAS method is applied to ensure the consistency of the import structure. The same method is applied to the adjustment of export data.

On this basis, the OECD-AMNE data were used to categorize the sources of merchandise imports from other countries in the GTAP 11 database that distinguish between domestic and foreign capital, determine the sources and destinations of imports of intermediate and final goods, and adjust the share of imports proportionally to ensure that total imports are consistent with the original database values.

2、Constructing the GTAPSR model to distinguish between domestic and foreign capitals

In order to match the modified AMNE database structure, this paper makes the following modifications to the GTAPSR model, adds new variables and related equations on the basis of the original model, and adjusts the elasticity coefficient in the model. The specific modifications are shown in Figures 3 and 4:

(1) Expanding the intermediate input sector:

First, use the CES function to define the additional variables to categorize the demand for intermediate goods into the demand for domestic products (Qfd_D) and the demand for foreign-imported products (Qffm), as shown in equations (1)(2).

$$qffm_{c,a,b,r} = qfa_{c,a,b,r} \times \left[\frac{pffm_{c,a,b,r}}{pfa_{c,a,b,r}} \right]^{-ESUBNf_{c,a,b,r}} \quad (1)$$

$$qfd\_d_{c,a,b,r} = qfa_{c,a,b,r} \times \left[\frac{pffm_{c,a,b,r}}{pfa_{c,a,b,r}}\right]^{-ESUBf_{c,a,b,r}} \quad (2)$$

Second, for domestic products, this paper uses the CES function to further define the interregional trade variable (Qfd_DCRS) for domestic products, as shown in equation (3).

$$qfd\_DCRS(c,a,b,s,t) = qfd\_D(c,a,b,r) \times \left[\frac{pfd\_DCRS_{c,a,b,s,r}}{pfd\_D_{c,a,b,r}}\right]^{-ESUBMh_{a,r}} \quad (3)$$

Third, for foreign-funded products, this paper further distinguishes between imported foreign-funded products (Qfm) and locally produced foreign-funded products (Qfd_F), as shown in equation (4)(5)

$$qfm_{c,a,b,r} = qffm_{c,a,b,r} \times \left[\frac{pfm_{c,a,b,r}}{pffm_{c,a,b,r}}\right]^{-ESUBMz_{a,r}} \quad (4)$$

$$qfd\_F_{c,a,b,r} = qffm_{c,a,b,r} \times \left[\frac{pfd\_F_{c,a,b,r}}{pffm_{c,a,b,r}}\right]^{-ESUBMz_{a,r}} \quad (5)$$

Fourth, this paper performs import source differentiation for imported products (Qfm) as shown in equation (6). The foreign-capitalized products are differentiated into interregional trade sources (qfd_FCRS), as shown in equation (7).

$$qfms_{c,a,b,s,r} = qfm_{c,a,b,r} \times \left[\frac{pfms_{c,a,b,s,r}}{pfm_{c,a,b,r}}\right]^{-ESUBMp_{a,r}} \quad (6)$$

$$qfd\_FCRS_{c,a,b,s,r} = qfd\_F_{c,a,b,r} \times \left[\frac{pfd\_FCRs_{c,a,b,s,r}}{pfd\_F_{c,a,b,r}}\right]^{-ESUBMq_{a,r}} \quad (7)$$

Fifth, this paper further differentiates the regional sources among the 31 provinces by using "China" as the source of imported products, as shown in Equation (8):

$$qfmsts_{c,t,a,b,s,r} = qffst_{c,t,a,b,"chn",r} \times \left[\frac{pfmsts_{c,t,a,b,s,r}}{pfmst_{c,t,a,b,"chn",r}}\right]^{-ESUBMl_{a,r}} \quad (8)$$

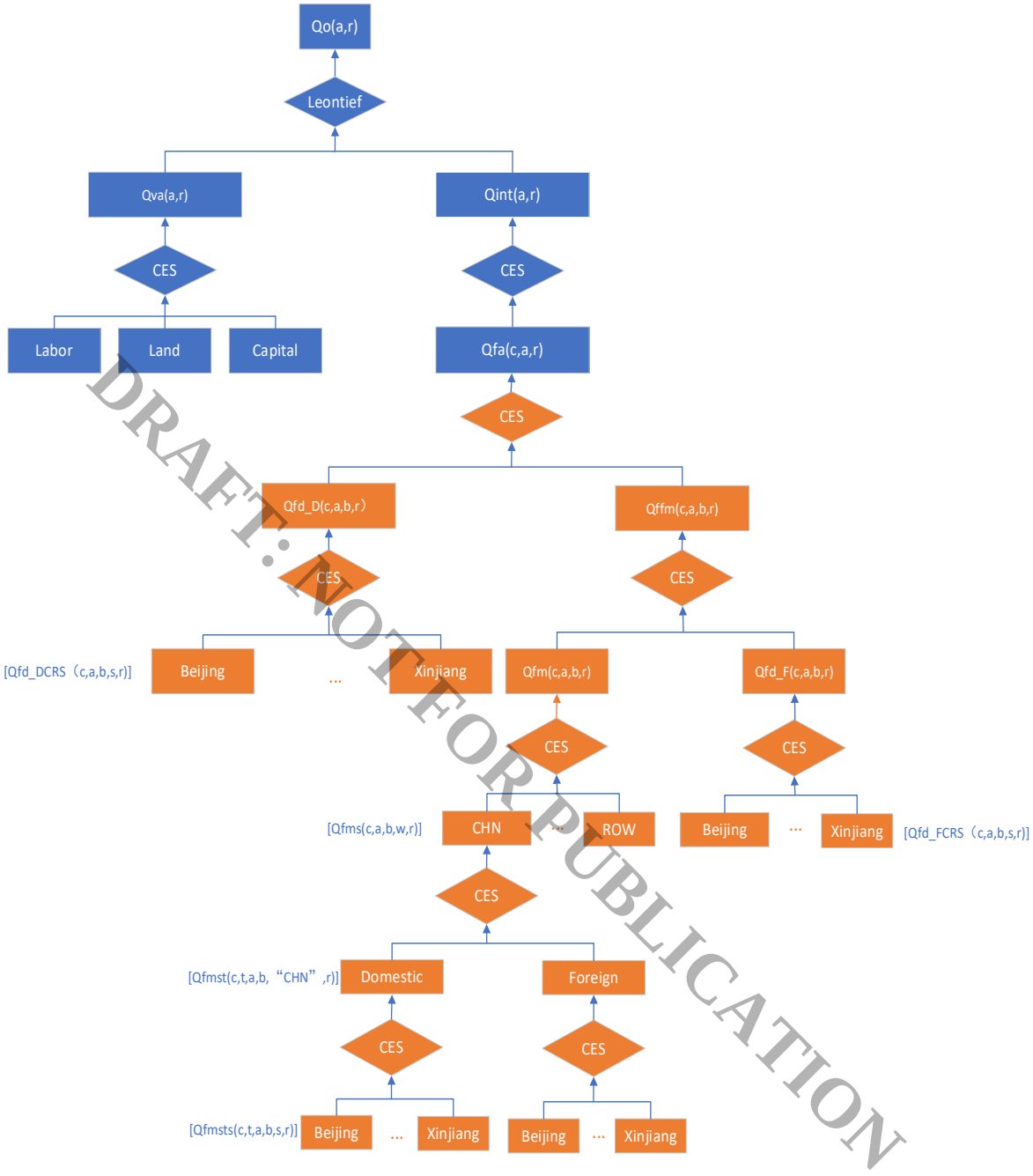

Figure 3 Nested structure of domestic and foreign product production

(2) Expanding the final demand sector

Given that the structure of government sector consumption, private sector consumption expenditure is broadly similar, where the function used for private sector top-level nesting is is the CDE function, and space is limited, this part will show the modified government sector consumption expenditure structure.

First, the CES function is used to define the additional variables to categorize the demand for intermediate goods into the demand for domestic products (Qgd_D) and the demand for foreign-imported products (Qggm), as shown in equations (9)(10).

$$qggm_{c,b,r} = qga_{c,b,r} \times \left[\frac{pggm_{c,b,r}}{pfg_{c,b,r}} \right]^{-ESUBNg_{c,b,r}} \quad (9)$$

$$qgd\_d_{c,b,r} = qga_{c,b,r} \times \left[\frac{pggm_{c,b,r}}{pga_{c,b,r}} \right]^{-ESUBg_{c,b,r}} \quad (10)$$

Second, for domestic products, this paper uses the CES function to further define the inter-regional trade variable (Qgd_DCRS) for domestic products, as shown in equation (11).

$$qgd\_DCRS(c,b,s,t) = qgd\_D(c,b,r) \times \left[\frac{pgd\_DCRS_{c,b,s,r}}{pgd\_D_{c,b,r}} \right]^{-ESUBMgh_r} \quad (11)$$

Third, for foreign products, this paper further distinguishes between imported foreign products (Qgm) and locally produced foreign products (Qgd_F) as shown in equation (12)(13).

$$qgm_{c,b,r} = qggm_{c,b,r} \times \left[\frac{pgm_{c,b,r}}{pggm_{c,b,r}} \right]^{-ESUBMhz_r} \quad (12)$$

$$qgd\_F_{c,b,r} = qggm_{c,b,r} \times \left[\frac{pgd\_F_{c,b,r}}{pggm_{c,b,r}} \right]^{-ESUBMz_r} \quad (13)$$

Fourth, this paper performs import source differentiation for imported products (Qgm) as shown in equation (14). The foreign-capitalized products are differentiated into interregional trade sources (qgd_FCRS), as shown in equation (15).

$$qgms_{c,b,s,r} = qgm_{c,b,r} \times \left[\frac{pgms_{c,b,s,r}}{pgm_{c,b,r}} \right]^{-ESUBMp_r} \quad (14)$$

$$qgd\_FCRS_{c,b,s,r} = qgd\_F_{c,b,r} \times \left[\frac{pgd\_FCRs_{c,b,s,r}}{pgd\_F_{c,b,r}} \right]^{-ESUBMq_r} \quad (15)$$

Fifth, this paper further differentiates the regional sources among the 31 provinces by using "China" as the source of imported products, as shown in equation (16):

$$qgmsts_{c,t,b,s,r} = qggst_{c,t,b,"chn",r} \times \left[\frac{pgmsts_{c,t,b,s,r}}{pgmst_{c,t,b,"chn",r}} \right]^{-ESUBMl_r} \quad (16)$$

The specific structure is shown in Figure 4:

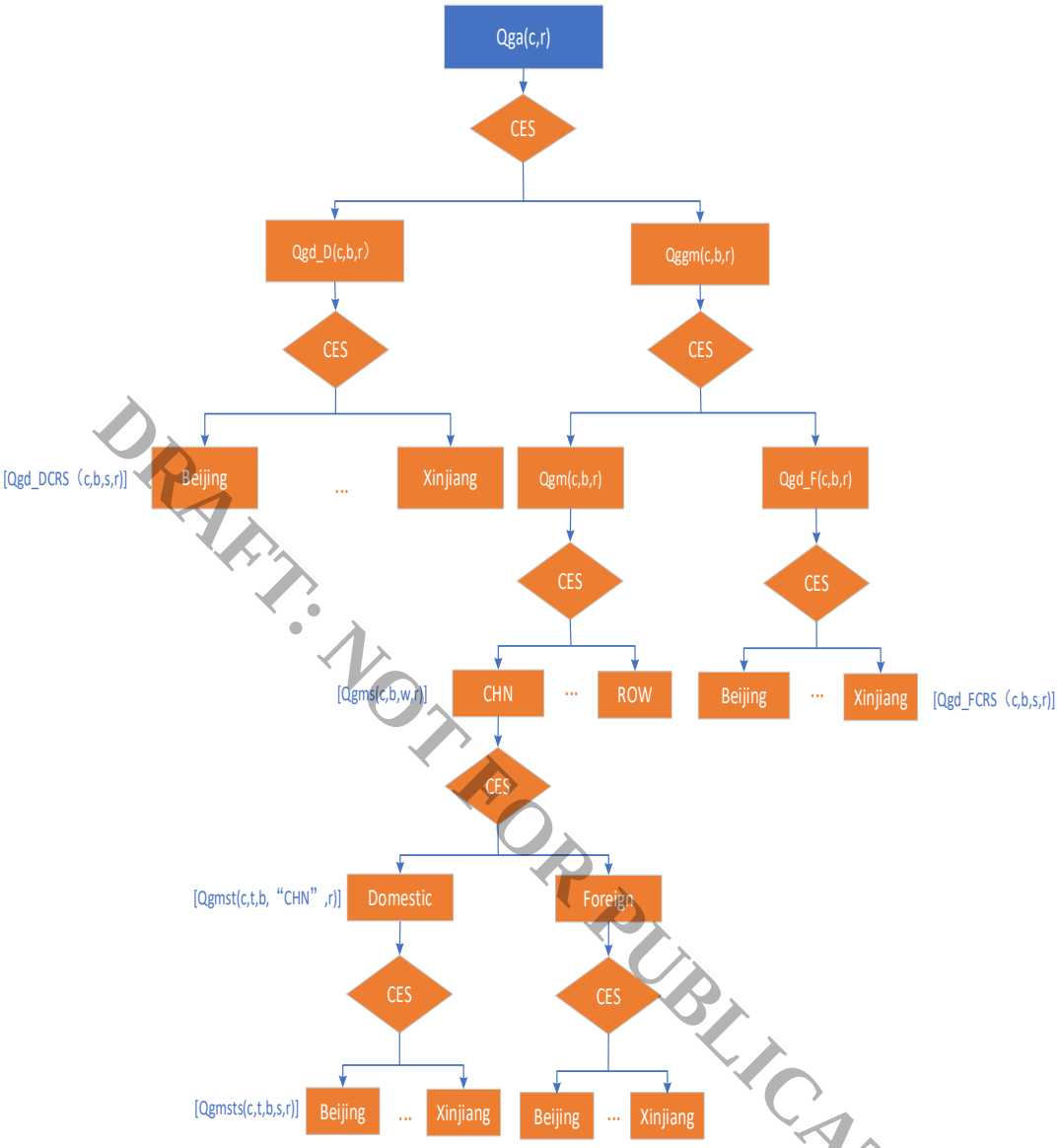

Figure 4 Nested structure of government consumption demand for domestic and foreign products

IV. Scenario Setting

Data released by the Ministry of Commerce (MOFCOM) showed that 53,766 new foreign-invested enterprises were established nationwide in 2023, a year-on-year increase of 39.7%. However, the actual utilization of FDI amounted to only RMB 1133.91 billion, a year-on-year decrease of 8.0%. In terms of industries, the actual utilization of FDI in high-tech manufacturing industry increased by 6.5%, electronic and communication equipment manufacturing industry increased by 12.2%, and the actual utilization of FDI in scientific R&D service industry increased by 4.1%.

Based on the above data, this paper sets up the following scenarios:

Scenario 1 (Baseline Scenario): Under this scenario, FDI in the electronics and communications equipment manufacturing sector grows by 12.2%, FDI in the automobile manufacturing sector grows by 6.5%, and FDI in the scientific R&D services sector grows by 8.9%, while FDI in all other FDI sectors declines by 8%. This scenario examines the decline in foreign investment in China in 2023.

Scenario 2 (No more growth in key sectors increasing FDI): In the baseline scenario, FDI in electronics and communications equipment manufacturing, foreign-owned automotive manufacturing, and scientific R&D services all grow by zero, while all other foreign-owned sectors decline by 8 percent. This scenario aims to analyze the impact of a further decline in FDI on Chinese regions and industries.

Scenario 3 (Overall Decline in Foreign Investment): In this scenario, foreign investment in China declines by 8% on average. This scenario aims to explore the impact of the overall decline in foreign investment on Chinese regions and industries.