A Study on the Relationship between Export Trade and Employment Level in China's Border Provinces and Regions

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Abstract: *This study investigates the influence of export trade on employment levels in the border regions of China. By collecting data spanning from 2000 to 2016, we constructed a panel dataset focused on export trade. Through empirical analysis, we determined that export trade plays a crucial role in elevating employment levels within these border regions. However, employing robustness tests and heterogeneous analysis, we uncovered disparities in the impact of export trade on employment across distinct geographical areas and industries. Specifically, the stimulatory effect of export trade on employment is notably more pronounced within the secondary sector compared to the primary and tertiary sectors. Furthermore, an intriguing finding emerged: while inland border regions exhibit a positive correlation between export trade and employment, coastal border regions demonstrate a negative correlation. This dichotomy signifies an incongruity in the influence of export trade on employment across varied regions.*

Keywords: *Employment, Export, International trade, Border areas*

1. Introduction

Employment as the cornerstone of social stability, is undergoing increasing scrutiny due to the deepening integration of the global economy and the growing trend of globalized labor resource utilization. The relationship between trade and employment has become a pivotal topic in contemporary international trade research. However, over the long term, studies investigating the impact of export trade on employment have often been limited to coastal provinces, with a lack of empirical analysis focused on western regions, particularly China's border regions. In reality, the influence of exports on employment is often shaped by factors such as geographical location, industrial structure, and the degree of openness to the outside world. As an example, in the year 2010, despite the elevation in export trade levels in both eastern, central, and western regions, the eastern region witnessed an increase of nearly 80 million in employment compared to 2000, while the central and western regions experienced a growth of only about 30 million. In some years, certain border provinces demonstrated a situation where export trade volume continued to increase while employment levels progressively declined, raising thought-provoking questions.

Against the backdrop of pursuing high-quality development, China is currently placing heightened emphasis on balanced regional growth. The border regions have shifted from being the periphery of reform and opening-up to becoming the forefront, with foreign trade emerging as an effective means to overcome economic development challenges. In the context of China's active promotion of innovative trade development and the comprehensive open development opportunities for border regions, investigating foreign trade in the new era, especially export trade, and its impact on employment levels in these border regions carries significant and profound practical and theoretical significance.

2. Literature Review

In recent years, both domestic and international researchers have extensively explored the impact of export trade on employment. However, the viewpoints presented in the literature are diverse, generally falling into three categories:

The first perspective asserts that export trade promotes employment, which is the most commonly held view. Zhang YanYan using data from 1992 to 2017, conducted an empirical study by establishing

regression models to examine the relationship between export trade and employment[1]. The results indicated a long-term equilibrium relationship between China's foreign trade and employment levels, suggesting a positive effect of exports on employment. It was suggested that China could alleviate employment pressure by expanding foreign trade. Nevertheless, the employment impact of export trade varies across different regions. Liang Ping and Liu Jun employing provincial panel data from 2001 to 2013, reached contrasting conclusions regarding regional disparities in the employment impact of export trade. They argued that the influence of export trade on total employment is highest in the eastern coastal regions, followed by the central regions, and is least pronounced in the western regions[2].

The second perspective posits a negative effect of export trade on employment. In the domestic context, many scholars hold that the negative impact of export trade on employment is often concentrated in certain industries. For instance, Zhang ZhiMing constructed a multi-regional input-output model with export value-added as a core explanatory variable. This model was employed to explore the relationship between export value-added and employment in various industries within China. The findings revealed diminishing marginal effects of employment generated by export value-added in certain industries[3]. Wei Hao conducted a quantitative analysis based on panel data from 33 industrial sectors in China from 1992 to 2007, and drew a more detailed conclusion that the expansion of export trade often has a positive employment effect on low-level and high-level technology manufacturing sectors, while the employment effect on exports to primary product and medium-sized technology manufacturing sectors is negative [4].

The third viewpoint asserts that export trade has no impact on employment. Mao RiSheng utilizing panel data from 1999 to 2007 for 329 Chinese manufacturing industries, investigated the contemporaneous labor demand and subsequent impacts of export trade and FDI on China's overall manufacturing sector and different factor-intensive manufacturing sectors. The results indicated that export trade and FDI exerted significant and important effects on labor demand through output expansion in the manufacturing sector. However, the impact on specific industries, such as capital-intensive manufacturing, was minimal[5]. Zhan Jinhua believes that the decline in domestic employment levels in a country often has multiple reasons, which are not closely related to the country's foreign trade[6].

The aforementioned research collectively illustrates that while most scholars believe that export trade has an overall positive effect on employment within a country, varying conclusions emerge when considering different regions and industries. Moreover, external economic conditions and changes in domestic economic policies can impact the relationship between international trade and employment. Consequently, when examining the connection between foreign trade and employment in border regions, it is necessary to conduct detailed analyses based on geographical location and economic conditions of each province within these regions. Additionally, considering the variation in time samples might help mitigate the influence of external shocks on the relationship.

3. Analysis of Export Trade and Employment in China's Border Regions

China's border regions consist of nine provinces: Tibet, Inner Mongolia, Jilin, Guangxi, Xinjiang, Gansu, Liaoning, and Heilongjiang. Tibet is excluded from analysis due to the lack of economic data. Table 1 presents the ranking of trade export values and employment growth rates in China's border provinces from 2000 to 2016, using 2000 as the base year. It is evident that among the border provinces, those in the southwest and northwest regions experienced trade export growth rates significantly higher than those in the northeast. The northeastern provinces ranked among the lowest in terms of trade growth rates. By 2016, Gansu's trade export had grown nearly 30-fold, whereas Jilin's trade export only increased by 2.7 times. This disparity can be attributed to local industrial and economic structures. The northeastern provinces, being China's heavy industrial base, embarked on industrialization earlier than other border regions, leading to more mature industrial systems and larger trade export values, hence slower growth rates.

Regarding employment, Xinjiang exhibited the highest growth rate at 87% over the 17-year period, making it the fastest-growing employment region among the border provinces. In contrast, Gansu's employment rate only increased by 4%, rendering it the slowest-growing employment region. Even the province with the slowest export growth rate, Jilin, saw a 29% employment increase. This discrepancy can be attributed to Gansu historically having the highest employment rate among China's border provinces, reaching 59% in 2000, while Xinjiang's employment rate only reached 52% in 2016. According to Keynesian theory, unemployment is a result of inadequate effective demand, which

comprises both consumption and investment demand. Investment demand encompasses not only domestic goods but also foreign ones. An increase in export trade in border regions implies local producers must expand production to offer more goods to the market, which in turn requires more labor. However, from the present data, it is evident that mere growth rates do not suffice to discern the relationship between foreign trade exports and employment. The significant mismatch between trade and employment growth rates in the border provinces highlights the need to consider the actual economic conditions and industrial structures of each province for a comprehensive analysis.

Table 1: Export and employment of China's eight frontier provinces from 2000 to 2016

province	Export growth(%)	ranking	Employment growth	ranking (%)
Yunnan	822%	4	130%	3
Inner Mongolia	348%	5	138%	2
Jilin	269%	8	129%	4
Guangxi	1232%	2	110%	7
Xinjiang	1103%	3	187%	1
Gansu	2977%	1	104%	8
Liaoning	331%	6	112%	6
Heilongjiang	276%	7	126%	5

4. Research Design

Drawing from domestic and international literature, we have identified numerous factors that can influence employment, including export trade, gross domestic product (GDP), wage levels, infrastructure development, human capital, government intervention, urbanization level, regional GDP, central bank monetary policy, Renminbi exchange rate, and foreign direct investment. Given the unique economic and geographical circumstances of border regions, we utilized Stata 16.0 for preliminary analysis to systematically exclude variables that exhibited insignificant effects on employment in these regions. Ultimately, we selected the year-end employment figures for each province as a representative employment indicator, while utilizing export trade openness as the core explanatory variable. Export trade openness measures the proportion of export value to GDP within a country, and its specific formula is as follows (1). Wage levels, infrastructure development, GDP, foreign direct investment, and government intervention were included as control variables.In this section, we construct an econometric model to examine the impact of high-quality development of foreign trade in China's border regions on residents' employment. The overall specification of the model is as follows:

$$\ln\text{Employ}_{it} = \alpha + \beta_1 lnEX_{it} + \beta_2 lnW_{it} + \beta_3 lnGDP_{it} + \beta_4 lnInfra_{it} + \beta_5 ln\text{FDI}_{it} + \beta_6 lnGovernment_{it} + \mu_i + \gamma_t + \epsilon_{it} \tag{1}$$

Where i denotes the provinces of border regions, t represents the corresponding years; lnEmploy is the core dependent variable of this section, representing the total employment in the three major industries of each border province;lnEX is the core independent variable, representing the trade export openness in the border regions; are control variables, lnW,lnInfra,lnFDI,Government,lnGDP representing average worker wages, per capita infrastructure investment, foreign direct investment, government intervention, and gross domestic product respectively; μ_i and$\gamma_t$denote province fixed effects and year fixed effects, ϵ_{it} respectively represents the error term.

Table 2: Descriptive statistical results

variable	meaning	source
lnEmploy	Total employment personnel of the frontier provinces	Provincial statistical yearbook
lnEX	The proportion of exports to GDP	Provincial statistical yearbook
lnW	Average monetary wage of provincial workers	Guo-Taian data platform
lnGDP	gross domestic product	Provincial statistical yearbook
lnInfra	Road mileage per square kilometer of land	Provincial statistical yearbook
lnFDI	Level of foreign direct investment	Provincial statistical yearbook
Government	The ratio of provincial expenditure to regional GDP over the years	The EPS data platform

The selected sample for this study comprises data from 8 provinces in China's border regions spanning from 2000 to 2016. Variables such as export trade, wage levels, foreign direct investment, infrastructure development, and gross domestic product were subjected to logarithmic transformation to mitigate the effects of hetero skedasticity. Table 2 presents the descriptive statistical results for each variable, along with their respective data sources.

5. Description of Variables

5.1 Baseline Regression Analysis

Prior to conducting the regression analysis, we first examined the correlations between variables. The Variance Inflation Factor (VIF) test results indicated the absence of multicollinearity in the model. We evaluated the regression methods employed in the model, utilizing the Least Squares Dummy Variable (LSDV) method and applying the Hausman test with clustered robust standard errors. The results of the Hausman test demonstrated the significance of both fixed and random effects within the model. In light of these findings, we determined to undertake an analysis using three distinct models: the Mixed Ordinary Least Squares (OLS) model, the Random Effects model, and the Fixed Effects model. The final regression results are presented in Table 3:

Table 3: Results of the regression analysis

Explanatory variable	Explained variable lnEmploy		
	Mixing OLS	RE	FE
lnEX	0.370**	0.370**	0.479***
	(0.152)	(0.152)	(0.158)
LnW	0.481***	0.481***	0.390**
	(0.0810)	(0.0810)	(0.159)
lnFDI	0.0385***	0.0385***	0.0396***
	(0.00992)	(0.00992)	(0.0100)
lnInfra	-0.655***	-0.655***	-0.986***
	(0.146)	(0.146)	(0.165)
lnGDP	-0.159***	-0.159***	-0.251***
	(0.0491)	(0.0491)	(0.0674)
Goverment	0.00221	0.00221	-0.0473*
	(0.0531)	(0.0531)	(0.0751)
Observations	136	136	136
R^2	0.82	0.98	0.98
Area FE	NO	NO	YES
Year FE	NO	NO	YES

Note: *** indicates $p < 0.01$, ** indicates $p < 0.05$, * indicates $p < 0.1$; values in parentheses are t-statistics.

Table 3 presents the regression results based on nine border provinces. From Table 3, it can be observed that in the Mixed Ordinary Least Squares (OLS) model, Random Effects model, and Fixed Effects model, the core explanatory variable, trade export openness, is significantly positive at higher levels. This suggests that trade export openness is conducive to an increase in employment levels, rendering the regression results reliable. Taking the Fixed Effects model as an example, for China's border provinces, a 1% increase in export trade level corresponds to a 0.479% increase in local employment levels. This may be attributed to the elevation of export trade levels, which spurs the development of the local industrial chain in the eight border provinces. This increase satisfies local market demand, prompting local businesses to expand production to maximize profits, consequently generating more employment opportunities.

Regarding other control variables, the growth of average wages for employees in the border region exhibits a positive correlation with employment growth, aligning with our expectations. In practical economic activities, rising average wages boost labor's eagerness and willingness to engage in employment. Foreign Direct Investment (FDI) remains significantly positively correlated with employment levels at the 1% significance level, indicating FDI's distinct role in promoting employment in China's border regions. Typically, FDI generates direct employment effects in the host country, mainly through foreign-invested enterprises establishing local factories and employing local workers for production.

The impact coefficient of infrastructure development on employment maintains a significant negative association. This could be attributed to the challenge faced by many border provinces in absorbing their labor force into local labor markets. Instead, improved infrastructure largely facilitates the movement of people from these border provinces to work in the more developed eastern coastal regions. Gross Domestic Product (GDP) demonstrates a positive correlation with employment, aligning with our expectations. This implies that as the economy continues to develop, it simultaneously drives an increase in employment levels.

Both government intervention and employment exhibit limited significance and negative coefficients. This is likely due to the preference of local governments for capital-intensive industries in the process of attracting investment, aiming to bolster their political performance and fiscal revenue. This could potentially lead to the displacement of relatively labor-intensive small local enterprises.

5.2. Robustness Checks

This section addresses robustness testing in the context of our academic analysis. Previous sections have demonstrated that the overall regression results suggest a positive impact of foreign trade exports in border regions on employment growth, albeit with relatively modest coefficients. However, these coefficients are influenced by the distinctive economic conditions of China's border provinces as opposed to the eastern provinces. In fact, extended periods of decline in certain industries within these border provinces have led to significant labor force outflows, resulting in an absolute reduction in local employment levels. To verify the robustness of the aforementioned findings, we employ two strategies involving the replacement of the core dependent variable.

1) We opt for a substitution approach with the core dependent variable itself. This entails investigating the impact of border regions' foreign trade exports on employment across diverse industries. Specifically, we employ the number of employees in the primary, secondary, and tertiary sectors as alternative dependent variables while keeping control variables constant. Second, to address potential endogeneity issues in the regression analysis arising from the interdependence between a region's industry employment and its historical employment levels, we draw inspiration from Liu Jun's research [2]. We introduce first-order lagged values of total employment in the three major industries, effectively mitigating endogeneity concerns associated with the dependent variable in the model. This approach serves to enhance the robustness of our analysis.

Table 4: The robustness test

	Endogenous problem				
	primary industry	secondary industry	tertiary industry	A lag phase	Additional variable
lnEX	0.245*	1.221***	0.699**	0.419**	0.479***
	(0.134)	(0.394)	(0.314)	(0.206)	(0.158)
Observations	136	136	136	128	136
R^2	0.97	0.94	0.98	0.98	0.94
Area FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

Note: *** indicates $p < 0.01$, ** indicates $p < 0.05$, * indicates $p < 0.1$; values in parentheses are t-statistics.

According to Table 4, we can observe that regardless of whether the core explanatory variable is changed or first-order lags are introduced, there remains a significant positive correlation between trade exports and employment. However, the positive impact of export trade on employment in the secondary sector is much greater than in other sectors. This is because the industrial structure of China's border provinces still largely revolves around the secondary sector, and the exported products are mostly related to industries in this sector.

2) Supplementary Variable Method. In the aforementioned regression analysis, most of the control variables we selected fall within the realm of fiscal policy, overlooking the significance of monetary policy. Therefore, following the approach of Dai Yu, we incorporate the lagged interest rate (4 periods) into the model to consider the impact of monetary policy on export trade's effect on employment [7]. The test results in Table 4 indicate that with the inclusion of the central bank's interest rate, the direction and significance of the core explanatory variable's impact remain fundamentally unchanged. The conclusion aligns with the results obtained from the baseline regression estimation, demonstrating the robustness of the original findings.

5.3 Heterogeneous Analysis Based on Regional Disparities

While all eight border provinces are categorized as border regions, significant economic development disparities exist among them due to historical factors and geographical differences. To address this, we intend to divide China's border regions into two distinct areas based on geographical positioning: Inland Border Regions (Yunnan, Xinjiang, Inner Mongolia, Heilongjiang, Gansu) and Coastal Border Regions (Jilin, Liaoning, Guangxi). This division allows us to contrast the variations in employment levels resulting from foreign trade exports in different regions.

Table 5: Results of the heterogeneity analysis

Explanatory variable	Inland area	Foreland
lnEX	0.883***	-0.707***
	(0.221)	(0.224)
LnW	-0.238	0.470*
	(0.217)	(0.248)
lnFDI	0.0291**	0.0111
	(0.0142)	(0.0164)
lnInfra	-1.781***	-0.455**
	(0.272)	(0.195)
lnGDP	0.184*	-0.0585
	(0.0935)	(0.0561)
lnGoverment	0.131	0.229**
	(0.0999)	(0.0961)
Observations	140	140
R^2	0.99	0.97
Area FE	NO	NO
Year FE	NO	NO

Note: *** indicates $p < 0.01$, ** indicates $p < 0.05$, * indicates $p < 0.1$; values in parentheses are t-statistics.

Table 5 presents the impact of local export trade on employment levels in China's Inland Border Regions and Coastal Border Regions. The results reveal a distinct pattern: In the Inland Border Regions, there is a significant positive correlation between export trade and employment levels, while in the Coastal Border Regions, there exists a significant negative correlation between export trade and employment levels. This suggests that in the Inland Border Regions, trade exports continue to foster a relationship of expanding domestic market demand, boosting production capacity, and driving employment. However, in the Coastal Border Regions, the effect of trade exports on employment is reversed, as an increase in trade exports seems to decrease local employment levels.

Possible explanations for this phenomenon lie in the fact that with the growth of export trade, enterprises in the Coastal Border Regions have increasingly adopted automated production methods, reducing the need for manual labor. Furthermore, the provinces of Jilin and Liaoning, which are part of the Coastal Border Regions, have experienced long-term population outflows. The loss of a significant labor force and the impact of policy changes have influenced the results of the regression analysis.

6. Research Conclusions and Policy Validation

6.1 Research Conclusions

This study focuses on the eight border provinces of China, investigating the impact of export trade on local employment levels. The results indicate that the growth of export trade continues to have a positive significance on overall employment levels in the border regions. Furthermore, robustness tests and heterogeneous analyses suggest that, compared to the primary and secondary sectors, export trade has a more pronounced effect on employment growth in the tertiary sector. Export trade also plays a more positive role in boosting employment levels in China's inland border provinces, while it has a counteractive effect on employment levels in the coastal border regions. The research conclusions remain significant after addressing endogeneity issues and conducting robustness tests to eliminate outliers.

6.2 Policy Recommendations

1) Embrace Eastern Industrial Transfer and Expand Export Trade: The influence of export trade on employment growth in the border provinces is relatively limited due to their industrial structures. The provinces have long been dominated by monotonous, resource-intensive, and capital-intensive industries. These industries provide fewer job opportunities compared to labor-intensive sectors. Meanwhile, in the eastern provinces, there is a need for the transfer of labor-intensive industries. Eastern provincial governments should facilitate the transfer of labor-intensive industries to the western border provinces, seizing the opportunity to attract businesses through proactive policies[8].

2) Engage in Targeted Foreign Trade with Neighboring Countries and Improve Marketing Networks: The border provinces share cost and information advantages when engaging in foreign trade with neighboring countries. To develop foreign trade effectively, the provinces need to produce high-quality products suitable for neighboring markets and establish robust marketing systems. Southwest border provinces should leverage the opportunity provided by the RCEP, showcasing their advantages to trade partners through initiatives like the Greater Bay Area Economic Cooperation Forum and China-ASEAN Business and Investment Summit. Northeastern border provinces should deeply integrate into the Belt and Road Initiative, establishing a hub for Northeast Asian economic and trade cooperation. Northwestern border provinces should focus on enhancing economic and trade cooperation mechanisms with countries like Russia and Mongolia, and expand trade volumes with Central Asian nations such as Kazakhstan, Uzbekistan, Turkmenistan, and Kyrgyzstan.

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