Proceedings of the 4th International Conference on Global Politics and Socio-Humanities
DOI: 10.54254/2753-7048/2026.34412

The Impact of the Launch of International Cargo Routes at Ezhou Huahu Airport on Regional Trade

Aize Zhang

Management School, University of Liverpool, Liverpool, UK
A.Zhang12@student.liverpool.ac.uk

Abstract. In recent years, air cargo infrastructure develops fast. Airport-based logistics hubs play a key role in promoting regional trade, and this issue has attracted increasing attention from researchers and policymakers because it can provide important implications for both theory and practical policy making. The study examines the impact on regional trade. Monthly data are used, and Synthetic Control Method (SCM) is applied to evaluate how the launch of international cargo routes at Ezhou Huahu Airport affects regional trade in Wuhan Customs District, which can help people understand the policy effect and provide reference for future planning. Results show there is a positive gap between Wuhan and its synthetic counterpart after the policy started, and this gap persists over time, which suggests that enhanced air cargo connectivity can promote regional trade. The study finds this effect comes mainly from export side. It is worth noting that exports show sustained increase. But imports have weaker response and are more volatile. Also, dynamic analysis shows the impact accumulates over time and it does not appear immediately. Placebo tests and RMSPE ratio analysis confirm the observed effect should not be caused by random fluctuations. Mechanism analysis shows air cargo capacity has greater influence than route expansion, and this indicates capacity utilization is key channel through which air cargo development can improve trade performance. These findings show it is important to enhance both connectivity and capacity to support regional trade growth.

Keywords: Air Cargo Connectivity, Regional Trade, Ezhou Huahu Airport, Synthetic Control Method, Exports

1. Introduction

SF Group is parent company of SF Airlines, which is the largest cargo airline in China. Since June 2013, they started to plan a dedicated cargo hub airport in central and western China. It is worth noting that the development process is complex and takes a long time because it includes site selection, regulatory approvals, construction work and also other procedures that should be completed step by step, and this process requires coordination with multiple government departments. Ezhou Huahu Airport started operation in July 2022 under IATA code EHU. At the beginning, it only served domestic cargo routes. Then in April 2023, the first international cargo route was opened when SF Airlines started to operate flights to Liège using a Boeing 747-400F.

© 2026 The Authors. This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/).

DOI: 10.54254/2753-7048/2026.34412

After that, the airport expanded its international network. It now operates 53 international cargo routes, connecting over 20 cities and forming an extensive air cargo hub.

Recently, China has paid more attention to development of air transport logistics infrastructure. Airport-based logistics hubs are important nodes for regional economic development. Also, it is shown in previous studies that these hubs can create spillover effects by improving infrastructure and strengthening regional economic capacity, so it can promote regional trade and economic growth [1]. Ezhou Huahu Airport is the first dedicated cargo hub in China, and it has expanded its international cargo network since 2023. The study can use this case to examine how improved air cargo capacity affects regional trade.

Ezhou Huahu Airport is in this district. The study uses monthly data and Synthetic Control Method (SCM) to see how opening international cargo routes at this airport can affect regional imports and exports, and this approach is expected to help people understand the policy effect in the whole region. The analysis treats imports and exports separately. Also, the study includes variables like the number of routes and flight frequencies. It is worth noting that these can help people to further investigate the underlying mechanisms.

2. Literature review

Air cargo has a key role in transporting goods with high value and time sensitivity, and it forms a logistics system with speed and reliability [2]. In fact, it is shown that airfares can affect export volumes more than geographical distance, and air transport supports trade competition and competence, and it can improve overall trade performance [3, 4].

Infrastructure development is still a main factor in improving mobility efficiency. In fact, studies about the maritime sector show that some infrastructure, for example port capacity, can promote exports and also create spillover effects for nearby regions [5]. But aviation research shows that the economic benefits of air transport stay in the regions with airports, so local benefits are bigger and spillover effects on neighboring areas are small [6].

In general, it is worth noting that air transport can influence regional economic performance in local areas, and it helps reduce transport costs and improve factor mobility, while physical connectivity between regions can also be improved, so productivity and total economic activity are enhanced [7, 8]. Despite these developments, empirical evidence about the impact of specialized cargo hub airports on regional import and export performance at the customs level is limited. So, air cargo is an important link to global markets.

3. Data description

The study uses monthly data from January 2021 to December 2025 in this study, and this data is collected from the General Administration of Customs of China. The Wuhan Customs District can be seen as the treated unit. The control group includes the Changsha, Kunming, Nanchang, Xi'an, and Zhengzhou customs districts. It is worth noting that the dependent variables are total trade volume, export volume, and import volume.

The study wants to examine the potential mechanism, so the study collects monthly aviation data for Ezhou Huahu Airport from Route Approval Reports published by the Civil Aviation Administration of China (CAAC). It is worth noting that the dataset includes two main indicators. One is route connectivity, which is measured by the number of destinations served, and the other is air cargo capacity, which is measured by weighted monthly flight frequencies.

DOI: 10.54254/2753-7048/2026.34412

4. Methodology

4.1. Empirical strategy

To identify the causal impact of the opening of international cargo routes at Ezhou Huahu Airport on regional trade, an initial Difference-in-Differences (DID) framework was considered. However, the parallel trends assumption was not met, indicating potential bias in DID estimates. Consequently, the Synthetic Control Method (SCM) is adopted to construct a credible synthetic control.

The policy intervention is defined as April 2023, when the first international cargo route at Ezhou Huahu Airport became operational. The Wuhan Customs District is treated as the affected unit, while the remaining regions serve as the control group for constructing the synthetic control.

4.2. Construction of the synthetic control

Let Y_{it} denote the outcome variable for the region i at time t. The treated unit is the Wuhan Customs District. The synthetic control is constructed as a weighted average of control units, as shown in Equation (1).

$$Y_i^{synthetic} = \sum_{j=1}^{J} \omega_j Y_{it} \tag{1}$$

where weights ω_j are non-negative and sum to one.

4.3. Treatment effect estimation

The treatment effect at time t is defined in equation (2).

$$Gap_t = Y_t^{Wuhan} - Y_t^{synthetic} \tag{2}$$

where

$Gap_t > 0$: indicates a positive effect of the policy

$Gap_t < 0$: indicates a negative effect

4.4. Placebo tests

The study also uses placebo tests to check whether the estimated effects are statistically meaningful. The study assigns the treatment to each control unit and estimate the gap for every unit. In this way, the study can see whether the observed pattern is reliable or just appears in a random term. If Wuhan shows a larger gap than the placebo units after the intervention, the effect is less likely to be random.

4.5. RMSPE ratio

The study can examine the treatment effect by comparing the Root Mean Squared Prediction Error (RMSPE) before and after the policy intervention, using post-to-pre RMSPE ratio given by equation (3).

$$RMSPE\ Ratio = \frac{Post-treatment\ RMSPE}{Pre-treatment\ RMSPE} \tag{3}$$

DOI: 10.54254/2753-7048/2026.34412

If the ratio becomes larger after the intervention, it means the treated unit differs more from its synthetic control than before.

4.6. Mechanism analysis

The study wants to understand how international cargo routes at Ezhou Huahu Airport may affect regional trade. So, the study introduce two variables: route connectivity and air cargo capacity. These two variables change over time and may show similar trends across regions. When time effects are included in the model, their direct effects may be absorbed and become difficult to identify. So, the study uses interaction terms to identify the effects of these aviation factors on the treated region.

Hence, the identification is given by equation (4).

$$Y_{it} = \alpha + \beta\,(Treat_i \times Aviation_t) + \mu_i + \lambda_i + \varepsilon_{it} \tag{4}$$

Y_{it} denotes the logarithm of total trade, exports, and imports in the region i at time

$Treat_i$ is a dummy variable equal to one for the Wuhan Customs District and zero for other customs

$Aviation_t$ denotes the aviation data

μ_i and λ_i denote region- and time-fixed effects, respectively.

β captures the effect of aviation factors on the treated region

It should be noted that this mechanism identification provides only suggestive evidence of the underlying mechanism, not a strong causal identification, as the aviation variables may still be correlated with other time-varying factors.

5. Results

5.1. Baseline results

After the SCM method is implemented, some findings can be observed. Figure 1 compares the treated unit with its synthetic control. Before international routes at Ezhou Huahu Airport began operations, the synthetic control tracked the observed trend in Wuhan, and the pre-treatment fit was good. It is worth noting that the estimated gaps fluctuate around zero during the pre-treatment period. So, the study can say that the synthetic control can serve as a credible counterfactual.

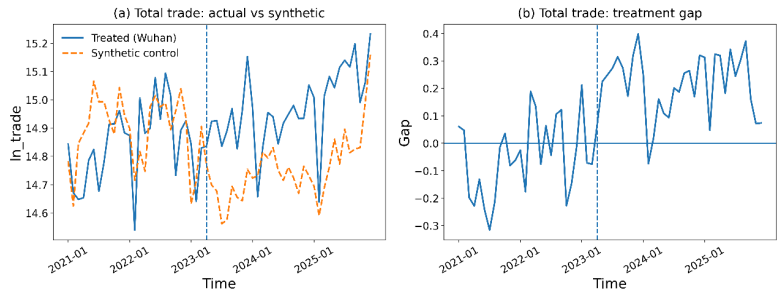


Figure 1. Baseline effects of the policy on total trade. The vertical dashed line indicates the timing of the policy intervention (April 2023)

After the international cargo routes opened at Ezhou Huahu Airport, the observed gaps became positive and clear, which indicates that actual trade performance surpassed the synthetic control. The

DOI: 10.54254/2753-7048/2026.34412

gap size increased over time, and it reached 0.4 log points in the later period. It is worth noting that these results indicate that the effect of the new routes may be cumulative rather than immediate.

Figure 2 also shows the heterogeneity of trade components. The export gap increased rapidly after the launch of the routes, and it remained positive for most of the post-treatment period. So, the response was more obvious and long-lasting. But the import gap showed more volatility, with deviations fluctuating around zero, so the effect was weaker and less stable. In fact, the divergence between the treated unit and the synthetic unit was clearer for exports than for imports.

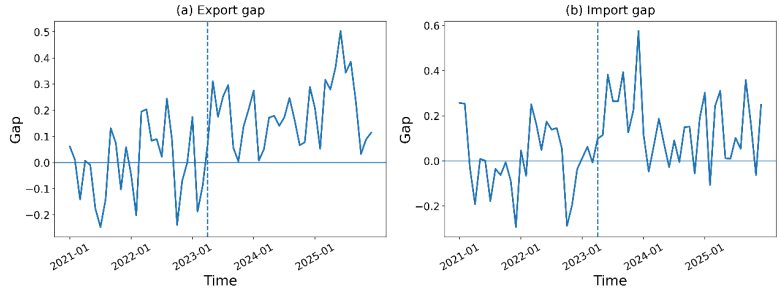


Figure 2. Treatment effects on trade components. The vertical dashed line indicates the timing of the policy intervention (April 2023)

5.2. Dynamic effects

The study examines how the treatment affects exports and imports over time. Figure 3 shows the movements of the treated unit and the synthetic control. Before the international routes were launched, the two lines had a very similar trend, and this can confirm the validity of the Synthetic Control Method. After the launch, the gap between the treated unit and the synthetic control became larger. This suggests that the policy effect did not appear immediately but increased over time. The dynamic patterns are different for exports and imports. For exports, the treated unit started to deviate from the synthetic control relatively early after the launch, andthe study can observe that the gap between them continued to grow over time. This may indicate that the export effect was relatively persistent. In contrast, the gap in imports was less systematic. In fact, it exhibited short-term fluctuations. This suggests that the response was weaker and less persistent.

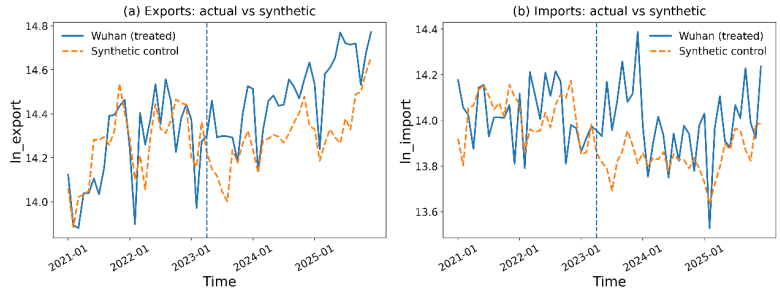


Figure 3. Dynamic effects of the policy on trade components. The vertical dashed line indicates the timing of the policy intervention (April 2023)

5.3. Placebo tests

To check whether the estimated effect is really related to the policy rather than random variation in the data,the study conduct placebo tests for each control unit. Figure 4 reports the gaps for Changsha, Kunming, Nanchang, Xi'an, and Zhengzhou. Compared with Wuhan, these placebo units

DOI: 10.54254/2753-7048/2026.34412

do not show a clear and lasting divergence after the intervention. Most of their gaps remain close to zero, and no obvious long-term pattern can be observed. Although several temporary deviations appear in some periods, they do not last for long and are not consistently positive. By comparison, the divergence for Wuhan is larger in magnitude and also more stable over time. This indicates that the observed pattern is not common across different regions and should be specific to the treated unit.

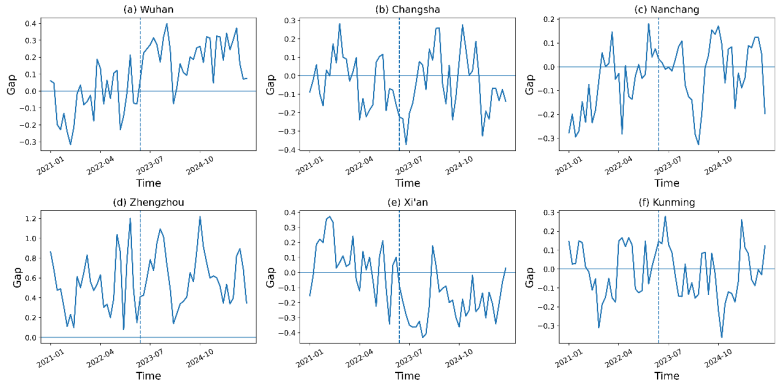


Figure 4. Placebo tests for total trade. The vertical dashed line indicates the timing of the policy intervention (April 2023)

5.4. RMSPE ratio analysis

Figure 5 shows the distribution of RMSPE ratios. Wuhan has the highest value. This indicates deviation between observed outcomes and synthetic outcomes can increase after the intervention, andthe study can see in principle the gap between actual data and predicted results becomes larger than before, so the prediction error is expected to grow. In contrast, placebo units show smaller changes. Also, there is no comparable increase in prediction error for these units. It is worth noting that this pattern suggests the divergence observed for Wuhan may not be driven by random variation.

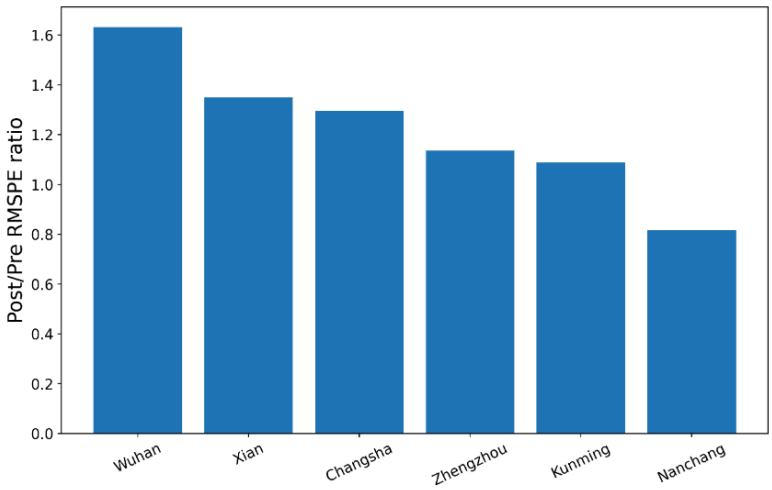


Figure 5. Post-treatment to pre-treatment RMSPE ratios across units

DOI: 10.54254/2753-7048/2026.34412

5.5. Robustness check

The study check robustness by repeating the analysis after Zhengzhou is excluded from the control group. Figure 6 shows the overall pattern is unchanged. In fact, the pre-treatment fit is still close. Also, the post-treatment gap remains positive and follows a similar upward trend. The magnitude of the divergence can be compared to the baseline results. It can be seen that the findings may not be driven by any single control unit.

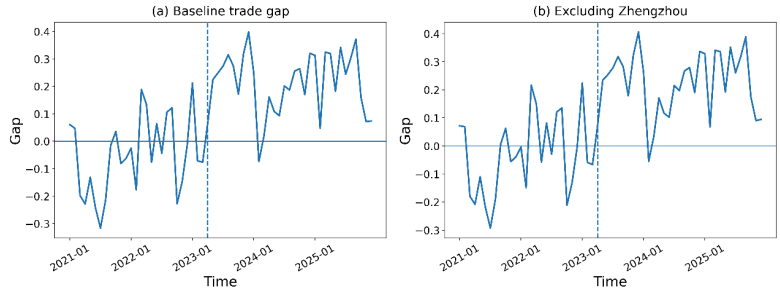


Figure 6. Robustness check excluding Zhengzhou. The vertical dashed line indicates the timing of the policy intervention (April 2023)

5.6. Mechanism analysis: air cargo capacity and routes

The study report in Table 1 the results for air cargo capacity measured by flight frequency.the study can see that the interaction term between capacity and the treatment indicator is positive and weakly significant for total trade and exports, while for imports it is close to zero and has no statistical significance. This pattern suggests that increases in flight frequency are more associated with export activity than with imports. In fact, one possible explanation is that higher flight frequency can improve delivery speed and reliability, which are important for time-dependent and high-value goods transported by air, and exporters may care more about these factors than importers do in this context. Also, increased flight frequency reflects an expansion of effective transport capacity, which can enhance economies of scale in the air cargo market and reduce per-unit transportation costs, and this can help promote trade growth [9].

Table 1. Mechanism analysis: air cargo capacity

	(1)	(2)	(3)
	ln_trade	ln_export	ln_import
Treat × Capacity	0.000*	0.001*	0.000
	(0.000)	(0.000)	(0.000)
Observations	204.000	204.000	204.000
R-squared	0.908	0.939	0.783

Region FE: Yes, Time FE: Yes,

Standard errors in parentheses, * p<0.1, ** p<0.05, *** p<0.01

The study show the route connectivity results in Table 2, where the estimated effects are weaker compared with capacity. The interaction term is positive, though it is only marginally significant for exports and not statistically significant for total trade or imports, which indicates a limited role of connectivity.This means that expanding the number of destinations alone may not lead to stronger

DOI: 10.54254/2753-7048/2026.34412

trade performance. Also, connectivity can increase market access and reduce trade frictions, but its effect can depend on the availability of sufficient transport capacity. Without enough cargo volume and operational frequency, expanded routes can improve network coverage but do not necessarily lead to higher shipment volumes, which is consistent with the role of connectivity discussed in the literature [10].

Table 2. Mechanism analysis: route connectivity

	(1)	(2)	(3)
	ln_trade	ln_export	ln_import
Treat × Routes	0.008	0.014*	-0.000
	(0.005)	(0.006)	(0.005)
Observations	204.000	204.000	204.000
R-squared	0.908	0.940	0.783

Region FE: Yes, Time FE: Yes,

Standard errors in parentheses, * p<0.1, ** p<0.05, *** p<0.01

6. Conclusion

The study uses the Synthetic Control Method (SCM) to examine how the opening of international cargo routes at Ezhou Huahu Airport affects regional trade in Wuhan Customs District. Results show there is a positive deviation after the treatment and this can demonstrate that improved air cargo connectivity should promote regional trade. Exports are the main driver. But the impact on imports is weak and not stable. Also, the study look at the mechanism and it is found that air cargo capacity measured by flight frequency can be the key factor rather than route expansion if the study want to improve trade performance. These results can have some implications. First, building the air cargo infrastructure can help regional trade grow. In fact, exports are the main source. Next, policies should focus on adding more international routes. At the same time, improving transport capacity and system efficiency is also important.

One limitation of this study is that, the estimated effect is relatively mild, and the placebo tests also present some differences among control units. Because of this, the findings should be interpreted with some caution. Another issue comes from the SCM approach itself. The results depend on how closely the synthetic control can match the actual trend of Wuhan before the policy intervention, while some unobserved factors appearing after the intervention may be difficult to identify and influence the estimates.

There are also several limitations related to the data. The aviation variables used in this study are based on approved flight schedules rather than actual flight operations. So, they may not fully reflect real transportation conditions. In addition, custom-level data may not completely capture the total trade effect, because Ezhou Huahu Airport can influence areas outside the Wuhan Custom District. Another limitation is that the post-treatment period is relatively short, making it difficult to evaluate possible long-term impacts.

Future research can continue to study this topic when more effective data are available. For example, a longer observation period may help show whether the trade effect changes over time. More detailed operational data may also improve understanding of how air cargo development affects regional trade. In addition, firm-level or product-level data may provide more detailed

DOI: 10.54254/2753-7048/2026.34412

evidence of the benefits of air cargo connectivity. Comparative studies across different cargo hubs may also help examine whether similar results can be observed in other regions.

References

[1] Shi, X., & Hu, Y. (2025). Evolution and spatial effects of airport-based national logistics hubs in China. Economic Geography, 45(11), 119–128.
[2] Puente-Mejia B, Lange A. (2025) Characterizing global air cargo: A study profiling air cargo operations worldwide. Journal of Transport Geography, 127: 104260.
[3] Fu, X., Oum, T. H., Zhang, A. (2010) Air transport liberalization and its impacts on airline competition and air passenger traffic. Transportation journal, 49(4): 24-41.
[4] Yamaguchi, K. (2008) International trade and air cargo: Analysis of US export and air transport policy. Transportation Research Part E: Logistics and Transportation Review, 44(4): 653-663.
[5] Jiang, M., Zhao, S., Jia, P. (2023) The spatial spillover effect of seaport capacity on export trade: Evidence from China pilot free trade zones. Ocean & Coastal Management, 245: 106879.
[6] Ceulemans E, Buyle S, Beckers J. (2025) Connected or not? The value of air connectivity for regional development in Europe. Regional Studies, 59(1): 2360649.
[7] Wong, D. W. H., Zhao, S. X. B., Lee, H. F. (2022) Air transport, economic growth, and regional inequality across three Chinese macro-regions. Geographical Research, 60(3): 446-462.
[8] Oum, T. H., Wu, X., Wang, K. (2024) Impact of air connectivity on bilateral service export and import trade: The case of China. Transport Policy, 148: 219-233.
[9] Lin, H., Luo, J., Nan, G. (2025) The effects of different subsidy policy modes on China's air cargo market: The all-cargo airline and scale economies perspective. Journal of Air Transport Management, 128: 102844.
[10] Oesingmann, K. (2022) The determinants of air cargo flows and the role of multinational agreements: An empirical comparison with trade and air passenger flows. The World Economy, 45(8): 2370-2393.