Regional economic impacts of military exercise: Evidence from nighttime light data

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Regional economic impacts of military exercise: Evidence from nighttime light data

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Abstract
The economic impacts of armed conflicts and geopolitical risks have been widely studied. However, the effects of large-scale military exercises remain largely unexplored. Accordingly, this study investigated the People's Liberation Army exercises in the Taiwan Strait, an understudied and recurrent source of geopolitical tension. Using county-level monthly nighttime light data and a difference-in-differences approach, we found that monthly nighttime lights in Fujian's coastal areas increased by 6.4%, suggesting a 1.9% boost in local GDP. These results highlight that military exercises, beyond their signaling role in geopolitics, may generate short-term stimulus effects on regional economies in mainland China.

Keywords
Military exercise, economic stimulus, People's Liberation Army, difference-in-difference, nighttime light

Highlights
- We examine the local economic impacts of People's Liberation Army military exercises in the Taiwan Strait.
- Using monthly county-level nighttime light data and DID design, we identify causal effects.
- Military exercises increased monthly nighttime lights by 6.4%, implying a 1.9% rise in local GDP.
- Results suggest short-term stimulus effects outweigh disruptions to fishing and transport.

1. Introduction

Armed conflicts and geopolitical tensions have profound economic consequences. The economic effects of wars and conflicts have been widely investigated (Abadie and Gardeazabal, 2003; Rohner, 2024), as well as the impact of military spending on economic growth (Alptekin and Levine, 2012; Saeed, 2025) and the closure of military bases on local economies (Fortuna, et al., 2022; Dahlberg, et al., 2024). However, despite the growing prominence of large-scale military exercises as a visible manifestation of geopolitical risk, their direct impact on real economic activity lacks sufficient research. Existing work has largely focused on the environmental and health effects of training exercises, such as long-term pollution from bombing ranges (Bobonis, et al., 2020).

This gap is particularly relevant in East Asia, where geopolitical risks have risen markedly since the late 2010s (Caldara and Iacoviello, 2022). For instance, in the Taiwan Strait, repeated large-scale military drills by the People's Liberation Army (PLA) represent a major source of uncertainty. Prior studies have shown their effects on financial markets and investment decisions in China and Taiwan (Wang et al., 2025; Bai et al., 2025). However, no existing research has measured the short-run, local economic effects of military exercises.

This study provides, to the best of our knowledge, the first empirical evidence that large-scale military exercises stimulate local economic activity. Using monthly county-level nighttime light data and a difference-in-differences (DID) design, we estimated the effects of the PLA's military drills conducted in the Taiwan Strait on the coastal regions of mainland China. Our baseline estimates suggest that these exercises led to a 6.4% increase in nighttime light intensity in Fujian's coastal counties, corresponding to a 1.9% increase in local monthly GDP.

The findings of this study contribute to the literature in two ways. First, they demonstrate that military exercises, beyond their geopolitical and security dimensions, can also act as short-term economic stimuli. Second, they suggest that recurrent military drills in the Taiwan Strait can function as a de facto economic policy, with measurable regional economic effects.

2. Data and empirical strategy

2.1 Data

We constructed a monthly balanced panel dataset using nighttime light data collected from the Visible Infrared Imaging Radiometer Suite (VIIRS) provided by the Defense Meteorological Satellite Program. Our dependent variable (the radiance values obtained from the VIIRS Day/Night Band) represents the intensity of nighttime lights observed at the Earth's surface and is expressed in units of nanowatts per square centimeter per steradian (nW/cm²/sr). Several papers demonstrated that the night light intensity variation reflects various economic activities, including the manufacturing and service sectors. Following Elvidge et al.'s (2017) methodology, the raw satellite data were filtered at multiple stages to remove contamination. Our dataset covers the period before and after the military exercise, that is, September 2022–June 2025.

2.2 Empirical strategy

The DID estimation model used in this study is specified as follows:

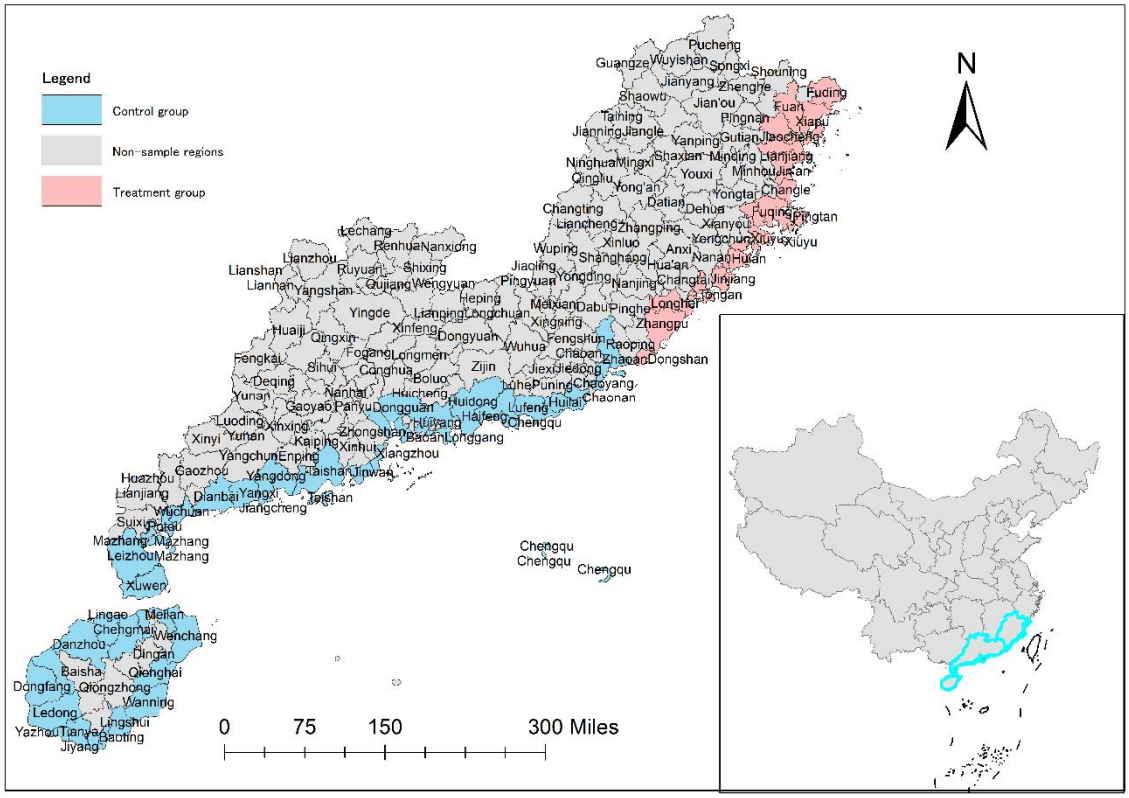
$$\text{asinh}(radiance_{it}) = \alpha_0 + \alpha_1 T_t * D_i + \tau_t + \delta_i + \varepsilon_{it} \quad (1)$$

where $radiance_{it}$ represents nighttime light intensity in city *i* at month *t*, and D_i and T_t are dummy variables indicating the treated areas and intervention period (a specific month), respectively. $T_t * D_i$, ε_{it}, and α_0 are the treatment, error, and constant terms, respectively. To address nightlight data seasonality and unobserved factors, we controlled for monthly and region fixed effects by τ_t and δ_i, respectively. Following Blakeslee et al.'s (2022) approach, we used inverse hyperbolic functions (asinh function) to transform nightlight data and thus account for the skewed distribution and the presence of zero or near-zero observations for our baseline. Alternatively, we estimated the model by using the $\log(radiance_{it})$ for a robustness check and interpretation.

The unit of analysis is the third-level administrative unit, namely, the county level, in mainland China. In the baseline specification, the intervention period dummy variable contains three military exercises: Joint Sword 2023, 2024A, and 2024B on April 2023, May 2024, and October 2024, respectively. These three months are coded as $T = 1$, and the rest are coded as $T = 0$.

In this study, the definition of the treatment group regions is a critical element. These military exercises are being conducted by the PLA's Eastern Theater Command as stated by the Chinese Ministry of National Defense. The Eastern Theater Command is one of the five major military regions of the PLA, including Jiangsu, Shanghai, Zhejiang, Fujian, Jiangxi, and Anhui. Among these, Fujian Province, located closest to Taiwan's coastal areas, has numerous military facilities and is most deeply involved in the aforementioned military exercises. By contrast, coastal areas of Guangdong Province and Hainan Island are not participating in the exercises by jurisdictional design despite their geographical proximity and similar socio-economic conditions to Fujian's coastline. Thus, in the baseline estimation, the coastal counties of Fujian Province are treated as the treatment group, whereas those of Guangdong Province and Hainan Island serve as the control group (Figure 1). Appendix Note 1 describes further background information on these military exercises.

Figure 1. Treatment group and control group in the baseline



Source: Drawn by authors.

2.3 Positive and negative mechanisms

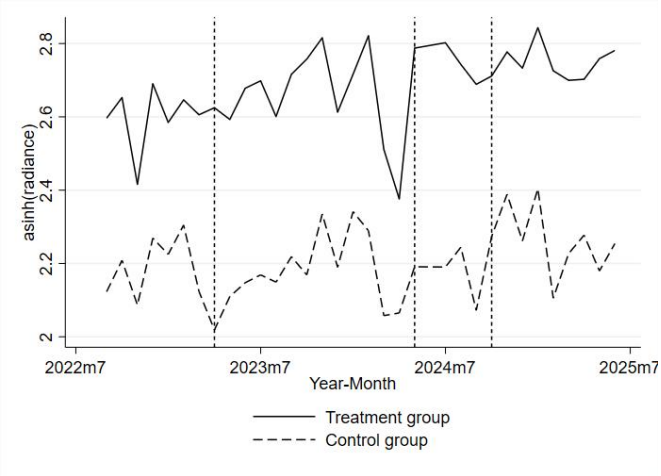
Maritime military exercises can have negative and positive economic effects.

Negative economic effects can arise from the disruption in the fishing industry and transportation activities. We confirmed this point using VIIRS Boat Detection data that measure the number of ships at sea based on sensor information from satellites. The data revealed that the number of ships in Taiwan's exclusive economic zone (EEZ) decreased during the PLA's military exercises in 2023 and 2024 (for details, see Appendix Note 2). The restriction on fishing activities may reduce economic activities, including production and consumption, in areas where these fishermen reside.

In contrast, the mobilization of numerous military aircraft and ships can generate positive economic effects. In addition to the soldiers directly participating in the exercises, numerous support personnel are likely mobilized at related facilities. Large-scale exercises typically involving tens of thousands of people likely stimulate various economic activities before and after the event.

As noted above, military exercises in the ocean produce positive and negative economic effects. Thus, we estimat the net effect. We examine the trends in nighttime lights for the treatment and control groups (Figure 2). Across the three exercises, no group-specific pre-trends were observed in either group before the events (see Appendix Figure A.2 for log transformation).

Figure 2. Parallel trend examination (asinh transformation)



Source: Authors' estimation.

3. Results

3.1 Baseline DID estimation

Table 1 reports the DID estimation results. Nighttime lights in the treatment regions significantly increased at the 1% level during the months of the exercises using the asinh and log transformations and rose by 6.4% under the log specification. This result translates into a 1.92% (6.4 × 0.3) increase in local economic activity based on the elasticity between GDP and lights estimated by Henderson et al. (2012), implying that a 1% increase in light intensity corresponds to a 0.3% increase in GDP. The combined Gross Regional Product (GRP) of the 25 affected regions in 2023 was RMB 2645.4 billion or RMB 220.4 billion monthly. Accordingly, the estimated 1.9% increase corresponds to RMB 4.189 billion (220.451 × 0.019), approximately USD 592 million per time.

When the estimations were conducted separately for each exercise, particularly strong effects were observed for Joint Sword 2023 and 2024A. In these cases, nighttime lights increased by 10%, corresponding to a 3% rise in monthly GDP (Appendix Table A.2). The relatively weaker effect of Joint Sword 2024B is likely attributable to its one-day duration (see Appendix Table A.1). Nevertheless, the estimated coefficient remains positive and statistically significant at the 10% level.

Table 1. Estimated effects of military exercises

	(1) asinh(*radiance*)	(2) log(*radiance*)
Treat * Post	0.075***	0.064***
	(0.0183)	(0.0149)
Constant	2.373***	1.890***
	(0.0006)	(0.0004)
Month FE	Y	Y
Prefecture FE	Y	Y
Adjusted R-squared	0.97	0.97
Observations	2277	2277

Note: *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.
Source: Authors' estimation

3.2 Robustness checks

We conducted several additional estimations to assess the robustness of our findings.

First, we implemented a propensity score matching DID (PSM-DID) approach (Heckman et al., 1998). PSM-DID estimates causal effects by balancing the attributes of treatment and control groups using covariates. Thus, the endogeneity problem can be mitigated. In our case, the estimation focused exclusively on Joint Sword 2023 because county-level covariates are only available up to 2023. Monthly nighttime light data from September 2022 to December 2023 were used for this

estimation. The covariates employed include the respective share of secondary and tertiary industries in GRP, population size (log-transformed), population density (persons/km²), and per capita GRP (log-transformed). We applied the nearest-neighbor matching method to pair treatment and control counties with a 1:1 matching method. As shown in Table 2, the estimated coefficients are larger than those obtained in the baseline specification.

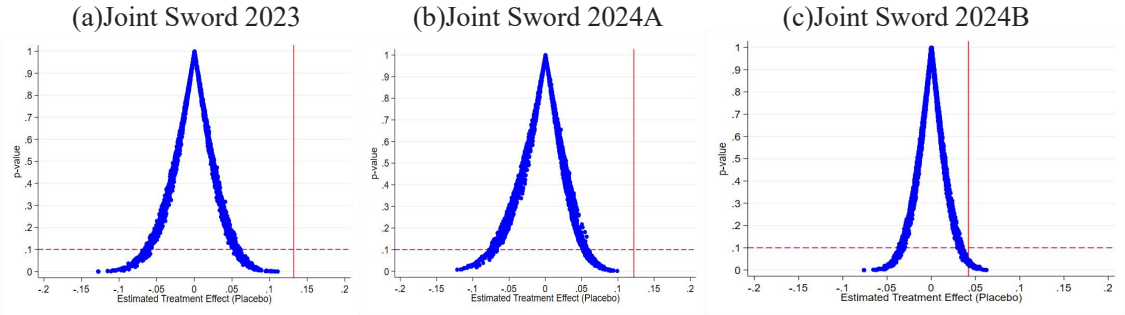
Table 2. PSM-DID results

	Joint Sword 2023	
	(1) asinh(*radiance*)	(2) log(*radiance*)
Treat * Post	0.151***	0.126***
	(0.0299)	(0.0245)
Constant	3.814***	2.941***
	(0.6316)	(0.4567)
Matching	Y	Y
Month FE	Y	Y
Prefecture FE	Y	Y
Adjusted R-squared	0.98	0.98
Observations	1100	1100

Note: *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.
Source: Authors' estimation

Second, we conducted a placebo permutation test to verify the robustness of the baseline estimates. Specifically, we randomly reassigned the treatment group 3000 times and re-estimated the model using log- and asinh-transformed nighttime light intensities. Figure 3 shows that the distribution of the placebo estimates centers on zero, with p-values exceeding 0.1 in most cases. In contrast, the actual estimates (indicated by the red line) are located far in the upper tail of the distribution. Therefore, the observed effects are unlikely to have occurred by chance (see Appendix Figure A.3 for log transformation). Although the results for Joint Sword 2024B are relatively weaker, the p-value remains below 0.1 as mentioned.

Figure 3. Placebo permutation results (asinh transformation)



Third, we conducted an alternative estimation by broadening the definitions of the treatment and control groups. As noted in Section 2.2, Jiangsu and Zhejiang belong to the Eastern Theater Command, whereas Shandong does not. Accordingly, we define the treatment group as counties in Fujian, Jiangsu, and Zhejiang Provinces (included in the Eastern Theater Command) and the control group as counties in Guangdong, Hainan, and Shandong Provinces. Appendix Table A.3 shows that the estimated positive effects on the treatment group remain statistically significant at 1% level and are qualitatively consistent with the baseline results. Moreover, the smaller estimated treatment effect than in the baseline specification is logically consistent as the treatment group has been expanded.

Fourth, we restricted the treatment group to areas within Fujian Province that are likely to be most directly affected. Based on publicly available information, we identified 22 counties hosting

the PLA's bases and facilities and defined them as the treatment group (see Appendix Note 3 for the list of counties). Appendix Table A.4 shows that the estimated coefficient under the asinh transformation is smaller than the baseline estimate, whereas the log transformation yields a slightly larger estimate than the baseline. The evidence confirms that the positive economic impact of the military exercises is robust.

4. Conclusion

This research contributes to the literature by providing empirical evidence of the economic impact of military exercises, an increasingly common but underexplored aspect of geopolitical risks. Our results reveal an underexplored feature of military exercises: their potential to generate economic stimulus effects by mobilization outweighs the disruption to fishing and transportation activities. In regions where geopolitical tensions are rising, military activities may not only pose security risks but also act as localized economic stimuli, at least in the short run. Although the level of analysis differs, these results are broadly consistent with the positive correlation between military expenditure and economic growth found in macro-level meta-analysis (Alptekin and Levine, 2012).

Nevertheless, important limitations remain. First, the effects estimated in this study captured only short-term, monthly impacts. The long-term consequences remain unclear. Second, our analysis focused exclusively on the PLA's Joint Sword exercises. Future research that incorporates a broader range of exercises would provide more robust estimates and reveal heterogeneity across exercise types and/or regions.

Declaration of Interest
None

Data Availability Statement
The nighttime light data used in this study are publicly available from the Earth Observation Group (EOG) at https://eogdata.mines.edu/products/vnl/.

Disclosure of Interest
No potential conflicts of interest were reported by the authors.

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References

Abadie, A., Gardeazabal, J., 2003. The economic costs of conflict: A case study of the Basque Country. Am. Econ. Rev. 93, 113–132. https://doi.org/10.1257/000282803321455188

Alptekin, A., Levine, P., 2012. Military expenditure and economic growth: A meta-analysis. Eur. J. Polit. Econ. 28, 636–650. https://doi.org/10.1016/j.ejpoleco.2012.07.002

Bai, H., Hong, Z., Niu, L., 2025. Geopolitical risk and Taiwan's government bond yields: Evidence from Nancy Pelosi's visit. Financ. Res. Lett. 78, 107174. https://doi.org/10.1016/j.frl.2025.107174

Blakeslee, D., Chaurey, R., Fishman, R., Malik, S., 2022. Land rezoning and structural transformation in rural India: Evidence from the industrial areas program. World Bank Econ. Rev. 36, 488–513. https://doi.org/10.1093/wber/lhab004

Bobonis, G.J., Stabile, M., Tovar, L., 2020. Military training exercises, pollution, and their consequences for health. J. Health. Econ. 73, 102345. https://doi.org/10.1016/j.jhealeco.2020.102345

Caldara, D., Iacoviello, M., 2022. Measuring geopolitical risk. Am. Econ. Rev. 112, 1194–1225. https://doi.org/10.1257/aer.20191823

Dahlberg, M., Martén, L., Öckert, B., 2024. Coping with job loss: Evidence from military base closures. Scand. J. Econ. 126, 440–464. https://doi.org/10.1111/sjoe.12557

Elvidge, C.D., Baugh, K., Zhizhin, M., Hsu, F.C., Ghosh, T., 2017. VIIRS night-time lights. Int. J. Remote. Sens. 38, 5860–5879. https://doi.org/10.1080/01431161.2017.1342050

Fortuna, M.J.A., Teixeira, J.C.A., Silva, F.J.F., 2022. Gone with the winds of peace: The regional economic effects of military base downsizings and closures. Def. Peace Econ. 33, 818–841. https://doi.org/10.1080/10242694.2021.1921463
Heckman, J.J., Ichimura, H., Todd, P., 1998. Matching as an econometric evaluation estimator. Rev Econ Studies 65, 261–294. https://doi.org/10.1111/1467-937x.00044
Henderson, J.V., Storeygard, A., Weil, D.N., 2012. Measuring economic growth from outer space. Am. Econ. Rev. 102, 994–1028. https://doi.org/10.1257/aer.102.2.994
Rohner, D., 2024. Mediation, military, and money: The promises and pitfalls of outside interventions to end armed conflicts. J. Econ. Lit. 62, 155–195. https://doi.org/10.1257/jel.20221603
Saeed, L., 2025. The impact of military expenditures on economic growth: A new instrumental variables approach. Defence Peace . Econ. 36, 86–101. https://doi.org/10.1080/10242694.2023.2259651
Wang, D., Li, K., Shen, X., 2025. Fear of war: Geopolitical risks and the potential impact on local government bonds, stock market and FDI in China. Econ. Lett. 251, 112329. https://doi.org/10.1016/j.econlet.2025.112329

Appendix

Appendix Note 1. Background information on the PLA's exercises around Taiwan

The series of Joint Sword exercises reflected China's responses to high-profile political events involving Taiwan. The 2023 exercise was triggered by President Tsai Ing-wen's U.S. transit and meeting with Former House Speaker McCarthy in April, which Beijing condemned as a violation of the "One China" principle. The 2024A exercise, conducted in May, immediately followed the inauguration of President Lai Ching-te, signaling Beijing's opposition to what it views as pro-independence tendencies in Taiwan's new administration. Later that year, the 2024B exercise in October was launched shortly after Lai's National Day speech. The speech reiterated Taiwan's democratic identity and resilience; Beijing used the exercise to reaffirm its deterrence posture and demonstrate its readiness for joint operations around the island.

An important point for the DID estimation design is that these military exercises are conducted by the Eastern Theater Command of the PLA. The Ministry of National Defense of the People's Republic of China has issued press releases for each exercise, explicitly stating that the Eastern Theater Command is responsible for carrying them out. Appendix Table 1 presents the details of these military exercises. Moreover, the military exercise conducted in 2022 following Speaker Pelosi's visit to Taiwan in August was a notable case; however, satellite data for that period contain anomalies that make estimation impossible.[1] Thus, our analysis focused on the Joint Sword exercises conducted from 2023 onward.

Appendix Table A.1. Comparison of Joint Sword Military Exercises.

Name of exercise	Joint Sword 2023 Exercise	Joint Sword 2024A Exercise	Joint Sword 2024B Exercise
Period	3 days: April 8–10, 2023	2 days: May 23–24, 2024	1 day: October 14, 2024
Background	Meeting between President Tsai Ing-wen and Former U.S. House Speaker McCarthy during Tsai's April 4–6 U.S. visit. China announced on April 7 and started the exercise on April 8 in the morning.	Speech by President Lai on the May 20 inauguration. China announced the start of the exercise on May 23 at 08:45.	Speech by President Lai on the October 10 National Day. China announced the exercise at 05:22 on October 14.
Responsive theater	The Eastern Theater Command, PLA	The Eastern Theater Command, PLA	The Eastern Theater Command, PLA
Exercise region and content	Northern, southern, and eastern waters/airspace around Taiwan; blockade-style exercises	Northern, southern, and eastern waters/airspace around Taiwan; blockade-style exercises	Northern, southern, and eastern waters/airspace around Taiwan; blockade-style exercises

[1] The SNPP satellite entered a non-nominal state on June 26th, 2022, and had no data from July 26th to August 10th, 2022. See VIIRS Boat Detection website for the details (https://eogdata.mines.edu/products/vbd/).

	Joint patrols and firepower strikes around Taiwan	Joint patrols, "island encirclement," live-fire exercises, and anti-submarine patrols	Joint patrols, live-fire strikes, and "encirclement" operations
	Anti-submarine exercises and live-fire exercises in the Taiwan Strait		Amphibious landing and coastal blockade exercises
Number of aircraft and vessels on the initial day	71 aircraft (45 crossed the median line)	49 aircraft (35 crossed the median line)	155 aircraft (90 crossed the median line or entered ADIZ)
	9 vessels	15 vessels	17 vessels
		16 coast guard vessels	7 coast guard vessels
Types and scope of exercises	The Fujian Maritime Safety Administration announced prohibited zones and live-fire artillery/missile exercises.	The Chinese Maritime Safety Administration announced prohibited zones and missile/artillery launches.	The Chinese Maritime Safety Administration announced prohibited zones.
	Missile launches into the Taiwan Strait and beyond	Missile launches into the Taiwan Strait, East China Sea, and beyond	Artillery and missile exercises could not be confirmed.
		Rocket artillery launches	

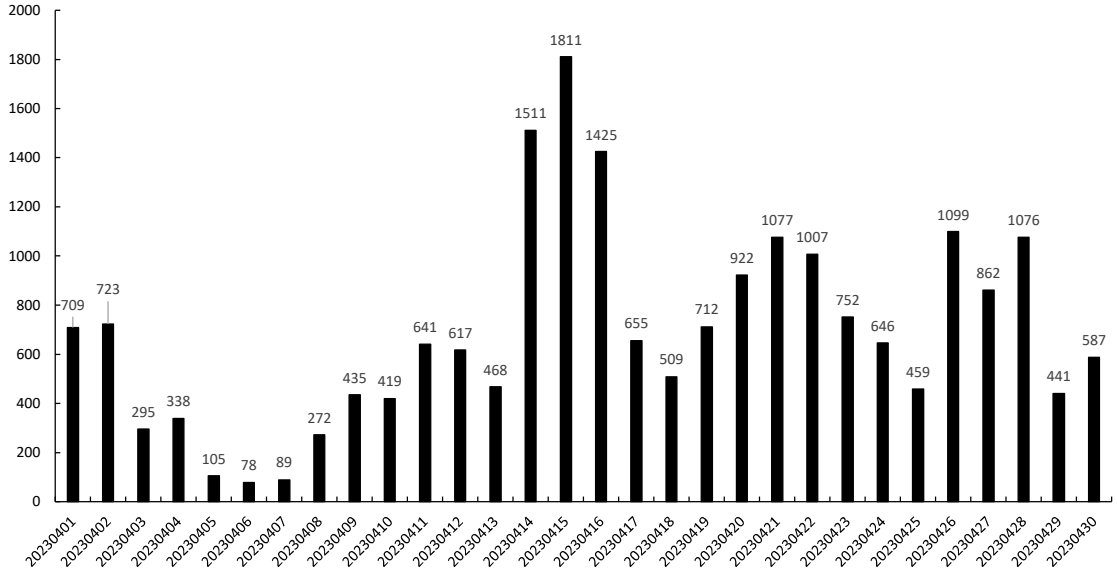
Source: "The Eastern Theater Command will conduct combat readiness patrols around Taiwan and the 'Joint Sword' exercise", April 8th 8:28 am, 2023, Ministry of National Defense of PRC. http://www.mod.gov.cn/gfbw/qwfb/16215315.html. "The Eastern Theater Command is conducting the 'Joint Sword—2024A' exercise around Taiwan", May 23rd 7:47 am, 2024, Ministry of National Defense of PRC. http://www.mod.gov.cn/gfbw/qwfb/16310654.html. "The Eastern Theater Command is carrying out the 'Joint Sword-2024B' exercise". October 14th 5:02 am, 2024, Ministry of National Defense of PRC. http://www.mod.gov.cn/gfbw/wzll/dbzq/16345141.html. [Final access on August 25th, 2025]. Chiwata, Ruriko. 2024. "The Chinese Eastern Theater Command's Taiwan-focused exercise" "Joint Sword-2024B," JASDF Air and Space Studies Institute(JASI) report, October 28th, 2025. https://www.mod.go.jp/asdf/meguro/center/img/JASIresearch20241028.pdf.

Appendix Note 2. Data from VIIRS Boat Detection

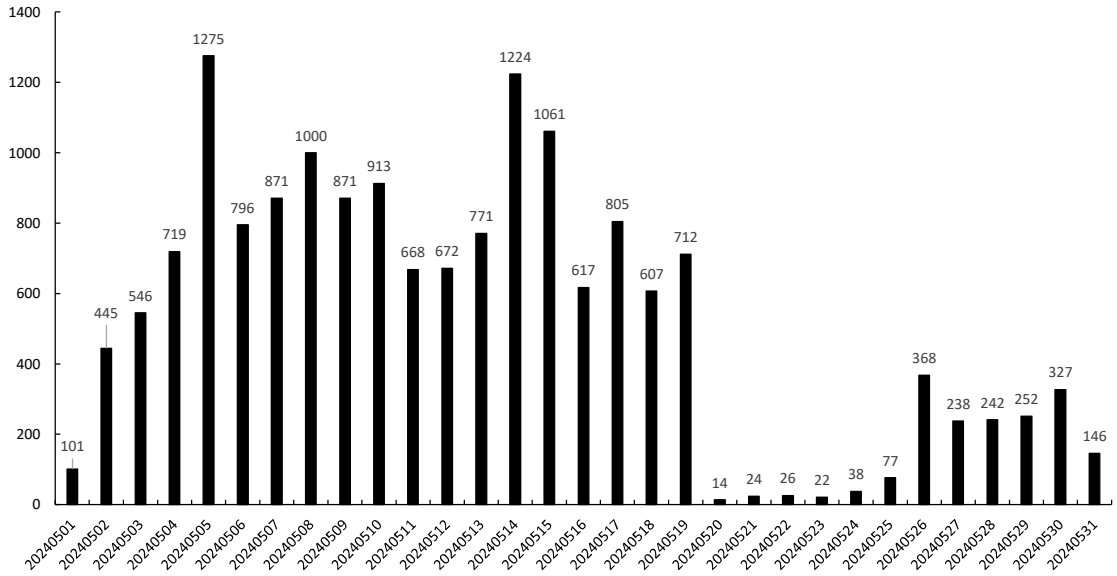
The VIIRS Boat Detection data allowed us to estimate the number of vessels operating in the Taiwan EEZ using satellite imagery. Appendix Figure A.1 shows the number of vessels in the Taiwan EEZ during the months of military exercises according to our aggregation. Specific mainland media reported that, before the exercises, fishing boats were asked to refrain from operating in the Taiwan EEZ, and this tendency is also observable in the figure. In particular, during Joint Sword 2023 (April 8–10, 2023), the number of vessels sharply declined from April 5 to 8, before the start of the exercise. Similarly, in May 2024, when Joint Sword 2024A was conducted, the number of vessels declined significantly not only on the exercise days but also before and after. By contrast, the decline during Joint Sword 2024B is relatively modest, likely because the exercise lasted only one day. In any case, these patterns suggest that military exercises negatively affect the number of vessels and thus fishing activity in the Taiwan EEZ.

Appendix Figure A.1. VIIRS Boat Detection during the Joint Sword Exercises

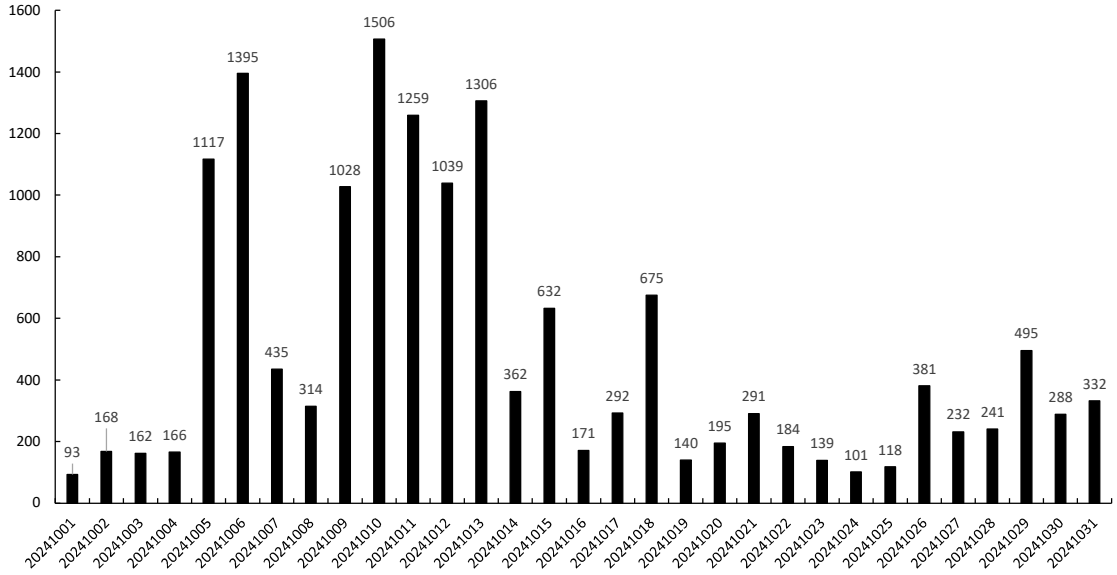
(a) April 2023



(b) May 2024 data



(c) October 2024 data



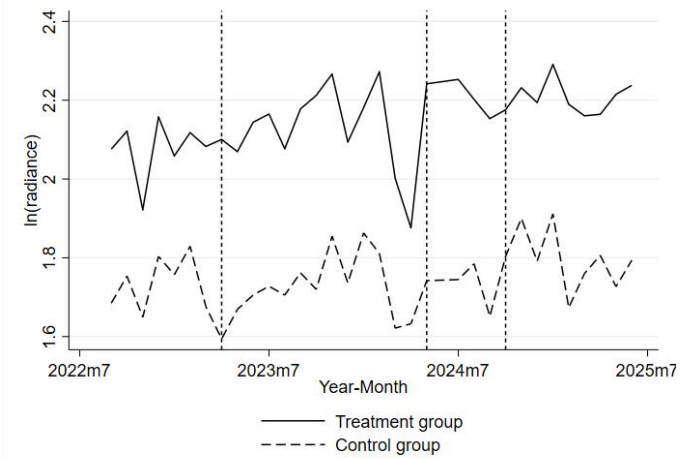
Source: VIIRS Boat Detection data.

Appendix Note 3. List of counties hosting the PLA's bases and facilities

We define the treatment group as those counties within Fujian Province that host the PLA's bases and facilities. The location information of the PLA's bases and facilities was obtained from "The Bases and Facilities of the Chinese People's Liberation Army," created by Joseph Wen: https://umap.openstreetmap.fr/en/map/by_77487#6/25.859/115.709 [final access on August 21, 2025].

The identified 22 counties are Cangshan District, Xianyou County, Pingtan County, Fuqing City, Lianjiang County, Mawei District, Jiaocheng District, Xiapu County, Hanjiang District, Xiuyu District, Hui'an County, Jinmen County, Jinjiang City, Nan'an City, Shishi City, Jimei District, Tong'an District, Xiang'an District, Longhai District, Zhangpu County, Changtai District, and Zhao'an County.

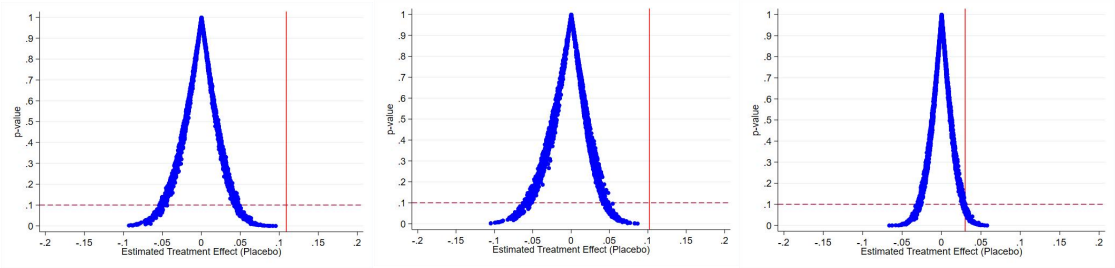
Appendix Figure A.2. Common trend test results (log transformation)



Source: Authors' calculation.

Appendix Figure A.3. Placebo permutation results (log transformation)

(a)Joint Sword 2023 (b)Joint Sword 2024A (c)Joint Sword 2024B



Source: Authors' estimation.

Appendix Table A.2. DID estimates of each Joint Sword military exercise.

	Joint Sword 2023		Joint Sword 2024A		Joint Sword 2024B	
	asinh(*radiance*)	log(*radiance*)	asinh(*radiance*)	log(*radiance*)	asinh(*radiance*)	log(*radiance*)
Treat * Post	0.132***	0.109***	0.122***	0.102***	0.042	0.030
	(0.0273)	(0.0222)	(0.0301)	(0.0245)	(0.0218)	(0.0182)
Constant	2.374***	1.891***	2.344***	1.891***	2.376***	1.893***
	(0.0003)	(0.0002)	(0.0003)	(0.0003)	(0.0002)	(0.0002)
Month FE	Y	Y	Y	Y	Y	Y
Prefecture FE	Y	Y	Y	Y	Y	Y
Adjusted R-squared	0.97	0.97	0.97	0.97	0.97	0.97
Observations	2277	2277	2277	2277	2277	2277

Note: In this specification, the effects of each military exercise are estimated using dummy variables (specific month dummy*treated group). In other words, periods of other military exercises are included in the control group, which may introduce a slight downward bias in the estimates. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.
Source: Authors' estimation

Appendix Table A.3. Alternative grouping specification.

	(1) asinh(*radiance*)	(2) log(*radiance*)
Treat * Post	0.043***	0.037***
	(0.0129)	(0.0109)
Constant	2.289***	1.814***
	(0.0004)	(0.0004)
Month FE	Y	Y
Prefecture FE	Y	Y
Adjusted R-squared	0.96	0.97
Observations	5346	5346

Note: The treatment group consists of coastal counties in Fujian, Jiangsu, and Zhejiang Provinces, whereas the control group consists of coastal counties in Guangdong, Hainan, and Shandong Provinces. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.
Source: Authors' estimation

Appendix Table A.4. Focused treatment group specification

	(1) asinh(*radiance*)	(2) log(*radiance*)
Treat * Post	0.047***	0.072***

	(0.0123)	(0.0157)
Constant	2.304***	1.829***
	(0.0006)	(0.0005)
Month FE	Y	Y
Prefecture FE	Y	Y
Adjusted R-squared	0.96	0.96
Observations	2178	2178

Note: The focused treatment group consists of 22 counties hosting the PLA's bases and facilities as listed in Appendix Note 3.
*, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively.
Source: Authors' estimation