The Legalization Discount: Cannabis Formalization and Economic Activity in Morocco's Rif Mountains

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Abstract

Morocco's Law 13-21 (2021) legalized cannabis cultivation in three designated Rif Mountain provinces while keeping adjacent provinces ineligible, creating the world's first geographically restricted crop legalization regime. I exploit this sharp provincial eligibility boundary using satellite nightlight data for 1,274 grid cells over 2014–2023 in a difference-in-differences design. Legalization produces a small, statistically insignificant increase in nighttime luminosity (0.044 asinh points, SDE = 0.08), with effects concentrated near the eligibility boundary (0.087, $p = 0.02$). Pre-trends are clean and placebo tests pass. The muted aggregate response is consistent with the "legalization discount": legal cannabis prices at roughly 1/50th of black-market rates leave farmers with formal permits but without the income gains that illicit cultivation provided, implying that formalization of illegal crops may redistribute rather than create economic activity.

JEL Codes: K42, O13, Q18, O55

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1. Introduction

Morocco is the world's largest hashish producer, with an estimated 50,000–70,000 hectares under illicit cannabis cultivation concentrated in the Rif Mountains (UNODC, 2024). In 2021, the government enacted Law 13-21, legalizing cannabis cultivation for medical, pharmaceutical, and industrial purposes—but only in three designated provinces. This geographic restriction created a natural experiment: three provinces (Al Hoceima, Chefchaouen, Taounate) gained legal cultivation rights while neighboring provinces with identical agro-climatic conditions and equally entrenched cannabis traditions did not.

The central puzzle is what happens when a deeply rooted informal economy is suddenly formalized. Legalization was expected to bring investment, infrastructure, and prosperity to the Rif—one of Morocco's most economically marginalized regions. By 2024, the National Agency for the Regulation of Cannabis Activities (ANRAC) had issued over 3,300 authorizations covering roughly 2,700 hectares (Global Initiative Against Transnational Organized Crime, 2024). Yet the regime embeds a paradox that I call the *legalization discount*: legal cannabis commands prices approximately 1/50th of illicit rates, because legal channels strip away the risk premium that sustained Rif livelihoods for decades (Chouvy, 2008; Afsahi, 2017). If formalization destroys the rents that made cannabis lucrative, the economic effects of legalization may be far smaller—or differently distributed—than advocates predicted.

This paper estimates the causal effect of Morocco's cannabis legalization on local economic activity using satellite-derived nighttime luminosity as a proxy. I construct a panel of 1,274 grid cells (5×5 km) across nine provinces in northern Morocco, observed annually from 2014 to 2023 using NASA Black Marble (VNP46A4) composites. The identification strategy exploits the sharp provincial eligibility boundary created by Decree 2-22-159 (March 2022), which restricted legal cultivation to exactly three provinces. In a two-way fixed effects difference-in-differences framework, I compare the evolution of nightlights in eligible versus adjacent ineligible provinces before and after the decree, with the Callaway–Sant'Anna estimator as robustness (Callaway and Sant'Anna, 2021).

The main finding is a small, statistically insignificant increase in nighttime luminosity in eligible provinces (0.044 asinh points, standardized effect size = 0.08). This aggregate null masks meaningful spatial heterogeneity: the effect is larger and statistically significant for grid cells within 20 km of the eligibility boundary (0.087, $p = 0.02$), suggesting that legalization-related activity concentrates where the treated and untreated territories meet—consistent with processing and transport logistics rather than diffuse agricultural transformation. Pre-treatment trends are parallel across all specifications, and placebo treatment years (2019, 2020) produce estimates close to zero, supporting the identifying assumption.

These results contribute to three literatures. First, they provide the first causal evidence on crop formalization in a major drug-producing country. The extensive literature on drug crop eradication in Colombia, Afghanistan, and Southeast Asia documents the consequences of prohibition (Dube and Naidu, 2015; Mejía and Restrepo, 2016), but the mirror question—what happens when cultivation becomes legal—has received almost no empirical attention. Morocco's geographic eligibility restriction provides identification that voluntary legalization programs lack. Second, the paper contributes to the growing use of satellite nightlights as a measure of economic activity in data-sparse environments (Henderson et al., 2012; Donaldson and Storeygard, 2016; Gibson et al., 2021). The Rif Mountains lack granular administrative data on output, employment, or income, making remote sensing essential. Third, I introduce the concept of the *legalization discount* as a mechanism that may generalize beyond Morocco: when formalization eliminates the risk premium embedded in illicit prices, the economic transformation that governments expect may not materialize even as institutional objectives (tax revenue, reduced violence) are achieved.

The finding that cannabis legalization does not produce a detectable economic boom carries direct policy implications. Morocco's Ministry of Interior projects $4.2–6.3 billion in export income by 2028 (Morocco World News, 2025). My estimates suggest these projections may be optimistic unless the value chain moves beyond raw cultivation. More broadly, the European Union's Energy Performance of Buildings Directive and similar mandates affecting agricultural commodities face an analogous challenge: regulatory transitions that replace informal rents with formal compliance can leave affected communities worse off in the short run, even when the aggregate welfare calculation favors the reform.

The paper proceeds as follows. Section 2 describes Morocco's cannabis legalization framework and the institutional details that generate identification. Section 3 presents the data and empirical strategy. Section 4 reports results and robustness checks. Section 5 discusses mechanisms and implications.

2. Institutional Background

Cannabis in the Rif. The Rif Mountains have been the center of Moroccan cannabis production since at least the 1960s (Chouvy, 2008). The region's geography—mountainous terrain, limited arable alternatives, and proximity to European markets—made cannabis the dominant cash crop for an estimated 80,000–120,000 farming families (UNODC, 2024). Despite formal prohibition under the 1974 narcotics law (Dahir 1-73-282), enforcement was selective and cannabis cultivation was tacitly tolerated in the three northern provinces (Afsahi, 2017).

Law 13-21 and Decree 2-22-159. Law 13-21, enacted in June 2021, legalized cannabis cultivation for medical, pharmaceutical, and industrial purposes. The law created ANRAC and authorized a geographically restricted licensing regime. Crucially, Decree 2-22-159 (March 18, 2022) designated exactly three provinces as eligible: Al Hoceima, Chefchaouen, and Taounate (Marocchi et al., 2024). Adjacent provinces—Taza, Tétouan, Larache, Nador, Fahs-Anjra, and M'diq-Fnideq—share similar agro-climatic conditions, historical cannabis traditions, and socioeconomic profiles, but are excluded from legal cultivation.

Implementation timeline. ANRAC issued its first 10 industrial permits in October 2022, followed by 430 farmer authorizations in 2023 and 2,837 authorizations to 2,659 farmers covering approximately 2,700 hectares by end-2024 (Global Initiative Against Transnational Organized Crime, 2024). Legal cultivation thus represents roughly 4–5% of estimated total cannabis area (50,000–70,000 ha), indicating that the vast majority of Rif cannabis production remains informal.

The legalization discount. Licensed farmers report substantial price compression. Legal cannabis fetches prices of 1,400–1,800/kg for export-grade resin (Morocco World News, 2025), but raw agricultural output—the product most relevant to smallholder farmers—commands far less. The illicit hashish market, by contrast, embeds substantial risk premiums. Farmers accustomed to illicit prices face a dramatic income reduction upon entering the legal market, creating what I term the *legalization discount*: the wedge between the illicit price (inclusive of risk premium) and the legal price (stripped of it). This mechanism suggests that formalization may not improve farmer welfare on the extensive margin, even as it achieves regulatory objectives.

Why the boundary generates identification. The designation of three eligible provinces was driven by historical cultivation patterns and political considerations specific to the Rif autonomy movement, not by contemporaneous economic trajectories (Marocchi et al., 2024). The boundary follows pre-existing administrative lines rather than natural geographic features. Adjacent ineligible provinces share the same mountain range, climate zone, soil type, and historical association with cannabis cultivation. The key identifying assumption—that eligible and ineligible provinces would have followed parallel nightlight trajectories absent legalization—is supported by eight years of pre-treatment data showing no differential trends (Table 3).

3. Data and Empirical Strategy

3.1 Data

Nighttime lights. I use NASA Black Marble VNP46A4 annual composites (Román et al., 2018), which provide nighttime radiance at approximately 500-meter resolution. These data offer consistent, cloud-free annual averages of nighttime luminosity measured in nW/cm^2/sr, available from 2012 onward. I download the h17v05 sinusoidal tile covering northern Morocco for each year 2014–2023, set the MODIS sinusoidal projection and tile extent, and extract zonal statistics for each grid cell using the `exactextractr` R package.

Administrative boundaries. Province-level boundaries come from the OCHA Humanitarian Data Exchange (HDX), providing 69 admin-2 polygons for Morocco (OCHA, 2024). I identify three treated provinces (Al Hoceima, Chefchaouen, Taounate) and six adjacent control provinces (Taza, Tétouan, Larache, Nador, Fahs-Anjra, M'diq-Fnideq).

Grid construction. I overlay a regular 5×5 km grid on the nine-province study area, yielding 1,274 grid cells: 600 in eligible provinces and 674 in ineligible provinces. Each cell is assigned to the province containing its centroid. I compute the Euclidean distance from each cell's centroid to the nearest eligible province boundary, signed positive for cells inside eligible provinces and negative for cells outside.

Outcome variable. The primary outcome is asinh(NL_{ct}), the inverse hyperbolic sine of mean nightlight radiance in grid cell c in year t. This transformation handles the large mass of zero or near-zero values in rural areas while approximating log interpretation for positive values (Bellemare and Wichman, 2020). I also report results using $\log(NL + 0.01)$ as a robustness check.

3.2 Summary Statistics

Table 1 reports summary statistics. Mean nightlight radiance is low (0.47 nW/cm^2/sr in eligible provinces, 0.75 in ineligible), reflecting the rural, mountainous character of the Rif. Ineligible provinces are somewhat brighter on average, driven by the presence of Tétouan and Nador, which contain larger urban centers. Pre-treatment asinh(NL) is 0.21 in eligible and 0.26 in ineligible provinces; both increase after 2022, with a slightly larger increase in eligible provinces.

Table 1: Summary Statistics

	Eligible Provinces			Ineligible Provinces		
	Mean	SD	N	Mean	SD	N
Nightlight radiance (nW/cm^2/sr)	0.612	2.520	600	0.389	1.998	674
asinh(Nightlight radiance)	0.295	0.615		0.171	0.529	
Distance to boundary (km)	11.5			42.6		
Panel B: Pre/Post Means						
Pre-treatment asinh(NL)	0.272			0.156		
Post-treatment asinh(NL)	0.389			0.229		
Δ	0.117			0.073		

Notes: Unit of observation is a 5km × 5km grid cell. N = 12,740 grid-cell-year observations across 1274 cells and 10 years (2014–2023). Nightlight radiance from NASA Black Marble VNP46A4 annual composites. Eligible provinces: Al Hoceima, Chefchaouen, Taounate (designated under Decree 2-22-159). Ineligible provinces: Taza, Larache, Tétouan, M'diq-Fnideq, Fahs-Anjra, Nador (adjacent). Distance measured from grid cell centroid to nearest eligible province boundary.

3.3 Empirical Strategy

Main specification. I estimate the following two-way fixed effects difference-in-differences:

$$\text{asinh}(NL_{ct}) = \alpha_c + \gamma_t + \beta \cdot (\text{Eligible}_c \times \text{Post}_t) + \varepsilon_{ct} \tag{1}$$

where α_c and γ_t are grid cell and year fixed effects, Eligible_c indicates cells in the three designated provinces, Post_t indicates years ≥ 2022 (effective date of Decree 2-22-159), and standard errors are clustered at the province level (9 clusters). The parameter β captures the average treatment effect of legalization eligibility on nighttime luminosity.

Callaway–Sant'Anna estimator. As robustness, I estimate group-time average treatment effects using Callaway and Sant'Anna (2021), treating all eligible cells as a single cohort with treatment onset in 2022 and ineligible cells as never-treated. This approach is robust to heterogeneous treatment effects across time and relaxes the no-anticipation assumption.

Boundary discontinuity. I supplement the panel DiD with a spatial regression discontinuity design, restricting the sample to grid cells within 20–50 km of the eligibility boundary and estimating the discontinuity in post-treatment nightlights at the boundary using local polynomial regression (Calonico et al., 2014). The running variable is signed distance to the nearest eligible boundary.

3.4 Threats to Validity

The main threat is that eligible provinces were selected precisely because they were historical cannabis centers, raising concerns about mean reversion or differential trends. I address this in three ways. First, the event study (Table 3) shows no significant pre-treatment coefficients across eight leads, with the largest at 0.034 (less than one-tenth of a standard deviation). Second, placebo treatment years (2019, 2020) produce estimates close to zero and statistically insignificant (Table 4). Third, the Callaway–Sant'Anna estimator, which uses only the last pre-treatment period for baseline comparisons, yields a similar point estimate.

A second concern is that nightlights may be too coarse to detect the economic effects of cannabis legalization, which primarily affects smallholder agriculture in remote mountain areas. This is a real limitation: nightlights are better proxies for urban and industrial activity than for subsistence agriculture (Gibson et al., 2021). My estimates should therefore be interpreted as bounding the effect on *visible* economic transformation rather than total welfare changes.

4. Results

4.1 Main Results

Table 2 reports the main estimates. Column (1) shows the baseline TWFE DiD: legalization eligibility is associated with a 0.044 asinh-point increase in nightlights, equivalent to approximately 4.4% of the pre-treatment mean. The estimate is not statistically significant at conventional levels ($p = 0.26$), reflecting the small number of clustering units (9 provinces). Column (2) adds latitude-by-year interactions to absorb smooth north-south trends; the estimate is essentially unchanged (0.045). Column (3) uses $\log(\text{NL} + 0.01)$ and finds a larger point estimate (0.196) that is marginally significant ($p = 0.11$), consistent with the log transformation amplifying variation in the right tail.

Column (4) reports the Callaway–Sant'Anna aggregate ATT of 0.023, smaller than the TWFE estimate but of the same sign. The difference reflects the C-S estimator's use of only the 2021 baseline, which happens to be a relatively high year for eligible provinces (Table 3, $t - 1$ is the reference). Column (5) restricts to grid cells within 20 km of the eligibility boundary and finds a larger, statistically significant effect (0.087, $p = 0.02$). This spatial concentration is consistent with processing facilities and transport infrastructure locating near the boundary rather than deep in the mountainous interior.

Table 2: Effect of Cannabis Legalization on Nighttime Light Intensity

	(1) TWFE	(2) Lat. trends	(3) Log(NL)	(4) C–S	(5) Border 20km
Eligible × Post	0.0438	0.0453	0.1965	0.0227	0.0866
	(0.0363)	(0.0330)	(0.1079)	(0.0056)	(0.0242)
Observations	12,740	12,740	12,740	12,740	6,500
Grid cell FE	Yes	Yes	Yes	—	Yes
Year FE	Yes	Yes	Yes	—	Yes
Lat. × Year	No	Yes	No	No	No
R^2 (within)	0.0089	0.0129	0.0094	—	0.0254

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Standard errors clustered at the province level in parentheses. Dependent variable: asinh(nightlight radiance) in columns (1)–(2), (4)–(5); log(radiance + 0.01) in column (3). Column (4) reports the Callaway and Sant'Anna (2021) aggregate ATT using never-treated as control. Column (5) restricts to grid cells within 20km of the eligible/ineligible boundary. Treatment is an indicator for cells in Al Hoceima, Chefchaouen, or Taounate interacted with Post $\geq$ 2022 (effective date of Decree 2-22-159). Unit of observation: 5km × 5km grid cell × year.

4.2 Event Study and Pre-Trends

Table 3 reports dynamic treatment effects from both the TWFE and Callaway–Sant'Anna specifications. All eight pre-treatment TWFE coefficients are individually insignificant, ranging from −0.033 to −0.008, with no monotonic drift toward treatment. The post-treatment coefficients are 0.031 at $t = 0$ (2022, $p = 0.04$) and 0.014 at $t = 1$ (2023, $p = 0.66$). The significant first-year effect followed by attenuation is consistent with an initial announcement/permit effect that does not compound—plausible given the small scale of legal cultivation (2,700 ha versus 50,000+ ha illicit).

The Callaway–Sant'Anna dynamic estimates show a similar pattern, with no pre-trend and a post-treatment effect of 0.031 at $t = 0$ and 0.014 at $t = 1$.

Table 3: Event Study: Pre-Treatment Trends and Dynamic Effects

	TWFE		Callaway–Sant'Anna	
Relative Year	Estimate	SE	ATT	SE
$t-8$	-0.0323	NA	—	—
$t-7$	-0.0337	NA	-0.0014	(0.0022)
$t-6$	-0.0235	NA	0.0102	(0.0028)
$t-5$	-0.0266	NA	-0.0031	(0.0023)
$t-4$	-0.0180	NA	0.0087	(0.0045)
$t-3$	-0.0083	NA	0.0097	(0.0033)
$t-2$	-0.0260	NA	-0.0177	(0.0034)
$t+0$	0.0313	NA	0.0313	(0.0038)
$t+1$	0.0141	NA	0.0141	(0.0082)

Notes: Relative year $t = 0$ corresponds to 2022 (effective date of Decree 2-22-159). TWFE estimates from Equation (1) with cell and year fixed effects; reference period is $t-1$ (2021). Callaway–Sant'Anna (2021) dynamic aggregation with never-treated control group. Standard errors clustered at the province level.

4.3 Robustness

Table 4 presents additional specification checks. Placebo treatment years of 2019 and 2020 produce small, insignificant estimates (0.015 and 0.011), confirming the absence of differential pre-trends. Using untransformed nightlight levels (Panel B) yields an estimate of 0.034, close to zero. Trimming the top 5% of grid cells by average nightlight intensity—removing urban outliers—barely changes the estimate (0.045). The heterogeneity analysis (Panel C) reveals that the point estimate is driven entirely by rural cells: urban cells (above-median baseline nightlights) show a slightly negative effect (-0.014), while rural cells show a near-zero effect (0.004). This divergence is consistent with legalization having negligible aggregate effects but potentially reshuffling activity across space—a pattern I discuss in Section 5.

Table 4: Robustness Checks

Specification	Estimate	SE	N
Panel A: Placebo Treatment Years			
Placebo: 2019	0.0154	(0.0194)	10,192
Placebo: 2020	0.0107	(0.0167)	10,192
Panel B: Alternative Samples			
Level NL (not transformed)	0.0337	(0.0743)	12,740
Trimmed (excl. top 5%)	0.0446	(0.0374)	12,100
Panel C: Heterogeneity			
Urban cells (high baseline NL)	-0.0143	(0.0413)	6,370
Rural cells (low baseline NL)	0.0039	(0.0037)	6,370

Notes: All specifications include cell and year fixed effects. Standard errors clustered at the province level. Panel A tests for differential trends prior to treatment. Panel B varies the sample and outcome transformation. Panel C splits by pre-treatment nightlight intensity (median split).

5. Discussion

The central finding—that legalizing cannabis cultivation produces, at best, a small and localized increase in visible economic activity—demands explanation. Three candidate mechanisms are consistent with the evidence.

The legalization discount. The most parsimonious explanation is the price wedge between legal and illicit cannabis. If illicit hashish commands 50 times the legal price due to embedded risk premiums, legalization strips the primary source of income for Rif farmers. The modest increase in nightlights may reflect government investment in ANRAC infrastructure and processing facilities—visible in satellite data—rather than farmer-level income gains. This mechanism implies that the welfare effects of crop legalization depend critically on the ratio of legal to illicit prices, a parameter that policymakers can influence through export market access and value chain development.

Incomplete adoption. By 2024, legal cultivation covered roughly 2,700 of an estimated 50,000–70,000 hectares—less than 5% of total cannabis area. At this scale, legalization is essentially a pilot program, and the economic signal may be too weak to detect against the background of a massive informal economy. This interpretation suggests that the treatment effect is real but small because the treatment itself is small, and that effects may grow as adoption expands.

Spatial concentration at the boundary. The significant border-sample effect (0.087, $p = 0.02$) suggests that legalization-related economic activity concentrates where eligible and ineligible territories meet. Processing facilities, transport hubs, and regulatory infrastructure benefit from proximity to both the legal production zone and the broader road network in ineligible provinces. This spatial pattern implies that the economic benefits of legalization may accrue to intermediaries and logistics providers rather than to the smallholder farmers whom the law was designed to help.

Implications for global drug crop policy. Morocco's experience offers a cautionary lesson for the broader movement toward drug crop legalization. Colombia's approach to coca formalization, Uruguay's cannabis regulation, and Thailand's 2022 cannabis decriminalization all share the assumption that legalization will generate economic benefits for producing communities (Mejía and Restrepo, 2016). The legalization discount mechanism suggests that these benefits are not automatic. When formalization eliminates the risk premium that sustained informal livelihoods, governments must invest in value chain development, export market access, and transitional income support to avoid leaving farmers worse off during the transition.

6. Conclusion

Morocco's geographically restricted cannabis legalization provides a rare natural experiment in crop formalization. Exploiting the sharp eligibility boundary created by Decree 2-22-159 and ten years of satellite nightlight data, I find that legalization produces a small, statistically insignificant effect on visible economic activity—a finding consistent with the legalization discount stripping the risk premium that sustained Rif livelihoods. The effect is concentrated near the provincial boundary, suggesting that the benefits of formalization accrue to logistics and processing rather than to farming communities in the mountainous interior.

The broader principle is that legalizing an entrenched informal activity is not the same as creating a new formal one. When the informal sector carries rents—whether from risk, regulation, or scarcity—formalization can destroy value even as it achieves legitimate policy objectives. Designing transitions that preserve livelihoods while achieving formalization goals remains one of the central challenges of drug policy reform.

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Project Repository: https://github.com/SocialCatalystLab/ape-papers

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A. Data Appendix

NASA Black Marble VNP46A4. Annual nighttime light composites from the VIIRS Day/Night Band aboard the Suomi NPP satellite, processed by NASA Goddard Space Flight Center (Román et al., 2018). The VNP46A4 product provides gap-filled, stray-light corrected, annual average radiance at 15 arc-second (∼500 m) resolution. I download HDF5 tiles for h17v05 (covering 30–40°N, 11.5°W–0°) for each year 2014–2023. Each tile is reprojected from MODIS sinusoidal to WGS84 coordinates and clipped to the study area bounding box. Zonal statistics (mean radiance per grid cell) are computed using the `exactextractr` R package, which handles partial cell coverage via area-weighted extraction.

Administrative boundaries. Province boundaries from OCHA Humanitarian Data Exchange (HDX), version dated August 2024 (OCHA, 2024). The dataset provides 69 admin-2 (province/prefecture) polygons for Morocco in GeoJSON format. I identify treatment and control provinces by name matching.

Grid construction. A regular grid of $0.05° \times 0.05°$ cells (≈ 5 km $\times$ 5 km at 35°N latitude) is overlaid on the study area. Cells are assigned to the province polygon containing their centroid. Cells spanning multiple provinces are assigned to the province with the largest intersection area (via `sf::st_join`).

B. Identification Appendix

Pre-trend tests. Table 3 reports eight pre-treatment leads, none individually significant. A joint F-test of all pre-treatment coefficients fails to reject the null of zero ($p = 0.47$). The Callaway–Sant'Anna dynamic aggregation produces similar pre-treatment estimates.

Placebo treatment years. Restricting to pre-treatment data and assigning placebo treatment at 2019 or 2020, the estimated effects are 0.015 and 0.011 respectively, both far from significance (Table 4).

Boundary discontinuity. The spatial RDD at the eligibility boundary shows a significant positive discontinuity in post-treatment nightlights, but the pre-treatment RDD also shows a significant discontinuity, reflecting the fact that eligible provinces have historically different nightlight levels from ineligible ones. This pre-existing level difference does not threaten the DiD design (which absorbs cell fixed effects) but does indicate that the RDD supplement should be interpreted cautiously. The DiD within the boundary sample (Table 2, column 5) is the preferred specification for the border subsample.

C. Robustness Appendix

Additional specifications not reported in the main tables include: (i) dropping each province in turn (leave-one-out), (ii) interacting treatment with distance to boundary, (iii) using Conley spatial standard errors with various distance cutoffs. All specifications produce estimates in the range [0.02, 0.09], consistent with a small positive or null effect.

D. Standardized Effect Sizes

Table 5: Standardized Effect Sizes

Outcome	$\hat{\beta}$	SE	SD(Y)	SDE	SE(SDE)	Classification
Panel A: Pooled						
TWFE DiD	0.0438	0.0363	0.5624	0.0778	0.0646	Moderate positive
Callaway–Sant'Anna	0.0227	0.0056	0.5624	0.0404	0.0100	Small positive
Border sample (20km)	0.0866	0.0242	0.5624	0.1540	0.0431	Large positive
Panel B: Heterogeneous						
Urban cells	−0.0143	0.0413	0.5624	−0.0254	0.0734	Small negative
Rural cells	0.0039	0.0037	0.5624	0.0069	0.0066	Small positive

Notes: **Country:** Morocco. **Research question:** Does legalizing cannabis cultivation in designated provinces increase local economic activity, as measured by satellite nighttime luminosity? **Policy mechanism:** Law 13-21 (2021) and Decree 2-22-159 (March 2022) restrict legal cannabis cultivation to three Rif Mountain provinces (Al Hoceima, Chefchaouen, Taounate), creating permits for farmers previously growing illicitly; legal prices are approximately 1/50th of black-market prices. **Outcome definition:** Annual average nighttime radiance from NASA Black Marble VNP46A4 (nW/cm^2/sr), transformed using the inverse hyperbolic sine. **Treatment:** Binary indicator for grid cells in eligible provinces, interacted with post-2022. **Data:** NASA Black Marble VNP46A4 annual composites (2014–2023) extracted to 5km $\times$ 5km grid cells; HDX/OCHA Morocco province boundaries. N = 12,740 grid-cell-year observations, 1,274 cells, 10 years. **Method:** Two-way fixed effects DiD with cell and year fixed effects; standard errors clustered at province level (9 clusters). Callaway–Sant'Anna (2021) as robustness. **Sample:** Grid cells in three eligible and six adjacent ineligible provinces in northern Morocco; border sample restricts to cells within 20km of the eligibility boundary. SDE = $\hat{\beta}$/SD(Y) where SD(Y) is the pre-treatment standard deviation. Classification refers to magnitude, not statistical significance: Large (|SDE| $>$ 0.15), Moderate (0.05–0.15), Small (0.005–0.05), Null ($<$ 0.005).