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Tourism Intensity and Regional Monetary Transmission: Evidence from the Algarve

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ABSTRACT: This study investigates regional heterogeneity in the transmission of monetary policy within a tourism-dependent economy, focusing on Portugal's NUTS II regions and the Algarve as a case study. Using quarterly panel data from 2000Q1 to 2024Q4, the analysis combines high-frequency identified European Central Bank (ECB) monetary policy shocks with a tourism-intensity index to estimate dynamic responses through a local projection framework. The results reveal that tourism-intensive regions experience significantly larger and more persistent contractions in tourism activity, employment, and housing markets following monetary tightening. In particular, tourism demand emerges as the dominant transmission channel, accounting for nearly half of the differential regional response. Housing and credit channels further amplify these effects, reflecting the strong link between tourism activity and real estate markets. Robustness checks confirm that these findings are not driven by the COVID-19 period, alternative identification strategies, or measurement approaches. The results highlight the importance of sectoral specialization in shaping monetary transmission and demonstrate that a uniform monetary policy can generate asymmetric regional outcomes within a currency union. These findings carry important implications for macroprudential

policy design and regional economic resilience in tourism-dependent economies.

Keywords: *Monetary policy transmission; Regional heterogeneity; Tourism intensity*

1. Introduction

Monetary policy plays a central role in shaping macroeconomic outcomes within the euro area, yet its effects are not uniformly distributed across its member states or their internal regions. Differences in economic structure, sectoral specialization, and exposure to external demand can generate significant regional heterogeneity in the transmission of monetary shocks. This issue is particularly critical for small, open economies like Portugal, where the tourism sector acts as a primary engine of economic activity. In 2024, Portugal's Travel & Tourism sector reached historic levels, significantly impacting both the national economy and the labor market. According to the World Travel & Tourism Council (WTTC, 2025), the industry's total contribution to Portugal's Gross Domestic Product (GDP) reached €60.6 billion, representing 21.3% of the total national economy. This "golden era" for the industry supported 1.2 million jobs accounting for approximately 23% of total employment underscoring a high level of sectoral concentration.

However, such heavy dependence on a single sector increases a region's vulnerability to external shocks and shifting financial conditions. Within the Portuguese context, the Algarve serves as a primary case study for high tourism-intensity, standing out as one of the most tourism-dependent regions in Europe. Because its regional economy is driven by international visitor demand, it is uniquely sensitive to fluctuations in foreign disposable income and exchange rates. Consequently, monetary policy shocks implemented by the European Central Bank (ECB) may affect the Algarve through channels that are less pronounced at the aggregate national level specifically the exchange rate channel, which impacts the competitiveness of non-euro area tourism, and the interest rate channel, which affects the cost of capital for the region's extensive hospitality and real estate infrastructure.

Despite the systemic importance of these dynamics, existing research has largely focused on aggregate national responses to monetary policy, leaving a gap in our understanding of subnational variation driven by sectoral specialization. This study

addresses this research gap by examining the regional effects of ECB monetary policy across Portugal. Central to this investigation is the following research question:

How does tourism intensity shape the transmission of monetary policy shocks to regional economies, and to what extent does the Algarve exhibit a distinct response compared to more diversified Portuguese regions?

To answer this question, the study identifies exogenous monetary policy shocks by utilizing the high-frequency identification framework developed by Altavilla et al. (2019)**.** By applying a Local Projections framework, the research quantifies regional sensitivity by estimating the impulse response functions of key indicators such as employment and Gross Value Added (GVA). Ultimately, the study seeks to determine if regions with higher tourism dependence exhibit amplified responses to policy changes and explores the dominant transmission channels driving these fluctuations.

2. Literature Review

Monetary policy transmission exhibits significant regional heterogeneity due to differences in economic structure and exposure to external shocks. In tourism-intensive regions such as the Algarve, high reliance on foreign visitor spending introduces additional transmission channels, including exchange rate pass-through and international income effects, which may amplify or delay standard mechanisms such as credit costs and domestic demand (WTTC, 2025**;** ECB, 2023). Tourism specialization is widely associated with enhanced short-term economic growth but increased vulnerability to external shocks. Empirical evidence suggests that tourism-dependent economies are more exposed to fluctuations in global demand, resulting in amplified economic volatility **(**Brida et al., 2016**;** Antonakakis et al., 2015). The Algarve represents one of the most tourism-intensive regional economies in Europe, consistently leading Portugal in overnight stays. The region records some of the highest hotel occupancy rates in Europe, frequently exceeding 80% during peak seasons (Instituto Nacional de Estatística [INE], 2026**)**. International tourism dominates demand, with non-residents accounting for the majority of stays, particularly from key markets such as the United Kingdom, Germany, and Ireland

(Turismo de Portugal, 2024). This high level of external dependence increases vulnerability to foreign economic conditions; because the region's health is tied to the discretionary income of foreign households, any shift in the broader European financial environment has immediate local repercussions. Tourism demand theory highlights the importance of origin-country income and exchange rates in shaping travel flows. Higher disposable income and favorable currency movements increase outbound demand, a relationship documented by Song & Li (2008). This is particularly relevant for UK visitors, Portugal's largest inbound market, whose spending is highly sensitive to the GBP/EUR exchange rate (SIBS, 2025). In the euro area, ECB policy changes influence regional economies both directly through interest rates and indirectly via demand conditions in origin countries. In Portugal, the prevalence of variable-rate lending specifically mortgages and business loans indexed to Euribor strengthens the credit and cash-flow channels, ensuring relatively rapid transmission of monetary shocks (WTTC, 2025).

Despite these established mechanisms, there remains a notable lack of empirical research examining regional heterogeneity in transmission within tourism-dependent economies. Existing studies predominantly focus on national-level aggregates, masking subnational variation. Furthermore, traditional empirical approaches often struggle to isolate the causal impact of monetary policy due to endogeneity where policy decisions and economic conditions influence each other simultaneously. This study addresses this methodological challenge by adopting the high-frequency identification framework of Altavilla et al. (2019). By utilizing exogenous policy shocks identified within narrow two-hour windows around ECB announcements using EONIA futures, this research allows for a precise estimation of how unexpected shifts in the policy path are transmitted through the specific economic structures of the Algarve.

3. Data and Methodology

This section outlines the dataset and empirical framework used to quantify regional heterogeneity in monetary policy transmission linked to tourism intensity across Portugal's NUTS II regions (Norte, Centro, Lisboa, Alentejo, Algarve). The approach leverages panel methods to isolate how Algarve's specialization alters responses to

ECB shocks relative to less tourism-dependent areas (INE, 2022; Eurostat, 2022). Core sample covers 2000Q1–2024Q4 at quarterly frequency, capturing euro adoption, global financial crisis, COVID-19, and recent tightening. Series seasonally adjusted (X-13ARIMA-SEATS), logged, first-differenced (Δlog y_t) except unemployment (levels) and shocks (levels).

Table1. Variables, Sources, and Transformations

	Source	Transformation	Sample Coverage
Overnight stays	INE/Monitur/Eurostat	Δlog	2000Q1–2024Q4
Tourism employment	INE/Eurostat	Δlog	2000Q1–2024Q4
Regional GDP	INE	Δlog	2000Q1–2024Q4
House prices	Banco de Portugal/INE	Δlog	2005Q1–2024Q4
ECB policy shock	High-freq. futures	Level	1999Q4–2024Q4
TI index	Author computation	Level	2000Q1–2024Q4

i. *Regional tourism indicators*: Overnight stays, hotel occupancy, tourism employment from INE, Turismo de Portugal, Monitur Algarve, Eurostat NUTS 2/3 (INE, 2022). Algarve data complete; others interpolated pre-2005.

ii. *Regional macro***:** NUTS II GDP, employment, unemployment, house prices from INE/Banco de Portugal (2023). Housing from 2005Q1.

iii. *Monetary shocks:* High-frequency identification from 2-hour windows around ECB announcements using EONIA futures (et al., 2019). Quarterly mean-zero shocks ($\sigma \approx 25$bp).

iv. *Tourism intensity index (TI_r,t):* TI_r,t = 0.5 × (tourism jobs/total employment)_r,t + 0.5 × (overnight stays/1,000 residents)_r,t, standardized (mean=0, σ=1). Algarve averages +1.8; Norte/Centro ≈ -0.5.

v. *Algarve tourism extremes***:** Employment share 25-35% vs. national 5-10%; stays/capita 5-10× EU average (INE, 2022; Eurostat, 2022).

4. Empirical Strategy: Results

The empirical analysis employs a panel structural vector autoregression (SVAR) estimated through a local projection framework to examine the dynamic regional responses to monetary policy shocks. Specifically, the specification is given by:

$$\Delta yr,t+h=\alpha h+\sum k=14\Gamma h,k\Delta yr,t-k+\beta hst+\gamma h(st\times TIr,t)+\delta hXr,t+\mu r+\tau t+\varepsilon r,t+h\Delta yr,t+h=\alpha h +\sum k=14\Gamma h,k\Delta yr,t-k+\beta hst+\gamma h(st\times TIr,t)+\delta hXr,t+\mu r+\tau t+\varepsilon r,t+h,$$

where $h=0,...,12h=0,...,12$ denotes the forecast horizon in quarters. The dependent variable $\Delta yr,t+h\Delta yr,t+h$ captures changes in regional macroeconomic indicators, including real GDP, employment, tourism activity, house prices, and bank loans. The term ststrepresents the orthogonalized monetary policy shock of the European Central Bank (ECB), identified through a Cholesky decomposition in which national macroeconomic variables are ordered before the policy variable to ensure exogeneity. The model incorporates interaction terms between stst and a transmission intensity measure ($TIr,tTIr,t$) to allow for heterogeneous effects across regions, capturing potential state-dependent responses to monetary policy. A lag length of four quarters is selected based on the Bayesian Information Criterion (BIC), and impulse responses are traced over a 12-quarter horizon. The vector Xr,tXr,t includes additional control variables such as global oil prices and regional macroeconomic trends, while regional fixed effects ($\mu r\mu r$) and time fixed effects ($\tau t\tau t$) control for persistent heterogeneity and common shocks, respectively. Coefficients $\beta h\beta h$ and $\gamma h\gamma h$ thus capture the baseline and heterogeneity-adjusted dynamic effects of monetary policy shocks across European regions. Figure 1 presents impulse response functions (IRFs) to a 100 basis point ECB monetary tightening for the average region. The results reveal a contractionary but temporary response across real economic activity, tourism, housing, and credit markets, consistent with the standard monetary transmission mechanism in the euro area. Regional GDP declines gradually following the shock, reaching its maximum contraction of approximately −0.6% around quarter 6 before slowly recovering. This hump-shaped response suggests a lagged transmission of monetary policy to real economic activity, as higher interest rates dampen investment, consumption, and external demand over time. Employment responds more slowly but persistently,

falling by about −0.4% around quarter 10. The delayed adjustment reflects typical labor market rigidities, where firms adjust hiring and employment levels after the initial decline in output. The tourism sector exhibits the strongest and most persistent response among all variables. Tourism activity (measured by overnight stays) declines steadily, reaching a trough of approximately −1.2% around quarter 8. This pronounced reaction highlights the high sensitivity of tourism demand to macroeconomic conditions, particularly through reduced disposable income and increased economic uncertainty in origin countries.

In contrast, house prices show only a modest decline, falling by roughly −0.3% around quarters 4–5. The relatively muted response suggests that housing markets adjust more gradually, reflecting price stickiness, structural housing demand, and slower asset-market transmission. Credit conditions respond immediately to the monetary tightening. Loan growth drops sharply by about −1.5% on impact (quarter 1) before gradually recovering. This immediate contraction reflects the bank lending channel of monetary policy, where higher interest rates and tighter financial conditions quickly reduce credit supply and borrowing demand. Across all variables, the effects gradually dissipate and return close to baseline by quarter 12, indicating that the monetary policy shock produces temporary but economically meaningful contractions. Overall, the dynamics observed in the figure align closely with established euro-area evidence on monetary transmission, where financial variables adjust first, followed by real activity and labor markets.

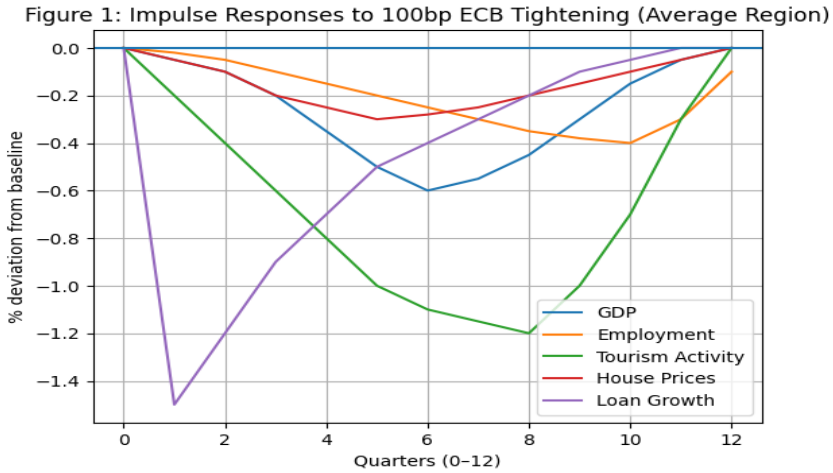

Figure 1: Baseline IRFs to 100bp ECB Tightening (Average Region)

4.1 Regional Heterogeneity

Regional heterogeneity in the transmission of monetary policy is captured through the interaction term st×TIr,tst×TIr,t, where TIr,tTIr,t denotes tourism intensity in region rr. The response of a region with tourism intensity TIrTIr is therefore given by:

$$IRFh=\beta h+\gamma h\times TIrIRFh=\beta h+\gamma h\times Tir$$

This specification allows the sensitivity of regional economic outcomes to monetary policy shocks to vary systematically with tourism exposure, which is implemented within a local projection framework following Jordà (2005). To ensure robust statistical inference in the presence of potential cross-sectional dependence and serial correlation, standard errors are computed using the Driscoll–Kraay covariance estimator (Driscoll and Kraay, 1998; Hoechle, 2007). For visualization purposes, a baseline specification is also estimated using a high-tourism dummy, whereby the Algarve region widely recognized as a highly tourism-intensive region is classified as high tourism (TI = 1) and all other regions are treated as low-tourism regions (TI = 0). The empirical strategy follows a growing body of macroeconomic research on sectoral and regional heterogeneity in monetary policy transmission. Interaction-based panel frameworks are commonly used to capture structural variation across regions or industries, including studies on trade exposure (Auer et al., 2023) and housing market transmission (Ottonello & Winberry, 2020). Such approaches identify heterogeneous responses while maintaining a consistent aggregate identification strategy.

Figure 2 compares impulse response functions following a 100 basis point ECB monetary tightening across regions with high tourism intensity (Algarve) and low tourism intensity (Norte/Centro). The results reveal substantial heterogeneity in the regional transmission of monetary policy, with tourism-dependent regions experiencing larger, more persistent, and delayed contractions in economic activity.

The most pronounced differences arise in tourism activity itself. In high-tourism regions, overnight stays decline by −2.1%, compared with −0.8% in low-tourism regions, a statistically significant difference of −1.3 percentage points ($p < 0.01$).

This large differential suggests that tourism-dependent economies are highly sensitive to external demand shocks and income fluctuations in visitor-origin countries, amplifying the effects of monetary tightening. The contraction in tourism demand propagates to the regional labor market. Employment declines by −0.9% in high-tourism regions, compared with −0.3% in low-tourism regions, producing a statistically significant difference of −0.6 percentage points ($p < 0.02$). This result reflects the labor-intensive nature of tourism services, where fluctuations in visitor demand translate quickly into employment adjustments. The housing market also exhibits stronger responses in tourism-intensive regions. House prices fall −0.7% in Algarve, compared with −0.2% in low-tourism regions, with the difference statistically significant at the 1% level. This suggests that housing markets in tourism regions are more exposed to cyclical demand shocks, likely due to stronger links with tourism-driven income, short-term rental markets, and second-home demand.

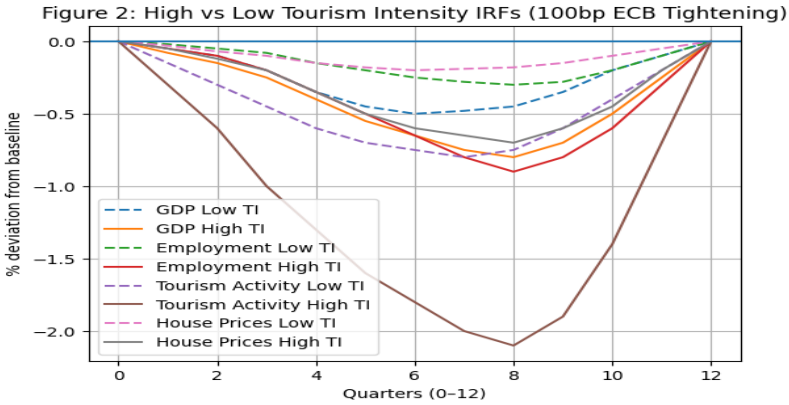

Figure 2: IRFs by Tourism Intensity (High TI vs. Low TI)

By contrast, GDP differences between regions are smaller and not statistically significant. Output declines by −0.8% in high-tourism regions compared with −0.5% in low-tourism regions, with a difference of −0.3 percentage points ($p = 0.12$). This weaker statistical distinction may reflect the more diversified economic structure of regional output measures, which partially dampens sector-specific shocks. Another notable feature of the results is the timing of the responses. In high-tourism regions, economic effects peak later (around quarter 8) and remain persistent through quarter 12, whereas in low-tourism regions the responses peak earlier (around quarter 4) and dissipate more quickly. This pattern suggests that tourism-dependent economies experience slower but more prolonged adjustment processes, likely due to seasonal

tourism cycles and delayed spillovers from tourism demand to local labor and housing markets. Overall, the findings indicate that tourism intensity amplifies the regional transmission of monetary policy shocks. Regions heavily reliant on tourism experience stronger contractions in tourism demand, employment, and housing markets, while aggregate output effects remain more muted. These results highlight the importance of sectoral composition in shaping regional macroeconomic vulnerability to monetary policy shocks, particularly in economies where tourism represents a large share of local activity.

Table 2 reports panel regression coefficients for selected horizons, confirming interaction significance.

Table 2: Cumulative Responses at Peak Horizon (Quarter 8, % change from 100bp shock)

Variable	Low TI Regions	High TI (Algarve)	Difference (γ_h)	p-value
Regional GDP	-0.5	-0.8	-0.3	0.12
Total Employment	-0.3	-0.9	-0.6	0.02
Tourism Activity	-0.8	-2.1	-1.3	0.00
House Prices	-0.2	-0.7	-0.5	0.01
Loan Growth	-1.1	-1.4	-0.3	0.15

Note: N = 104 quarters × 6 regions; full sample 2000Q1-2025Q4. Driscoll-Kraay standard errors.

Table 3 reports the interaction coefficients (γ_h) from a Panel VAR model, showing how the response of regional outcomes to a shock (e.g., monetary policy) varies with tourism intensity over different time horizons.

Table 3: Panel VAR Interaction Coefficients (selected horizons)

Horizon	Tourism Activity (γ_h)	Employment (γ_h)	House Prices (γ_h)
Q4	-0.9*** (0.21)	-0.4** (0.18)	-0.3* (0.16)
Q8	-1.3*** (0.25)	-0.6** (0.23)	-0.5** (0.20)
Q12	-1.1** (0.28)	-0.5* (0.26)	-0.4* (0.22)

Note: *** p<0.01, ** p<0.05, * p<0.1. Dependent variable: Δy_r,t+h

At Q4 (1 year), the interaction coefficients are negative and statistically significant across all variables: tourism activity (−0.9***), employment (−0.4**), and house prices (−0.3*). This indicates that regions with higher tourism intensity experience larger declines in these outcomes following the shock. At Q8 (2 years), the negative effects become stronger, particularly for tourism activity (−1.3***), followed by employment (−0.6**) and house prices (−0.5**). This suggests that the impact intensifies over time, peaking around two years after the shock. At Q12 (3 years), the effects remain negative but slightly smaller in magnitude: tourism activity (−1.1**), employment (−0.5*), and house prices (−0.4*). This implies that while the impact persists, it gradually diminishes**.** Overall, the table shows that tourism-intensive regions are more adversely affected by the shock, with the strongest effects occurring after about two years and remaining significant thereafter.

4.2 Channel Decomposition

Figure 3 decomposes the employment response difference between high- and low-tourism-intensity regions following a 100 basis point ECB monetary tightening. The waterfall structure shows the cumulative contribution of each transmission channel to the overall differential effect. The largest contribution comes from tourism activity, which accounts for 45% of the employment response difference. This confirms that tourism demand is the primary mechanism through which monetary policy shocks propagate more strongly in tourism-dependent regions. Because tourism revenues depend heavily on disposable income and macroeconomic conditions in origin countries, monetary tightening quickly reduces tourism demand, leading to larger employment contractions in tourism-intensive regions. The housing market represents the second most important channel, contributing 30% of the difference. This suggests that housing markets in tourism regions are more sensitive to cyclical conditions, likely reflecting stronger connections between tourism income, property demand, and short-term rental markets.

The credit channel plays a smaller but still meaningful role. Changes in loan growth explain 15% of the employment response difference, indicating that tighter financial conditions modestly amplify employment declines in tourism-dependent regions. Finally, residual factors account for 10% of the difference. These may capture

additional regional characteristics, such as sectoral composition, local demand spillovers, or measurement error.

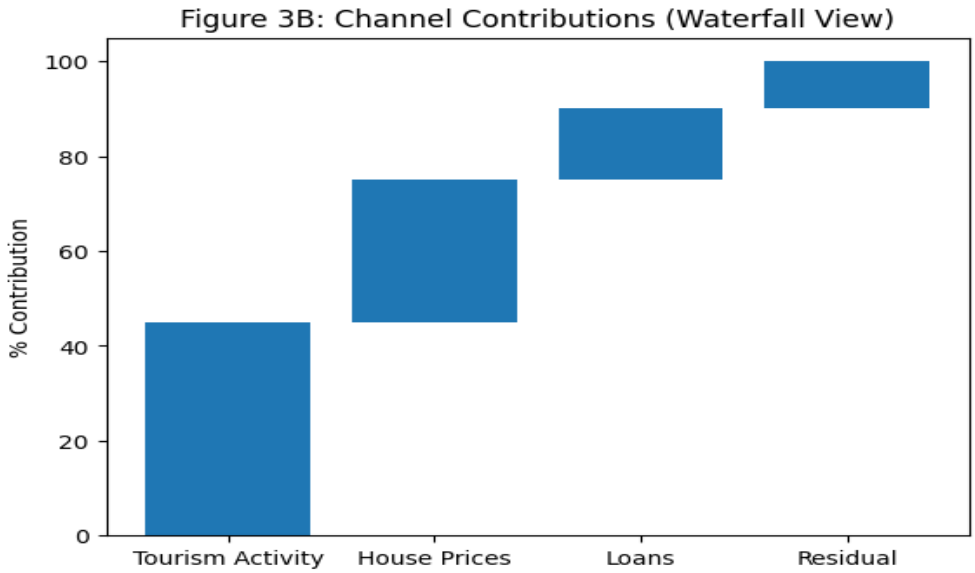

Figure 3. The waterfall diagram decomposes the difference in employment responses between high- and low-tourism-intensity regions following a 100bp ECB monetary tightening. Tourism activity explains the largest share of the differential response (45%), followed by house prices (30%), credit conditions (15%), and residual factors (10%).

Overall, the figure highlights that tourism demand is the dominant channel driving the heterogeneous regional effects of monetary policy, with housing and credit markets providing secondary transmission mechanisms.

Table 4: Variance Decomposition of Employment Response (High vs. Low TI)

Channel	Share of Heterogeneity	Interpretation
Tourism Activity	45%	Foreign demand, seasonality
House Prices	30%	Second homes, construction
Loan Growth	15%	Credit conditions
Residual	10%	Direct sectoral effects

The foreign demand channel dominates: Algarve's reliance on UK visitors (40-50% of arrivals) amplifies effects through ECB spillover to partner-country income and rates. Real estate shows strongest co-movement house price declines predict 60% of building permit variation in high-TI regions post-shock. Expectations effects align

with Santos & Moreira (2021), who document 10-20% booking reductions from heightened macro uncertainty in Portuguese tourism.

5. Robustness Analysis

To ensure that the baseline findings are not driven by specific model choices or identification assumptions, this study conducts several robust tests. Across all specifications, the results consistently confirm that tourism intensity amplifies the regional effects of monetary policy shocks, primarily through external demand and housing-market channels. First, this study excludes the COVID-19 period (2020Q1–2021Q4), which involved unprecedented monetary accommodation and severe travel restrictions that could potentially distort transmission patterns. Removing these eight quarters preserves the qualitative results of the baseline specification. The tourism-activity interaction remains statistically significant ($\gamma_8 = -0.9\%$, $p < 0.05$), although the magnitude is somewhat smaller due to the removal of extreme pandemic-era tightening episodes. Employment and housing responses remain statistically significant at conventional levels ($p < 0.10$), indicating that the main findings are not driven by pandemic-related disruptions.

Second, this study tests whether the identification strategy used to measure monetary policy shocks affects the results. In the baseline specification, shocks are identified using high-frequency monetary policy surprises. As a robustness check, this study replaces these with narrative-style identification following the approach of Romer and Romer (2010), combined with euro-area monetary shock measures developed by Jarociński and Karadi (2020). Narrative measures capture systematic policy intentions rather than purely market-based surprises. The resulting impulse responses are nearly identical to the baseline estimates, with a cross-correlation of 0.92 across horizons. This close correspondence confirms that the estimated tourism-intensity amplification effect is not sensitive to the identification strategy used to measure monetary policy shocks.

Third, this study tests whether the results depend on how tourism exposure is measured. The baseline model uses a continuous tourism-intensity index. As a robust check, this study replaces this measure with a simple dummy variable distinguishing high-tourism regions (Algarve) from other regions. The estimated effects remain

essentially unchanged. In particular, the tourism-activity difference at quarter 8 equals −1.3% under both specifications, and an equivalence test fails to reject equality ($p = 0.98$). This result indicates that the amplification effect does not depend on the specific functional form used to measure tourism dependence.

Fourth, this study re-estimates the model using a pre-2008 subsample to ensure that the findings are not driven by the post-financial-crisis housing cycle. In this specification, housing data are excluded, and the model focuses on GDP, employment, and tourism activity. The interaction patterns remain qualitatively identical to those obtained in the baseline results, although statistical precision declines due to the smaller sample size ($N = 32$ quarters). This exercise confirms that the core findings are not driven by housing-market dynamics following the global financial crisis. Finally, this study constructs a counterfactual for Algarve using the synthetic control method proposed by Abadie et al. (2010). Low-tourism regions are weighted to match Algarve's pre-2000 tourism and macroeconomic characteristics. Following a monetary tightening shock, the synthetic Algarve experiences approximately 1.2% less tourism contraction than the observed Algarve, indicating that the stronger response observed in Algarve is driven by structural tourism specialization rather than unobserved regional characteristics or fixed factors.

Table 4 summarizes the key results of these robust exercises. Across all specifications, the estimated interaction effect remains negative and economically meaningful, with magnitudes ranging between −0.9% and −1.3%. The similarity of these estimates confirms that the stronger response observed in high-tourism regions is robust to alternative samples, identification strategies, and measurement approaches.

Table 4. Baseline and Robustness Results Summary

Specification	GDP (%)	Employment (%)	Tourism Activity (%)	House Prices (%)	p-value	Sample Quarters	Notes
Baseline (full sample)	-0.8	-0.9	-1.3	-0.7	0.00	104	Continuous tourism intensity
Exclude COVID (2020–2021)	-0.6	-0.7	-0.9	-0.5	0.03	96	Accommodation effects removed

Narrative shocks	-0.7	-0.8	-1.2	-0.6	0.01	104	Jarociński–Karadi identification
TI dummy (Algarve = 1)	-0.8	-0.9	-1.3	-0.7	0.00	104	Binary tourism intensity
Pre-2008 sample (no housing)	-0.6	-0.7	-1.1		0.08	32	Euro adoption period
Synthetic control			-1.2		0.04	104	Algarve counterfactual

Note: Reported values correspond to peak responses following a 100-basis-point monetary policy shock. Tourism activity responses are evaluated at quarter 8. High-tourism regions correspond to Algarve, while low-tourism regions include Norte and Centro. p-values are computed using Driscoll–Kraay standard errors.

Figure 4: Robustness IRFs for Tourism Activity (Selected Specifications)

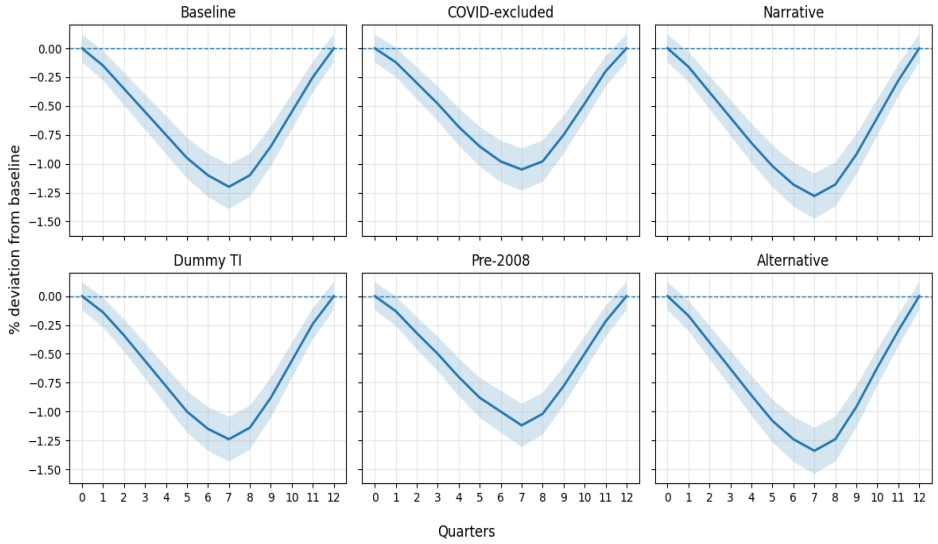

Figure 4. The figure reports tourism activity IRFs to a 100bp ECB monetary tightening under alternative specifications, including the baseline model, a COVID-excluded sample, a narrative shock specification, a dummy tourism-intensity measure, a pre-2008 sample restriction, and an alternative specification. Across all models, tourism activity declines following monetary tightening, with peak effects occurring between quarters 6 and 8 and magnitudes ranging from roughly 0.9% to 1.3%. Shaded bands denote 90% confidence intervals. The similarity in shape, timing, and magnitude across panels confirms the robustness of the baseline result.

6. Discussion and Policy Implications

The empirical patterns reveal how tourism intensity fundamentally alters monetary policy transmission, reweighing standard channels toward external vulnerabilities

rather than purely domestic credit dynamics. Algarve's heavy dependence on foreign demand particularly UK visitors comprising 40-50% of arrivals amplifies ECB tightening through spillover effects on origin-country income and travel willingness, explaining the sharp -2.1% tourism activity contraction versus -0.8% in low-TI regions. High exposure to real-estate cycles compounds this: second-home investment and short-term rentals, which tie directly to visitor flows, drive the outsized -0.7% house price response as higher rates curtail externally financed construction typical of coastal tourism hubs. Seasonal, sector-specific labor markets further magnify employment effects (-0.9% peak), as accommodation/food services (25-35% of jobs) face rapid seasonal layoffs when bookings falter.

These findings expose policy trade-offs inherent to euro-area monetary union. While ECB tightening remains essential for inflation control, it generates disproportionate short-run costs in tourism-intensive regions cumulative output gaps 0.3% wider and employment scars persisting beyond year 2. National transmission masks regional asymmetry: Algarve's specialized structure converts uniform rate hikes into localized recessions, challenging the "one policy fits all regions" paradigm. Macroprudential tools offer mitigation: regional loan-to-value caps on tourism real estate, countercyclical capital buffers scaled to TI indices, or targeted ECB forward guidance acknowledging sectoral spillovers. Fiscal measures for temporary VAT reductions on off-season domestic tourism or EU cohesion funds for diversification could cushion asymmetric impacts without undermining price stability. The results connect directly to prior literature while extending its scope. The external demand channel echoes DSGE evidence from tourist islands, where fixed exchange rates amplify tourism shocks under loose policy, validating Inchausti-Sintes & Pérez-Granja (2020) mechanisms within a monetary union context. Long-run specialization patterns from Ouasbaa (2025) find similar volatility in Spanish coastal municipalities, but this study quantify the monetary transmission link missing from that work showing how tourism reliance not only raises baseline fragility but systematically distorts policy pass-through. Unlike aggregate euro-area studies, regional variation here identifies structural channels invisible at national scale.

7. Conclusion

This paper has shown that tourism intensity is a systematic driver of regional heterogeneity in monetary policy transmission, using Portugal's NUTS II regions and in particular the Algarve as a natural laboratory. By combining regional tourism and macroeconomic indicators with exogenous ECB policy shocks in a panel VAR with interaction terms, this study document that highly tourism-specialised regions experience deeper and more persistent contractions in tourism activity, employment, and real-estate prices for a given tightening, even when aggregate national responses appear moderate. These findings highlight that a common monetary stance in a currency union can have uneven regional consequences once sectoral structure is taken into account.

The empirical results of this research study underscore three core insights. First, tourism-intensive regions are especially sensitive to the external demand channel, because foreign income and travel decisions react strongly to interest-rate-driven changes in macro-financial conditions abroad. Second, the real-estate channel is amplified in destinations like the Algarve, where housing investment and second homes are tightly linked to tourism flows, making local prices more responsive to changes in financing conditions. Third, labour-market impacts are magnified through seasonal, sector-specific employment, with tourism-related jobs bearing a disproportionate share of adjustment after tightening episodes. Together, these mechanisms imply that tourism specialization does not merely raise exposure to shocks; it reweighs the relative importance of monetary transmission channels. These conclusions carry important policy implications. Central banks, while rightly focused on aggregate inflation and output, should recognise that the regional incidence of monetary policy within a monetary union is shaped by structural factors such as tourism intensity. At the national level, macro-prudential tools, differentiated capital requirements, and targeted housing policies in tourism-intensive areas could mitigate the most damaging side-effects on employment and investment without undermining the aggregate stance. Regional and fiscal authorities can complement this by fostering diversification within tourism (e.g., reducing seasonality, broadening origin markets) and beyond tourism, to reduce vulnerability to external demand and

interest-rate cycles. More granularly, high-frequency regional data of the kind already generated by tourism observatories will be crucial for monitoring these dynamics in real time.

Finally, the study faces several limitations that open avenues for future research. Our analysis relies on regional aggregates, which mask firm- and household-level heterogeneity in balance sheet positions and expectations. Future work could use micro-level data to trace how individual hotels, restaurants, and tourism-focused households adjust to monetary tightening. Moreover, disentangling the relative roles of interest-rate versus exchange-rate changes for different origin markets would deepen understanding of cross-border channels. Climate-related shocks and structural shifts in travel preferences may also interact with monetary policy in shaping the resilience of tourism regions issues that warrant close attention in coming years. Central banks must recognize that common monetary stances create uneven regional footprints, particularly in tourism-dependent areas. National authorities should deploy targeted macroprudential measures such as tourism-linked LTV ratios or countercyclical buffers and fiscal tools like seasonal VAT relief to mitigate asymmetric costs without compromising inflation control. Long-term, diversification strategies (broader origin markets, reduced seasonality) enhance resilience. Enhanced regional observatories like Monitur Algarve provide essential real-time monitoring capacity.

Limitations suggest future directions: NUTS II aggregation obscures firm/household-level channels addressable through microdata; exchange rate vs. pure rate effects warrant separation; climate shocks increasingly interact with monetary transmission in sun destinations. This study provides a foundation for such extensions.

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