

Historical Perspectives On The Economic Impact Of The Acropolis On The Athenian Local Economy

Constantinos Challoumis¹, Nikolaos Eriotis², Dimitrios Vasiliou³

Abstract

This research examines the economic impact of the Acropolis as a major cultural heritage asset on the local economy of Athens, emphasizing its role as a multidimensional economic anchor rather than a narrowly defined tourism site. Adopting a theoretical and analytical research design grounded in cultural economics, tourism economics, and regional development theory, the paper does not rely on primary data collection or econometric estimation. Instead, it employs conceptual synthesis, structured classification of impact channels, and analytical visualization to explore how cultural heritage shapes economic activity through direct, indirect, and governance-related mechanisms. The analysis distinguishes between immediate economic effects, such as visitor spending, employment generation, and public revenues, and broader multiplier pathways that diffuse activity across local supply chains, labor markets, and public budgets. To enhance comparative clarity, the study uses illustrative heatmaps based on ordinal intensity scales, allowing complex interactions to be examined in a coherent visual framework without making causal claims. A third analytical dimension addresses sustainability pressures arising from intensive cultural tourism and evaluates corresponding governance and management levers. The findings highlight the heterogeneous nature of economic impacts and underline the need for differentiated context-sensitive policy responses that balance economic performance with cultural preservation, environmental protection, and social acceptance. The research contributes an integrative, policy-relevant framework for understanding the economic role of cultural heritage and offers a conceptual basis for future empirical research and strategic planning in heritage-based urban economies.

Keywords: *Cultural heritage economics; Acropolis; local economic impact; cultural tourism; multiplier effects; sustainability governance; urban economy.*

Introduction

The economic impact of the Acropolis archaeological site on the local economy is a complex phenomenon that reflects the interactive relationship between cultural heritage and economic development. The preservation, promotion, and exploitation of this cultural resource usually generate significant economic benefits, both directly and indirectly, affecting multiple sectors of the local economy. Restoration and maintenance projects, as well as activities related to site management, consume resources and create new jobs, contributing to the development of the local workforce. In addition, promoting the Acropolis through cultural and tourism programs boosts visitor numbers to the area, increasing revenue from tickets, accommodation, catering, and other tourism services. At the same time, local businesses benefit from increased demand, which boosts economic activity and secures jobs in sectors such as retail, catering, and services. At the public budget level, increased visitor numbers generate revenue from taxes and fees, which can replenish or increase resources for further investment in culture and local development. At the same time, the promotion and management of cultural wealth promotes environmental awareness and cultural identity, creating a positive environment for sustainable economic development. In any case, this economic potential depends on multiple factors, including effective management, adaptability to contemporary needs, and the development of strategic actions that will ensure the sustainable exploitation of cultural heritage. Systematic evaluation and consistent implementation of policies can maximize benefits and enhance the economic and

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cultural development of the region (Cerisola & Panzera, 2024; Chong & Balasingam, 2019; Della Spina, 2025; Drinia et al., 2022; Kostakis & Lolos, 2024; Rangkuti et al., 2025).

An additional dimension of this relationship concerns the institutional and governance framework through which the Acropolis is managed and integrated into the urban and regional economy. The effectiveness of cultural heritage as an economic driver depends not only on visitor volume but also on the quality of coordination between public authorities, local communities, and private stakeholders. Strategic governance arrangements can mitigate negative externalities such as congestion, environmental stress, and uneven distribution of benefits, while reinforcing long-term value creation. Policies related to visitor management, pricing, reinvestment of revenues, and local participation play a decisive role in determining whether economic gains translate into durable development outcomes. When cultural heritage management is embedded within a broader framework of urban planning, sustainability objectives, and social inclusion, the Acropolis functions not merely as a tourism attraction but as a stabilizing economic and symbolic anchor. This perspective highlights that cultural heritage-driven development is not automatic; it is the result of deliberate institutional choices that align economic incentives with preservation goals and societal well-being (Alexandrakis et al., 2019; Bowitz & Ibenholt, 2009; Chsauhnan & Raj, 2025; Mendoza & Talavera, 2025; Zeng & Wang, 2023).

Methodology

This study adopts a theoretical and analytical research design, grounded in the law-and-economics tradition and in the economics of cultural heritage. It does not rely on primary data collection, econometric estimation, or causal inference techniques. Instead, the methodological approach is based on conceptual synthesis, structured comparison, and analytical visualization, aiming to clarify how a major cultural heritage site such as the Acropolis shapes local economic activity through multiple channels. The analysis is explicitly descriptive and interpretative, focusing on economic mechanisms rather than measurement precision or hypothesis testing.

The first stage of the methodology involves a systematic review and classification of economic impact channels associated with cultural tourism and heritage management. Drawing on established literature in cultural economics, tourism economics, and regional development, the study distinguishes between direct effects (such as visitor spending, employment, and tax revenues), indirect and multiplier effects (such as supply-chain linkages and wage-spending rounds), and sustainability-related pressures (including congestion, environmental stress, and social acceptance). This classification provides the analytical structure upon which the subsequent visualizations and interpretations are built. To operationalize this conceptual framework, the study employs illustrative heatmaps as analytical tools. These heatmaps do not represent empirical measurements but rather relative intensity scores, assigned on a consistent ordinal scale to reflect the comparative strength of relationships between economic channels and outcomes. The scoring process is informed by theoretical expectations, documented empirical tendencies in the literature, and institutional knowledge of heritage-based tourism systems. The purpose of this approach is not quantification per se, but comparative clarity, allowing complex multidimensional interactions to be examined in a compact and interpretable form. The first heatmap focuses on direct economic impacts, mapping tourism-related activities against key outcomes such as local revenue, employment, fiscal contributions, business formation, and infrastructure demand. The second heatmap captures indirect and multiplier pathways, illustrating how initial spending diffuses through the local economy and identifying the sectors where these secondary effects materialize. The third heatmap addresses sustainability and governance, juxtaposing tourism-induced pressures with available policy and management levers. Together, these visualizations function as structured analytical devices rather than empirical estimates, supporting interpretative reasoning and policy discussion. Throughout the analysis, causality is not claimed. The study does not assert that observed economic outcomes are solely or mechanically caused by the Acropolis, nor does it estimate elasticities or multipliers. Instead, it examines structural associations and institutional linkages, highlighting how cultural heritage operates as an economic anchor within a broader urban and regional system. The methodology therefore prioritizes internal coherence, transparency of assumptions, and conceptual robustness over statistical inference. The methodological choice to combine theoretical analysis with visual synthesis reflects the paper's broader objective: to provide a policy-relevant, integrative framework for understanding the economic role of cultural heritage. By emphasizing structure, interaction, and governance rather than numerical precision, the methodology is particularly suited to informing strategic planning, sustainability debates, and future empirical research designs related to cultural capital and local economic development .

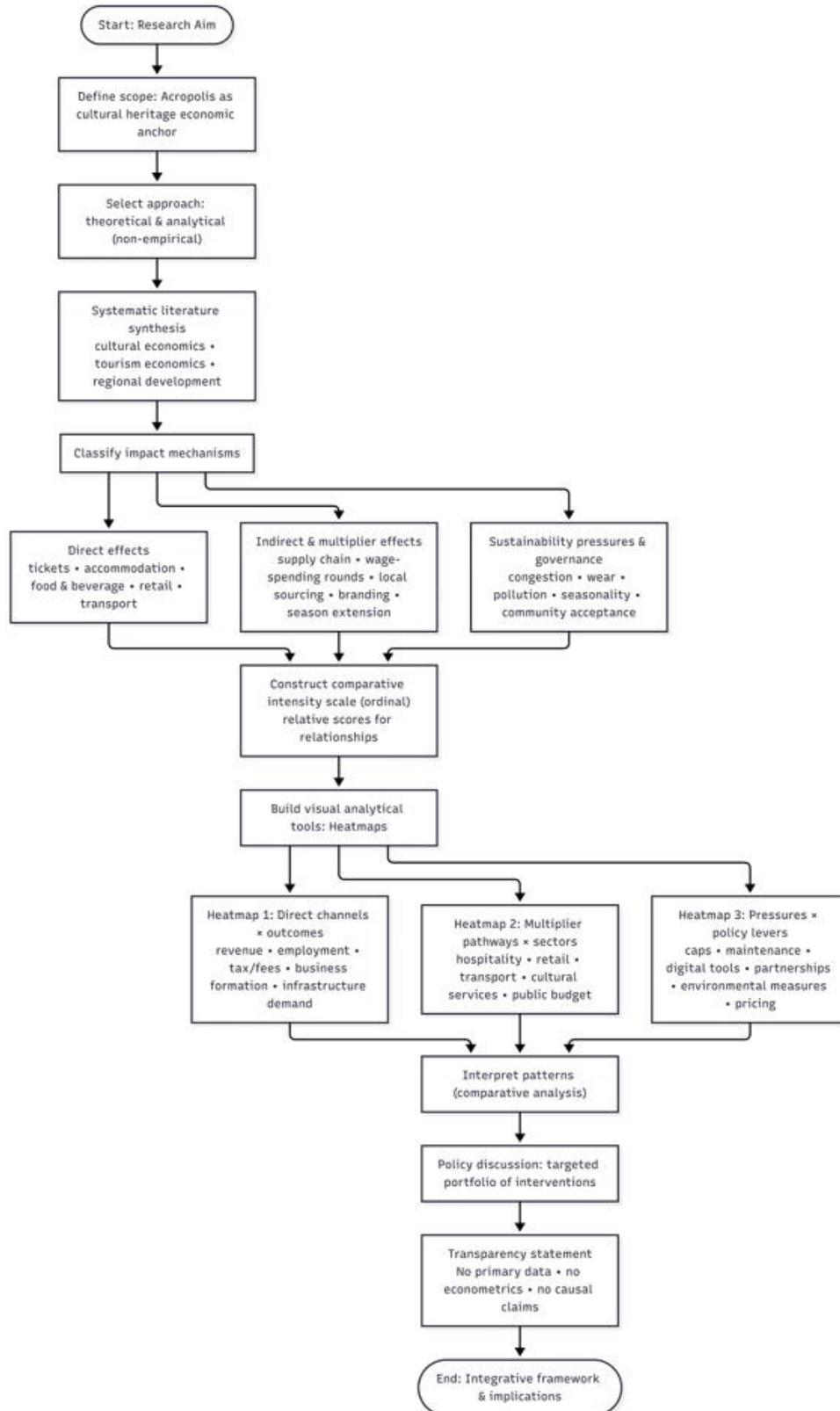


Figure 1: Methodology of economic impact of the Acropolis on the Athenian local economy (Authors' scheme)

Figure's 1 flowchart provides a structured visual representation of the methodological logic of the study, illustrating how the analysis progresses from the initial research aim to the final policy-relevant conclusions. It is designed to make explicit the non-empirical, analytical nature of the research and to clarify the sequence of conceptual steps underpinning the use of illustrative heatmaps. The process

begins with the formulation of the research aim, which is to examine the Acropolis as a cultural heritage asset that functions as an economic anchor for the local economy (Challoumis, 2023a, 2024b). This is followed by the definition of the study's scope and the explicit selection of a theoretical and analytical approach, emphasizing that the research does not rely on primary data collection or econometric estimation. At this stage, the methodological boundaries of the study are clearly set, ensuring transparency regarding its objectives and limitations. The next step involves a systematic synthesis of the relevant literature, drawing primarily from cultural economics, tourism economics, and regional development theory. Rather than aggregating datasets, the study integrates established theoretical insights to identify recurring patterns and mechanisms through which cultural heritage influences economic activity. This synthesis provides the conceptual foundation for the subsequent classification of impact mechanisms. Following the literature synthesis, the methodology proceeds to the classification of economic impact mechanisms into three broad categories: direct effects, indirect and multiplier effects, and sustainability pressures coupled with governance responses (Abdul, 2023; Cao et al., 2024; Chen, 2023; Chruściel, 2020; Cohen, 2018; M. Li & Gao, 2022; Noga, 2024; Pouw et al., 2022; Rogers et al., 2015). Direct effects capture immediate economic interactions such as ticket revenues, accommodation, food and beverage services, retail activity, and transport. Indirect and multiplier effects describe how initial spending circulates through supply chains, wage-spending rounds, local sourcing, branding, and season extension. Sustainability pressures and governance address non-market dimensions, including congestion, physical wear, pollution, seasonality, and community acceptance.

These three analytical streams converge in the construction of a comparative ordinal intensity scale, which assigns relative scores to the strength of relationships between activities, outcomes, and policy levers. Importantly, this step does not imply measurement or causality; the scale is used solely to enable structured comparison and visual clarity. Based on this scale, the study develops visual analytical tools in the form of three heatmaps. Each heatmap corresponds to one analytical dimension: direct economic channels and outcomes, indirect and multiplier pathways across sectors, and sustainability pressures in relation to governance instruments. The heatmaps serve as integrative devices that condense complex relationships into interpretable visual patterns. The methodology then advances to the interpretation of these patterns through comparative analysis, identifying asymmetries, concentrations of impact, and trade-offs across sectors and policy domains. This interpretation feeds into a policy discussion, where the emphasis is placed on the need for a targeted and differentiated portfolio of interventions rather than uniform policy solutions. The flowchart concludes with a transparency statement, explicitly reaffirming that the study makes no causal claims and does not employ econometric techniques or primary data. The methodological process culminates in the development of an integrative analytical framework that links economic performance, sustainability, and governance, offering structured insights and implications for cultural heritage management and local economic policy (Aurrekoetxea et al., 2024; Barrow, 2020; De Haro, 2024; Global Change Data Lab, 2024; Shank, 2019; Snobelen, 2003). Therefore, the flowchart functions as a methodological roadmap, clarifying how theoretical reasoning, structured classification, and visual synthesis are combined to analyze the economic role of the Acropolis.

Historical context and approach of the study

The research is based on a comprehensive assessment of the historical development and relevance of cultural heritage to the economic structures of the region. In the context of previous literature, it explores the finding that the cultural identity and historical significance of the monument act as catalysts for the development of local activities and the strengthening of the local economy (Challoumis, 2025b, 2025a). The study's approach focuses on the systematic recording and analysis of the effects resulting from the presence and promotion of the archaeological site, with an emphasis on economic functions and synergies. The use of both quantitative and qualitative methods allows the research to form a clear picture of the direct and indirect economic effects, while maintaining a critical stance towards the selection of samples and methodological approaches. Particular emphasis is placed on the historical trajectory of cultural exploitation, from antiquity to contemporary practices, as well as on the analysis of the different approaches and theoretical frameworks that have been developed in the field. This approach seeks to establish a methodological basis that will allow for the effective assessment of economic impacts, both locally and more broadly, ensuring the validity and reliability of the results (Aditia & Kano, 2025; Campoy-Muñoz et al., 2017; Drinia et al., 2022; Kostakis & Lolos, 2024; Shi & Sun, 2025; Ye et al., 2024).

Theoretical framework of the impact of cultural potential on the economy

The theoretical basis for the impact of cultural potential on the economy is based on the perception that cultural heritage, such as the Acropolis, activates a wide range of economic functions. The preservation and promotion of cultural resources generates direct revenue through tourism and also attracts investment, contributing to the economic development of the region. In addition, cultural identity strengthens local branding and national consciousness, enhancing the attractiveness of the place to visitors and investors. Transportation, catering, service provision, and commercial activity play a decisive role, supporting the local economy through employment and business development (Challoumis, 2023b, 2024a). An important part of the theoretical approach highlights the multiplier effect of cultural resources, which enhances the economic continuity and sustainability of the region. Finally, the contribution of cultural heritage to the economy calls for an emphasis on integrated management and protection of resources in order to ensure their long-term contribution to development and social well-being, without compromising their cultural identity and value (Atkinson et al., 2018; Bateman & Kling, 2020; Drupp et al., 2017; Gkargkavouzi & Halkos, 2024; Landorf, 2009; Reynolds, 2019; Shamshiyev, 2023).

Analysis of direct economic impacts

The direct economic impact of the Acropolis is mainly manifested through the exploitation of tourism resources and related consumption. Visitors to the archaeological site contribute significantly to the revenue of the wider area, with ticket sales being a decisive factor. Income from tourism not only covers operating costs but also supports the management and maintenance of the site. In addition, visitors spend money at local businesses, such as restaurants, accommodation, shops, and service providers, contributing to the development of the local market. The exploitation of tourism resources creates employment opportunities, both through direct jobs in tourism and management, and through indirect opportunities in related activities. The local community benefits from increased income, while the sustainability of small businesses and the economic vitality of the region are strengthened.

The accumulation of tourist traffic contributes to the diversification of economic activities and strengthens the economic resilience of the local economy. The recurring and increasing number of visitors leads to stable income, which can support further investment in infrastructure and cultural management. However, this exploitation requires appropriate management to ensure sustainability and protection of cultural assets, so that the economic benefits are lasting and consistent with the principles of sustainability (Bertarelli & Lodi, 2019; Eubanks & Furton, 2024; Guo et al., 2022; Ouyang et al., 2020; Petrolia et al., 2020; Yang et al., 2018). Tourism resources related to the Acropolis are an important pillar of the local economy. Visitors contribute to the increased revenue of local businesses by entering archaeological sites, purchasing tickets, guided tours, and other services. Staying in hotels, eating in restaurants, and shopping further boosts economic activity, while increased visitor numbers also lead to the development of related services, such as transportation, cultural events, and souvenir shopping. Studies have shown that tourist spending accounts for a significant portion of total income from cultural tourism, while the steady increase in visitor numbers ensures the sustainability and scalability of these resources. In addition, active management of tourist packages and the promotion of alternative forms of tourism contribute to the extension of the tourist season, maximizing economic benefits. As the local community and businesses invest in infrastructure and services, jobs are created and the local economic recovery is strengthened. The effective utilization and management of the Acropolis' tourism resources plays a decisive role in diversifying the economy, reducing unemployment, and enhancing the sustainability of the region.

Utilization of local businesses and the labor markets

The promotion of local businesses and employment in the area around the Acropolis are key factors contributing to sustainable development and the strengthening of economic activity. Increased visitor numbers lead to significant growth in the restaurant, hotel, and retail sectors, creating new job opportunities and strengthening the local commercial fabric. A diverse range of businesses, from local cafes and shops selling traditional products to organized tour and transport services, enjoy significant benefits from the presence of tourists. In addition, the need for skilled personnel and growing demand are creating opportunities for new jobs, both full-time and part-time. This environment encourages the development of local skills and the preservation of cultural heritage, while promoting business innovation. Local authorities, in collaboration with business bodies and organizations, promote actions that enhance the exploitation of local resources, strengthening the economic self-sufficiency of the region. However, maintaining a balance between economic development and the protection of the

cultural landscape is a pressing priority, so that the strengthening of the local market does not negatively affect cultural identity and the natural environment. Thus, the active participation of local businesses and the maintenance of a flexible and resilient labor market are key factors for the sustainability and development of the region (Knapp et al., 2025; Newbold & Johnston, 2020; Sagoff, 1981; Zhao et al., 2024).

Analysis of indirect economic impacts

The indirect economic impact of the Acropolis on the local Greek economy plays a decisive role in strengthening and ensuring its sustainability as a pillar of culture and development. Through the multiplier effect, the increase in visitor numbers and the associated tourist cycle contributes to the further strengthening of local businesses such as restaurants, accommodation, transport services, and retail. These activities not only secure jobs, but also strengthen the local market with indirect revenues, creating a network of economic interdependence. Furthermore, increased demand and the impact of tourism on the service sector lead to an increase in public revenue from taxes, fees, and contributions, which can be invested in upgrading cultural infrastructure and protecting cultural treasures. At the same time, the development of this activity strengthens the sustainability of local businesses and promotes entrepreneurship, creating additional employment opportunities and growth for the local economy. Finally, these positive effects enhance the region's reputation as an international cultural destination, attracting continuous investment and broadening the range of economic opportunities based on cultural heritage, thus enhancing the prosperity of the wider region.

The multiplier index is a fundamental tool for understanding the broader economic impact that cultural monuments, such as the Acropolis, have on the local economy. When a visitor enters the site, their direct expenditure on tickets, hotels, food, and other tourist goods triggers a series of additional expenditures by the businesses and employees involved in meeting these needs. The result is an increase in revenue for local businesses, leading to further hiring and increased consumer spending in the area. The multiplier theory argues that every euro initially spent in the tourism sector not only generates direct revenue, but also causes multiple benefits in the wider economy (Cain et al., 2024; Clare et al., 2019; Jiang et al., 2023; Joo et al., 2018; X. Li et al., 2024; Mazzucato, 2023; Zhang et al., 2020; Y. Zhou & Su, 2025). This occurs through multiple rounds of spending, where businesses repay their employees and suppliers, creating a chain of economic activity with a multiplier effect. In particular, the increasing number of visitors to the Acropolis area leads to an increase in demand for local products and services, contributing to the maintenance and strengthening of local business activity. This multiplier effect is demonstrated by economic studies showing that each additional expenditure in the cultural sector can generate multiple benefits throughout the economic chain. In conclusion, the preservation and promotion of cultural heritage has not only cultural but also significant economic value, making it a necessary strategy for the sustainable development of the region. The economic impact of the Acropolis on local public revenue and expenditure is shaped entirely by its broader functions as a factor of cultural and tourist value. The growing number of visitors contributes to increased revenue from admission fees, consumption taxes, and other tax burdens, creating a stable and significant fiscal benefit (Challoumis, 2024c). At the same time, the management and protection of the archaeological site require various expenditures, both in terms of maintenance and restoration, as well as in terms of promotion and security measures. The resources collected from tourist activities are invested in upgrading infrastructure and preserving this cultural treasure, thereby strengthening the local economy. However, increased visitor numbers also lead to increased financial requirements for managing damage to the monument as a whole and environmental pressures. In addition, the development of a sustainable financial framework requires continuous monitoring and adjustments to ensure long-term conservation and efficient use of resources (Dechezleprêtre & Sato, 2017; Guijarro & Tsinaslanidis, 2020; Halkos & Aslanidis, 2025; Senatore et al., 2025; Shao et al., 2020; P. Zhou et al., 2023).

Local authorities and the competent administration are called upon to strike a balance between increasing revenue and managing expenditure effectively in order to strengthen economic security and promote the sustainability of cultural capital. Therefore, sound management of financial resources is crucial both for the preservation of cultural treasures and for the overall development of the local community, with respect for the natural and cultural heritage.

Discussion

The management and sustainability of the Acropolis' cultural capital require a comprehensive approach that integrates both the needs of residents and local organizations and the protection of cultural and environmental resources. Effective governance must promote partnerships with

communities, educational institutions, and NGOs, creating a framework for the coordinated management and promotion of cultural wealth. Developing strategies that focus on education, information, and active participation of residents helps to preserve cultural identity and build strong bonds of trust. In addition, protecting the natural environment and addressing environmental challenges, such as pollution and infrastructure overload, are critical pillars of sustainability. The implementation of modern technological solutions, such as visitor management and digital reproduction systems, enhances the effectiveness and sustainability of activities (Challoumis & Eriotis, 2025). Therefore, preserving authenticity and respecting cultural heritage must be accompanied by administrative practices that ensure economic sustainability, making the Acropolis a model of cultural capital management, capable of supporting the local economy and society in the long term.

Cooperation with residents and organizations is a fundamental aspect of the sustainable exploitation of the Acropolis' cultural capital. The active participation of residents in promoting and preserving cultural wealth strengthens their sense of ownership and pride, creating a sustainable relationship of mutual benefit. Local organizations, cultural institutions, and businesses play a decisive role in the development of educational and intercultural activities, strengthening community awareness and active involvement. Through partnerships, programs that promote cultural heritage are implemented, while opportunities for local employment and entrepreneurship are created. The mediation and participation of organizations contribute to the effective management of resources and the adaptation of activities to local characteristics and needs. In addition, strengthening partnerships helps prevent social exclusion and promote social integration, creating a continuous network of support and knowledge exchange. Systematic communication and dialogue between public bodies, private organizations, and residents strengthens collective responsibility and a sense of shared effort to protect and enhance cultural heritage. Thus, the development of authentic and mutually beneficial relationships contributes to the strengthening of local identity, regional development, and the direct and indirect economic prosperity of the wider region. The environmental and cultural challenges facing the Acropolis archaeological site are an important factor in its preservation and sustainability. Increasing congestion and the continuous rise in visitor numbers are leading to damage to the marble and excessive pressure on the site's infrastructure. In addition, frequent human contact with sensitive archaeological finds increases the risk of losing valuable parts and worsens their state of preservation. Inadequate waste management and the lack of appropriate protection systems increase the risk of environmental pollution, highlighting the need for more comprehensive and sustainable management practices. The continuous growth of tourism puts pressure on the natural and cultural environment, while also causing interventions in local architecture and the urban landscape, which are often not in line with the historical characteristics of the area. For this reason, the protection of cultural identity and the ethical management of the area are essential for the preservation of cultural heritage. The need to raise awareness among visitors and actively involve the local community in protection and conservation activities is crucial. Overall, addressing these challenges requires a comprehensive strategy that will enhance both the environmental sustainability and cultural continuity of the monument, ensuring the coexistence of cultural and natural wealth with contemporary needs.

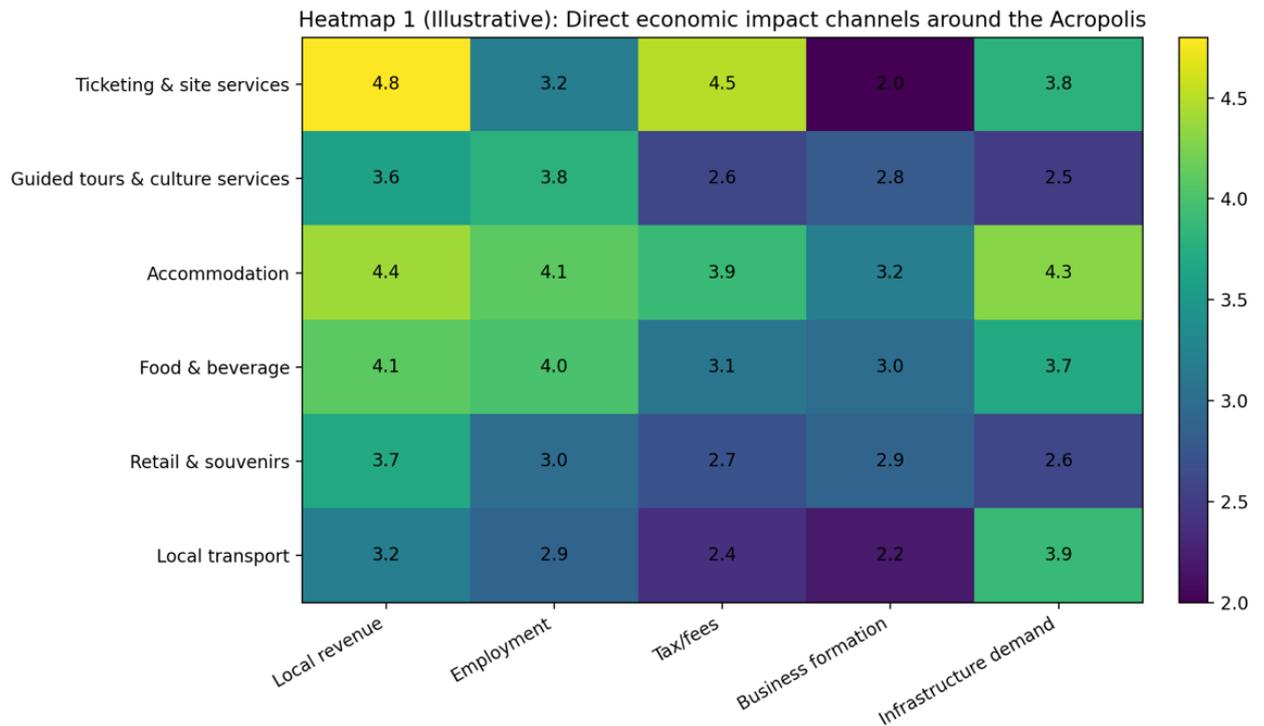


Figure 1: Direct economic impact channels around the Acropolis (Authors' scheme, see Appendix I)

Figure 1 illustrates the relative intensity of the direct economic impacts generated by the Acropolis across key sectors of the local economy and across distinct impact dimensions. Each row represents an economic activity directly associated with cultural tourism, while each column captures a specific outcome, namely local revenue generation, employment creation, tax and fee contributions, business formation, and infrastructure demand. The values shown are illustrative intensity scores, intended to support comparative interpretation rather than precise quantitative measurement. Ticketing and site-related services display the strongest direct effects on local revenue and public income through taxes and fees. This pattern reflects the centralized and regulated nature of heritage-site management, where revenues are directly collected and largely channeled through public or semi-public mechanisms. At the same time, the relatively weak score for business formation indicates limited entrepreneurial spillovers, suggesting that this channel primarily reinforces existing institutional structures rather than stimulating new market entry. Accommodation and food and beverage services exhibit consistently high scores across revenue and employment, confirming their central role in transforming cultural visitation into broader economic activity. Accommodation, in particular, combines strong revenue generation with high infrastructure demand, underlining the close link between tourism intensity, urban capacity constraints, and the need for sustained public investment in transport, utilities, and housing-related infrastructure. Guided tours and cultural services show a more labor-intensive profile, with employment effects that are proportionally stronger than their fiscal or infrastructure impacts. This suggests that these activities contribute primarily through human capital utilization and service provision, rather than through capital accumulation or large-scale public revenue flows. Retail and souvenir activities demonstrate moderate revenue effects but weaker employment and tax contributions, a pattern consistent with small-scale, fragmented enterprises and high seasonality. Their limited infrastructure impact further indicates that their economic footprint, while visible, remains relatively contained within existing urban structures. Local transport services register moderate revenue and employment effects but a comparatively high infrastructure demand. This reflects the pressure exerted by concentrated tourist flows on urban mobility systems and highlights transport as a key transmission channel through which cultural tourism generates costs alongside benefits. Taken together, the heatmap underscores the heterogeneous nature of the Acropolis' direct economic impact. While certain sectors primarily enhance public revenues and employment, others mainly amplify infrastructure pressures. This differentiation supports the broader analytical argument of the paper that major cultural heritage sites function as multidimensional economic anchors, shaping not only market activity but also public finance and urban planning dynamics.

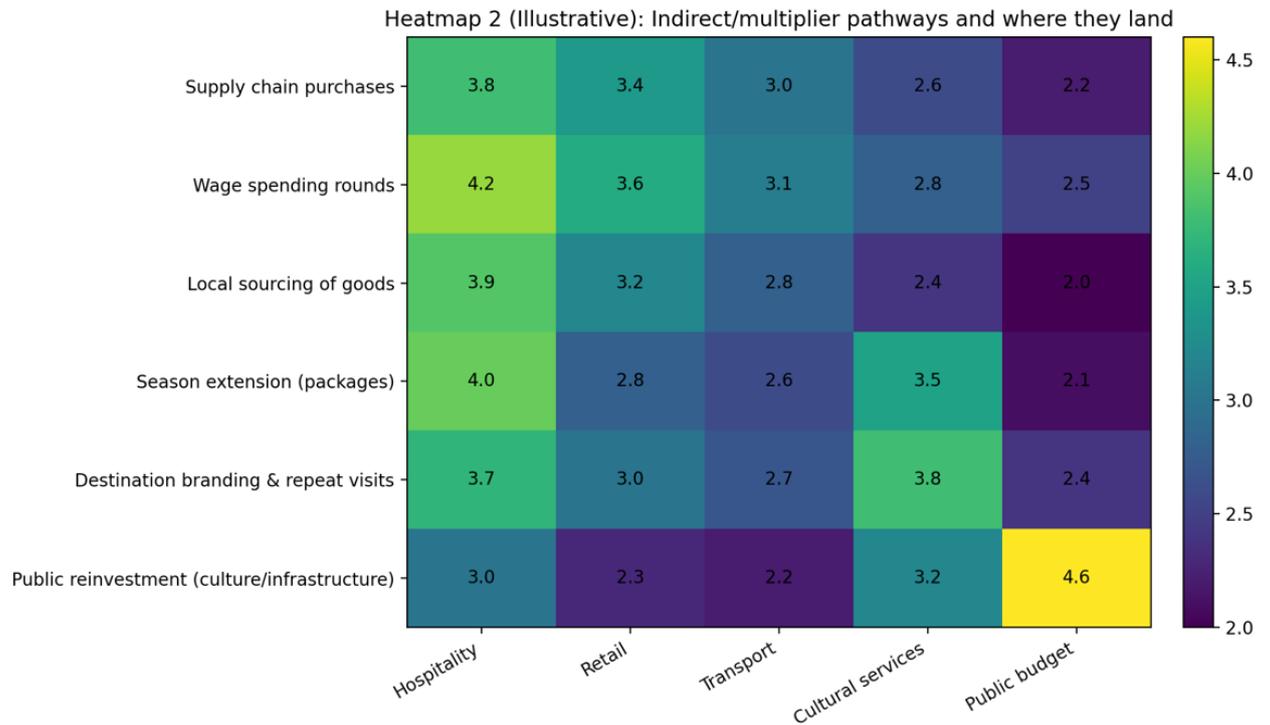


Figure 2: Indirect/multiplier pathways and where they land (Authors' scheme, see Appendix I)

Figure 2 depicts the indirect and multiplier pathways through which economic activity generated by the Acropolis diffuses into the broader local economy and identifies the sectors where these effects ultimately materialize. The rows represent distinct transmission mechanisms, such as supply-chain linkages, wage spending, and destination branding, while the columns capture the sectors that absorb these secondary effects, including hospitality, retail, transport, cultural services, and the public budget. As in the previous figure, the values represent illustrative intensity scores intended to support relative comparison. Supply-chain purchases show their strongest effects in hospitality and retail, indicating that accommodation, food services, and related activities rely heavily on upstream local suppliers. The diminishing intensity toward transport and the public budget suggests that these indirect procurement effects remain largely within private-sector circuits rather than translating directly into public revenues or infrastructure funding. Wage spending rounds emerge as one of the most powerful multiplier channels, particularly for hospitality and retail. This pattern reflects the circulation of income earned in tourism-related activities back into the local economy through household consumption. The gradual decline in intensity across transport, cultural services, and the public budget underscores the fact that consumption-driven multipliers primarily reinforce market demand rather than public finance. Local sourcing of goods follows a similar but slightly weaker pattern, with moderate impacts concentrated in hospitality and retail. The relatively low scores in the public budget column indicate that, while local sourcing strengthens domestic production networks, it does not automatically generate proportionate fiscal returns unless accompanied by effective taxation or formalization mechanisms. Season extension through tourism packages displays a distinct profile. While its strongest effects remain in hospitality, it also shows a comparatively high impact on cultural services. This suggests that policies or market strategies aimed at reducing seasonality can stabilize demand for cultural activities beyond peak periods, thereby supporting employment and service continuity rather than merely increasing volume during high season. Destination branding and repeat visits generate relatively balanced effects across hospitality and cultural services, highlighting their strategic role in shaping long-term demand. Unlike short-term consumption multipliers, branding effects operate through expectations and reputation, reinforcing cultural services more strongly than retail or transport and contributing to sustained tourism flows over time. Public reinvestment in culture and infrastructure stands out for its dominant impact on the public budget. This reflects the institutional feedback loop through which revenues generated directly and indirectly by the Acropolis are partially reinjected into public goods, cultural preservation, and infrastructure. However, the weaker spillovers into private sectors suggest that such reinvestment primarily strengthens collective assets rather than immediately stimulating market activity. Figure 2

illustrates that the Acropolis' economic influence extends well beyond direct spending, operating through multiple indirect channels with distinct sectoral destinations. The heatmap reinforces the argument that multiplier effects are unevenly distributed, with consumption-driven pathways favoring private services, while institutional pathways primarily reinforce public finance and cultural sustainability.

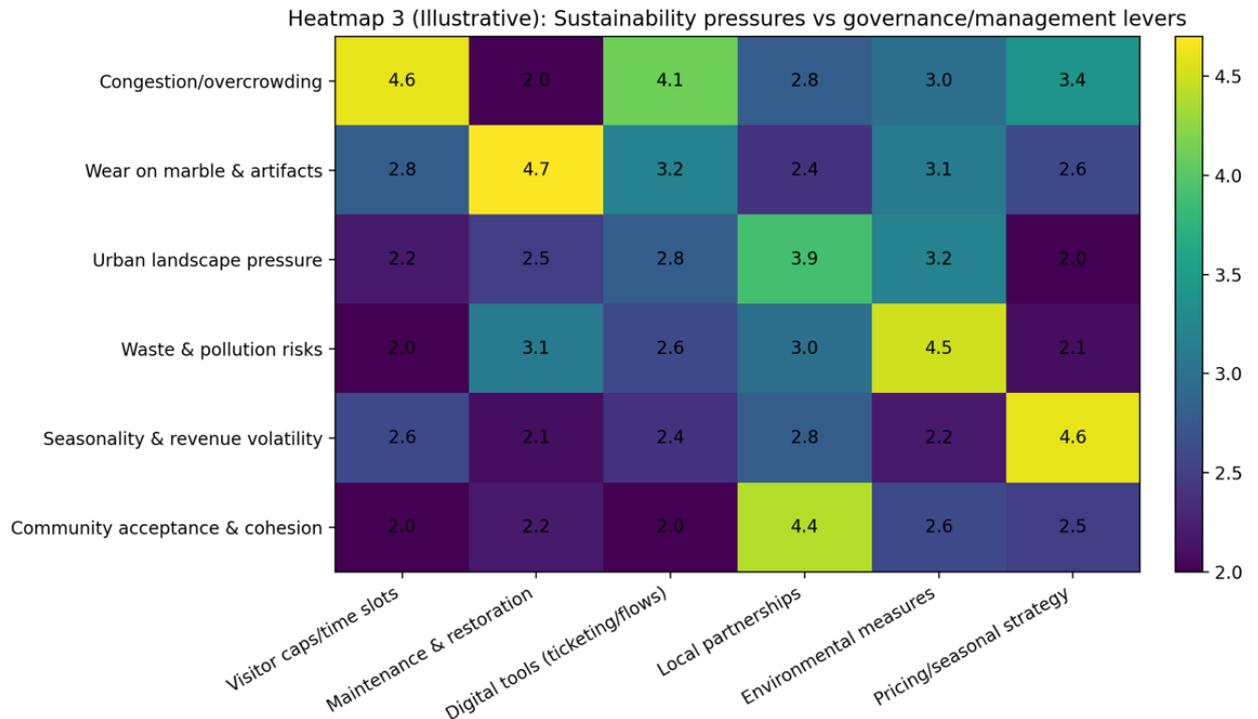


Figure 3: Sustainability pressures versus governance/management levers (Authors' scheme, see Appendix I)

Figure 3 presents a heatmap that contrasts key sustainability pressures associated with the Acropolis against the main governance and management levers available to policymakers and site administrators. The rows capture the principal pressures arising from intensive cultural tourism, including congestion, physical degradation, environmental stress, seasonality, and social acceptance. The columns represent policy and managerial instruments through which these pressures can be addressed. The intensity values are illustrative and indicate the relative effectiveness or relevance of each lever in responding to a specific pressure. Congestion and overcrowding emerge as most strongly associated with visitor caps and time-slot management, as well as with digital tools that regulate flows through advanced ticketing and monitoring systems. This highlights that demand-management mechanisms are more effective in addressing spatial and temporal concentration than traditional maintenance-oriented interventions. Pricing and seasonal strategies also play a secondary role by redistributing visitor demand across time. Wear on marble and archaeological artifacts is most strongly linked to maintenance and restoration measures, reflecting the fundamentally technical and conservation-oriented nature of this pressure. Digital monitoring tools and environmental measures provide complementary support, while visitor caps alone appear less directly targeted, indicating that physical degradation is not solely a function of visitor volume but also of material sensitivity and preservation practices. Urban landscape pressure shows a distinct pattern, with local partnerships scoring highest. This suggests that managing the broader urban impacts of heritage tourism requires coordination between site authorities, municipal planning bodies, and local communities. Digital tools and environmental measures also contribute, while direct demand controls and pricing strategies appear less effective in addressing spatial planning concerns. Waste and pollution risks are most closely associated with environmental measures, such as waste management systems, emissions control, and sustainability standards. Other levers display only moderate effectiveness, underlining that environmental externalities require targeted regulatory and infrastructural responses rather than indirect demand management alone.

Seasonality and revenue volatility are most effectively addressed through pricing and seasonal strategies. This reflects the capacity of differentiated pricing, off-peak incentives, and bundled offers to smooth demand and stabilize revenues over time. Other levers, including visitor caps and restoration efforts, show limited relevance for this particular challenge. Community acceptance and social cohesion are most strongly linked to local partnerships. This underscores the importance of participatory governance, benefit-sharing mechanisms, and engagement with residents in sustaining the social legitimacy of heritage tourism. Technical or pricing-based tools alone appear insufficient to address social acceptance without institutional cooperation and inclusion. Figure 3 demonstrates that sustainability pressures cannot be mitigated through a single universal policy instrument. Instead, effective governance of the Acropolis requires a portfolio of targeted interventions, each aligned with the specific nature of the pressure addressed. The heatmap reinforces the paper's broader argument that economic performance and sustainability must be jointly managed through differentiated and context-sensitive governance strategies. Policy proposals should aim to establish a coherent and sustainable strategy for managing the cultural wealth of the Acropolis, adopting a comprehensive framework for cooperation between the public and private sectors. Further strengthening investment in infrastructure and technologies will ensure better promotion and reuse of cultural resources, maximizing both their local economic impact and their global reach. In addition, the implementation of educational focus programs and the development of promotional activities would enhance educational and cultural awareness, attracting a wider range of visitors and creating new employment opportunities. At the management level, it is proposed to establish a National Committee for the preservation and sustainability of cultural capital, with an emphasis on environmental protection and the active participation of local residents and organizations. At the same time, strengthening research and studies to assess economic outcomes and adopting innovative holistic management models will improve the transparency and effectiveness of policies. Finally, promoting a harmonized environmental protection policy and strengthening shared responsibility will contribute to the long-term preservation of the cultural and natural environment, ensuring the sustainable development of the region.

Conclusions

The economic impact of the Acropolis on the local economy presents a multidimensional picture, confirming the importance of cultural heritage as a driver of growth. The exploitation of cultural resources contributes to increased visitor numbers and, by extension, to the creation of a sustainable income for the region. Tourism spending, which comes from visits to archaeological sites and related services, is a pillar of economic activity, while local businesses benefit from increased demand, creating jobs and strengthening the local market. The positive impact is not only achieved through direct benefits but also extends through the multiplier effect it has on the wider economy. This impact demonstrates how increased local incomes boost consumer spending, the supply chain, and public activities, leading to increases in public revenues. Of course, managing this economic momentum requires prudent policy that takes into account both the protection of the cultural and environmental environment and the preservation of social cohesion. The sustainability of cultural capital is crucial and depends on maintaining strong partnerships with local residents, associations, and organizations to ensure that the benefits are lasting and equitable. Furthermore, addressing environmental and cultural challenges is an integral part of the management strategy, with the aim of striking a balance between development and protection. This approach reflects the need for systematic planning and flexible policies that will support the further promotion and rational use of cultural resources, with a view to sustainability and social cohesion.

Appendix I

Heatmaps code in Python:

```
# Constantinos Challoumis ©© 2025 All Rights Reserved
```

```
import numpy as np
```

```
import matplotlib.pyplot as plt
```

```
import pandas as pd
```

```
from pathlib import Path
```

```
import zipfile
```

```
# Output folder
out_dir = Path("heatgraphs_acropolis")
out_dir.mkdir(parents=True, exist_ok=True)

def save_heatmap(data, row_labels, col_labels, title, filename):
    fig, ax = plt.subplots(figsize=(10, 6))
    im = ax.imshow(data, aspect="auto")

    ax.set_xticks(np.arange(len(col_labels)))
    ax.set_yticks(np.arange(len(row_labels)))
    ax.set_xticklabels(col_labels, rotation=30, ha="right")
    ax.set_yticklabels(row_labels)
    ax.set_title(title)
    # Cell annotations
    for i in range(data.shape[0]):
        for j in range(data.shape[1]):
            ax.text(j, i, f"{data[i, j]:.1f}", ha="center", va="center")
    fig.colorbar(im, ax=ax, fraction=0.046, pad=0.04)
    fig.tight_layout()

    path = out_dir / filename
    fig.savefig(path, dpi=200)
    plt.close(fig)
    return path

# -----
# Heatmap 1: Direct impacts
# -----
rows1 = [
    "Ticketing & site services",
    "Guided tours & culture services",
    "Accommodation",
    "Food & beverage",
    "Retail & souvenirs",
    "Local transport",
]
cols1 = ["Local revenue", "Employment", "Tax/fees", "Business formation", "Infrastructure demand"]
data1 = np.array([
    [4.8, 3.2, 4.5, 2.0, 3.8],
    [3.6, 3.8, 2.6, 2.8, 2.5],
```

```
[4.4, 4.1, 3.9, 3.2, 4.3],
[4.1, 4.0, 3.1, 3.0, 3.7],
[3.7, 3.0, 2.7, 2.9, 2.6],
[3.2, 2.9, 2.4, 2.2, 3.9],
], dtype=float)
p1 = save_heatmap(
    data1, rows1, cols1,
    "Heatmap 1 (Illustrative): Direct economic impact channels around the Acropolis",
    "heatmap1_direct_impacts.png"
)
df1 = pd.DataFrame(data1, index=rows1, columns=cols1)
csv1 = out_dir / "heatmap1_data.csv"
df1.to_csv(csv1)
# -----
# Heatmap 2: Indirect/multiplier links
# -----
rows2 = [
    "Supply chain purchases",
    "Wage spending rounds",
    "Local sourcing of goods",
    "Season extension (packages)",
    "Destination branding & repeat visits",
    "Public reinvestment (culture/infrastructure)",
]
cols2 = ["Hospitality", "Retail", "Transport", "Cultural services", "Public budget"]
data2 = np.array([
    [3.8, 3.4, 3.0, 2.6, 2.2],
    [4.2, 3.6, 3.1, 2.8, 2.5],
    [3.9, 3.2, 2.8, 2.4, 2.0],
    [4.0, 2.8, 2.6, 3.5, 2.1],
    [3.7, 3.0, 2.7, 3.8, 2.4],
    [3.0, 2.3, 2.2, 3.2, 4.6],
], dtype=float)
p2 = save_heatmap(
    data2, rows2, cols2,
    "Heatmap 2 (Illustrative): Indirect/multiplier pathways and where they land",
    "heatmap2_indirect_multiplier.png"
)
```

```
df2 = pd.DataFrame(data2, index=rows2, columns=cols2)
csv2 = out_dir / "heatmap2_data.csv"
df2.to_csv(csv2)
# -----
# Heatmap 3: Sustainability pressures vs governance levers
# -----
rows3 = [
    "Congestion/overcrowding",
    "Wear on marble & artifacts",
    "Urban landscape pressure",
    "Waste & pollution risks",
    "Seasonality & revenue volatility",
    "Community acceptance & cohesion",
]
cols3 = [
    "Visitor caps/time slots",
    "Maintenance & restoration",
    "Digital tools (ticketing/flows)",
    "Local partnerships",
    "Environmental measures",
    "Pricing/seasonal strategy",
]
data3 = np.array([
    [4.6, 2.0, 4.1, 2.8, 3.0, 3.4],
    [2.8, 4.7, 3.2, 2.4, 3.1, 2.6],
    [2.2, 2.5, 2.8, 3.9, 3.2, 2.0],
    [2.0, 3.1, 2.6, 3.0, 4.5, 2.1],
    [2.6, 2.1, 2.4, 2.8, 2.2, 4.6],
    [2.0, 2.2, 2.0, 4.4, 2.6, 2.5],
], dtype=float)
p3 = save_heatmap(
    data3, rows3, cols3,
    "Heatmap 3 (Illustrative): Sustainability pressures vs governance/management levers",
    "heatmap3_sustainability_governance.png"
)
df3 = pd.DataFrame(data3, index=rows3, columns=cols3)
csv3 = out_dir / "heatmap3_data.csv"
df3.to_csv(csv3)
```

```
# -----  
# Zip file  
# -----  
zip_path = Path("Acropolis_heatgraphs_bundle.zip")  
with zipfile.ZipFile(zip_path, "w", zipfile.ZIP_DEFLATED) as z:  
    for path in [p1, p2, p3, csv1, csv2, csv3]:  
        z.write(path, arcname=path.name)  
print("Saved:")  
print(" -", p1)  
print(" -", p2)  
print(" -", p3)  
print("Bundle ZIP:", zip_path)
```

References

- Abdul, M. (2023). Quō Vādis theoretical physics and cosmology? from Newton's Metaphysics to Einstein's Theology. *Annals of Mathematics and Physics*. <https://doi.org/10.17352/amp.000081>
- Aditia, R., & Kano, T. (2025). Innovation and Creative Entrepreneurship Management in Supporting Cultural Tourism at UNESCO World Heritage Sites. *International Journal of Social and Political Sciences*. <https://doi.org/10.69812/ijspss.v2i2.130>
- Alexandrakis, G., Manasakis, C., & Kampanis, N. (2019). Economic and Societal Impacts on Cultural Heritage Sites, Resulting from Natural Effects and Climate Change. *Heritage*. <https://doi.org/10.3390/heritage2010019>
- Atkinson, G., Groom, B., Hanley, N., & Mourato, S. (2018). Environmental Valuation and Benefit-Cost Analysis in U.K. Policy. *Journal of Benefit-Cost Analysis*, 9, 97–119. <https://doi.org/10.1017/bca.2018.6>
- Aurrekoetxea, J., Clough, K., & Lim, E. (2024). Cosmology using numerical relativity. *Living Reviews in Relativity*, 28. <https://doi.org/10.1007/s41114-025-00058-z>
- Barrow, J. (2020). Non-Euclidean Newtonian cosmology. *Classical and Quantum Gravity*, 37. <https://doi.org/10.1088/1361-6382/ab8437>
- Bateman, I., & Kling, C. (2020). Revealed Preference Methods for Nonmarket Valuation: An Introduction to Best Practices. *Review of Environmental Economics and Policy*, 14, 240–259. <https://doi.org/10.1093/reep/reaa009>
- Bertarelli, S., & Lodi, C. (2019). Heterogeneous firms, exports and pigouvian pollution tax: Does the abatement technology matter? *Journal of Cleaner Production*. <https://doi.org/10.1016/j.jclepro.2019.04.340>
- Bowitz, E., & Ibenholt, K. (2009). Economic impacts of cultural heritage – Research and perspectives. *Journal of Cultural Heritage*, 10, 1–8. <https://doi.org/10.1016/j.culher.2008.09.002>
- Cain, L., Hernández-Cortés, D., Timmins, C., & Weber, P. (2024). Recent Findings and Methodologies in Economics Research in Environmental Justice. *Review of Environmental Economics and Policy*, 18, 116–142. <https://doi.org/10.1086/728100>
- Campoy-Muñoz, P., Cardenete, M., & Delgado, M. (2017). Assessing the economic impact of a cultural heritage site using social accounting matrices. *Tourism Economics*, 23, 874–881. <https://doi.org/10.5367/te.2016.0554>
- Cao, Y., Lin, S., Li, M., Shan, Y., & Wang, P. (2024). Green Taxes: Productivity Effects of Tax-Based Environmental Regulations on Heavily Polluting Firms. *Economic Modelling*. <https://doi.org/10.1016/j.econmod.2024.106834>
- Cerisola, S., & Panzera, E. (2024). Heritage tourism and local prosperity: An empirical investigation of their controversial relationship. *Tourism Economics*, 31, 964–983. <https://doi.org/10.1177/13548166241234099>
- Challoumis, C. (2023a). FROM SAVINGS TO ESCAPE AND ENFORCEMENT SAVINGS. *Cogito*, XV(4), 206–216.
- Challoumis, C. (2023b). Risk on the tax system of the E.U. from 2016 to 2022. *Economics*, 11(2), 55–72.
- Challoumis, C. (2024a). Approach on Arm's Length Principle and Fix Length Principle Mathematical Representations. In *Innovations and Contemporary Trends in Business & Economics* (pp. 25–44). Peter Lang. <https://www.peterlang.com/search?searchstring=Approach+on+Arm's+Length+Principle+and+Fix+Lengt+h+Principle+Mathematical+Representations>
- Challoumis, C. (2024b). From Economics to Economic Engineering (The Cycle of Money): The case of Romania. *Cogito*, XVII(2), 161–170.

- Challoumis, C. (2024c). The Index of the Cycle of Money: The Case of Switzerland. *Journal of Risk and Financial Management*, 17(4), 1–24. <https://doi.org/https://doi.org/10.3390/jrfm17040135>
- Challoumis, C. (2025a). The impact factor of Tangibles and Intangibles of controlled transactions on economic performance. *Economic Alternatives*, 31(1), 64–76. <https://www.unwe.bg/doi/eajournal/2025.1/EA.2025.1.04.pdf>
- Challoumis, C. (2025b). THE INFLATION ACCORDING TO THE CYCLE OF MONEY (C.M.). *Economic Alternatives*, 2025(2), 324–353. <https://doi.org/https://doi.org/10.37075/EA.2025.2.03>
- Challoumis, C., & Eriotis, N. (2025). The Impact of Artificial Intelligence on the Greek Economy. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(3), 1–13. <https://doi.org/https://doi.org/10.1016/j.joitmc.2025.100578>
- Chauhan, P., & Raj, T. (2025). Optimizing Indian Tourism and Cultural Heritage: Bridging Policy Gaps through Integrated Governance, Agrotourism, and Regenerative Development. *International Journal For Multidisciplinary Research*. <https://doi.org/10.36948/ijfmr.2025.v07i04.54654>
- Chen, E. K. (2023). Does quantum theory imply the entire Universe is preordained? *Nature*, 624, 513–515. <https://doi.org/10.1038/d41586-023-04024-z>
- Chong, K., & Balasingam, A. S. (2019). Tourism sustainability: economic benefits and strategies for preservation and conservation of heritage sites in Southeast Asia. *Tourism Review*. <https://doi.org/10.1108/tr-11-2017-0182>
- Chruściel, P. (2020). Elements of General Relativity. *Compact Textbooks in Mathematics*. <https://doi.org/10.1007/978-3-030-28416-9>
- Clare, B., Walter, E., & Harold, E. (2019). Free market for the environment. *Economic Policy*. <https://doi.org/10.18288/1994-5124-2019-1-116-125>
- Cohen, H. (2018). Stock and bulk in the latest Newton scholarship. *The British Journal for the History of Science*, 51, 687–701. <https://doi.org/10.1017/s0007087418000924>
- De Haro, J. (2024). Relations between Newtonian and Relativistic Cosmology. *Universe*. <https://doi.org/10.3390/universe10060263>
- Dechezleprêtre, A., & Sato, M. (2017). The Impacts of Environmental Regulations on Competitiveness. *Review of Environmental Economics and Policy*, 11, 183–206. <https://doi.org/10.1093/reep/rex013>
- Della Spina, L. (2025). Community Branding and Participatory Governance: A Glocal Strategy for Heritage Enhancement. *Heritage*. <https://doi.org/10.3390/heritage8060188>
- Drinia, H., Tripolitsiotou, F., Cheila, T., & Zafeiropoulos, G. (2022). The Geosites of the Sacred Rock of Acropolis (UNESCO World Heritage, Athens, Greece): Cultural and Geological Heritage Integrated. *Geosciences*. <https://doi.org/10.3390/geosciences12090330>
- Drupp, M., Meya, J., Baumgärtner, S., & Quaas, M. (2017). Economic Inequality and the Value of Nature. *PSN: Income Inequality (Topic)*. <https://doi.org/10.2139/ssrn.3074570>
- Eubanks, L., & Furton, G. (2024). The institutional structure of pollution: large-scale externalities and the common law. *Public Choice*, 201, 429–450. <https://doi.org/10.1007/s11127-024-01172-2>
- Gkargkavouzi, A., & Halkos, G. (2024). The Psychology of Non-Market Environmental Valuation: An integrative review of research evidence, theoretical insights, and policy considerations. *Journal of Environmental Psychology*. <https://doi.org/10.1016/j.jenvp.2024.102510>
- Global Change Data Lab. (2024). Energy use per person vs. GDP per capita. *Our World in Data*. <https://ourworldindata.org/grapher/energy-use-per-person-vs-gdp-per-capita>
- Guijarro, F., & Tsinaslanidis, P. (2020). Analysis of Academic Literature on Environmental Valuation. *International Journal of Environmental Research and Public Health*, 17. <https://doi.org/10.3390/ijerph17072386>
- Guo, M., Wang, H., & Kuai, Y. (2022). Environmental Policy and Green Innovation: Evidence from Heavily Polluting Firms in China. *Finance Research Letters*. <https://doi.org/10.1016/j.frl.2022.103624>
- Halkos, G., & Aslanidis, P.-S. (2025). The Socio-Cultural and Spiritual Dimensions on Non-Marketed Environmental Valuation. *Sustainable Development*. <https://doi.org/10.1002/sd.70178>
- Jiang, J., Zhang, Q.-H., & Hui, Y. (2023). The Impact of Market and Non-Market-Based Environmental Policy Instruments on Firms' Sustainable Technological Innovation: Evidence from Chinese Firms. *Sustainability*. <https://doi.org/10.3390/su15054425>
- Joo, H.-Y., Seo, Y., & Min, H. (2018). Examining the effects of government intervention on the firm's environmental and technological innovation capabilities and export performance. *International Journal of Production Research*, 56, 6090–6111. <https://doi.org/10.1080/00207543.2018.1430902>
- Knapp, D., Bayrle-Kelso, N., Nigg-Stock, A., & Brecht, L. (2025). The Impact of Governmental Regulations and Environmental Activities on Innovation Efficiency. *Sustainability*. <https://doi.org/10.3390/su17020467>
- Kostakis, I., & Lolos, S. (2024). Uncovering the impact of cultural heritage on economic growth: empirical evidence from Greek regions, 2000–2019. *The Annals of Regional Science*, 73, 1209–1239. <https://doi.org/10.1007/s00168-024-01280-3>
- Landorf, C. (2009). A Framework for Sustainable Heritage Management: A Study of UK Industrial Heritage Sites. *International Journal of Heritage Studies*, 15, 494–510. <https://doi.org/10.1080/13527250903210795>
- Li, M., & Gao, X. (2022). Implementation of enterprises' green technology innovation under market-based environmental regulation: An evolutionary game approach. *Journal of Environmental Management*, 308, 114570. <https://doi.org/10.1016/j.jenvman.2022.114570>

- Li, X., Li, M., & Zeng, H. (2024). Environmental judicial reform and corporate investment behavior - Based on a quasi-natural experiment of environmental courts. *Journal of Environmental Management*, 365, 121640. <https://doi.org/10.1016/j.jenvman.2024.121640>
- Mazzucato, M. (2023). Governing the economics of the common good: from correcting market failures to shaping collective goals. *Journal of Economic Policy Reform*, 27, 1–24. <https://doi.org/10.1080/17487870.2023.2280969>
- Mendoza, H. M., & Talavera, A. (2025). Governance Strategies for the Management of Museums and Heritage Institutions. *Heritage*. <https://doi.org/10.3390/heritage8040127>
- Newbold, S., & Johnston, R. (2020). Valuing non-market valuation studies using meta-analysis: A demonstration using estimates of willingness-to-pay for water quality improvements. *Journal of Environmental Economics and Management*, 104, 102379. <https://doi.org/10.1016/j.jeem.2020.102379>
- Noga, A. (2024). Market Solution to Environmental Tragedy with Coasean Bargaining, Commons in the Form of Common Property, and International Human Rights Law. *Groningen Journal of International Law*. <https://doi.org/10.21827/grojil.11.2.230-255>
- Ouyang, X., Li, Q., & Du, K. (2020). How does environmental regulation promote technological innovations in the industrial sector? Evidence from Chinese provincial panel data. *Energy Policy*. <https://doi.org/10.1016/j.enpol.2020.111310>
- Petrolia, D., Guignet, D., Whitehead, J., Kent, C., Caulder, C., & Amon, K. (2020). Nonmarket Valuation in the Environmental Protection Agency's Regulatory Process. *Applied Economic Perspectives and Policy*. <https://doi.org/10.1002/aapp.13106>
- Pouw, N., Weikard, H., & Howarth, R. (2022). Economic analysis of international environmental agreements: lessons learnt 2000–2020. *International Environmental Agreements: Politics, Law and Economics*, 22, 279–294. <https://doi.org/10.1007/s10784-022-09576-5>
- Rangkuti, Y. A., Bangun, A. K., Kurniawan, R., Ilham, Z., Hasibuan, S., Tambunan, T. M. B., & Silitonga, D. F. (2025). Cultural heritage and sports tourism: a systematic literature review of sustainable destination management practices. *Frontiers in Sports and Active Living*, 7. <https://doi.org/10.3389/fspor.2025.1680229>
- Reynolds, J. (2019). An economic analysis of international environmental rights. *International Environmental Agreements: Politics, Law and Economics*, 19, 557–575. <https://doi.org/10.1007/s10784-019-09454-7>
- Rogers, A., Kragt, M., Gibson, F., Burton, M., Petersen, E., & Pannell, D. (2015). Non-Market Valuation: Usage and Impacts in Environmental Policy and Management in Australia. *Agricultural & Natural Resource Economics EJournal*. <https://doi.org/10.1111/1467-8489.12031>
- Sagoff, M. (1981). Economic Theory and Environmental Law. *Michigan Law Review*, 79, 1393–1420. <https://doi.org/10.2307/1288102>
- Senatore, L., Bimonte, G., & Gatto, A. (2025). Sustainable and Resilient Governance of Common-Pool Resources: A Critical Analysis of Non-Cooperative and Cooperative Game Theory Applications. *Journal of Economic Surveys*. <https://doi.org/10.1111/joes.12690>
- Shamshiyev, O. (2023). A Theoretical Study on Negative Externalities and the Free-Rider Problem in Natural Resource Management from Islamic Law Perspective. *İslam Ekonomisi ve Finansı Dergisi (İEFD)*. <https://doi.org/10.54863/jief.1381347>
- Shank, J. (2019). Between Isaac Newton and Enlightenment Newtonianism. *Science Without God?* <https://doi.org/10.1093/oso/9780198834588.003.0005>
- Shao, S., Hu, Z., Cao, J., Yang, L., & Guan, D. (2020). Environmental Regulation and Enterprise Innovation: A Review. *Business Strategy and the Environment*. <https://doi.org/10.1002/bse.2446>
- Shi, C., & Sun, L. (2025). Assembly or Subdivision? Comparative Institutional Analysis of Culture-Led Urban Regeneration Projects from Xi'an, China. *Urban Science*. <https://doi.org/10.3390/urbansci9090382>
- Snobelen, S. (2003). *The Cambridge Companion to Newton*. Isis. <https://doi.org/10.1017/ccol0521651778>
- Yang, Q., Liu, G., Casazza, M., Campbell, E., Giannetti, B., & Brown, M. (2018). Development of a new framework for non-monetary accounting on ecosystem services valuation. *Ecosystem Services*. <https://doi.org/10.1016/j.ecoser.2018.09.006>
- Ye, J., Qin, Y., & Wu, H. (2024). Cultural heritage and sustainable tourism: unveiling the positive correlations and economic impacts. *Current Psychology*, 43, 36393–36415. <https://doi.org/10.1007/s12144-024-07070-6>
- Zeng, Z., & Wang, X. (2023). Will World Cultural Heritage Sites Boost Economic Growth? Evidence from Chinese Cities. *Sustainability*. <https://doi.org/10.3390/su15108375>
- Zhang, J., Kang, L., Li, H., Ballesteros-Pérez, P., Skitmore, M., & Zuo, J. (2020). The impact of environmental regulations on urban Green innovation efficiency: The case of Xi'an. *Sustainable Cities and Society*. <https://doi.org/10.1016/j.scs.2020.102123>
- Zhao, A., Zhang, H., Liu, Y., & Guan, H. (2024). Environmental taxes, technological innovation and firm performance: Evidence from China's manufacturing firms. *Heliyon*, 10. <https://doi.org/10.1016/j.heliyon.2024.e31386>
- Zhou, P., Song, F., & Huang, X. (2023). Environmental regulations and firms' green innovations: Transforming pressure into incentives. *International Review of Financial Analysis*. <https://doi.org/10.1016/j.irfa.2023.102504>
- Zhou, Y., & Su, Q. (2025). Environmental Protection Tax, Management Efficiency, and Enterprise Green Technology Innovation. *Finance Research Letters*. <https://doi.org/10.1016/j.frl.2025.106860>