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Forests, wildlife, and economy: the role of hunting tourism in Czechia's sustainable forest management

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Forests and forest ecosystems are vital for providing habitats to wildlife while also supporting economic activities beneficial to society. Among these, hunting tourism represents a valuable economic opportunity across European regions, particularly in remote rural areas, and its integration into sustainable forest management can amplify the value of forest ecosystems. Integrating hunting tourism into sustainable forest management can enhance the long-term environmental, social, and economic value of forest ecosystems. The aim of this study is to assess the economic impact of hunting tourism as an integral part of sustainable forest management and restoration efforts in Czechia, with a particular focus on its contribution to the national economy between 2019 and 2022. Utilizing an input–output model and multiplier analysis, it quantifies both direct and indirect economic impacts based on domestic and foreign hunting tourist numbers, their expenditures, and symmetric input–output tables (SIOT), highlighting interdependencies among economic sectors. Results showed that hunting tourism contributes over 80 million euros annually to Czechia's economy, though income saw a decline in 2020 and 2021 due to the Covid-19 pandemic. The findings emphasize the role of forest management in sustaining wildlife resources, alongside the importance of data-driven decision-making, enabling policymakers and stakeholders to develop growth strategies that support both economic resilience and ecological restoration.

KEYWORDS

sustainable forest management, hunting tourism, economic impact, rural development, input–output model, wildlife management, sustainable tourism, COVID-19 pandemic

1 Introduction

Forestry offers an extensive range of benefits to society and the environment. The forestry sector provides essential goods and services that support livelihoods and contribute significantly to local and national economies worldwide (Aznar-Sánchez et al., 2018; Li et al., 2019). Forests play a crucial role in employment and economic growth, particularly in rural areas. Beyond traditional forestry and logging, industries dependent on wood processing and downstream activities are central to economic development in many rural regions (Sullivan, 2022). This includes a variety of sports, tourism, and hospitality services that support

businesses offering activities such as hunting, fishing, and services like hotels, campsites, and wellness centers.

In recent decades, the forestry industry has undergone substantial transformations, encountering some of the most profound changes in its history. This shift is driven by factors such as globalization, digitalization, COVID-19 pandemic, changing global competitive advantages and consumer behaviors, as well as evolving societal attitudes toward forest utilization and ecosystem services (Jayasundara et al., 2024; Hurmekoski et al., 2019). Alongside traditional products like firewood, there is growing demand for forestry's recreational value, with tourism linked to forests expanding across many regions globally (Hong-Wen et al., 2023; Zhao et al., 2022).

During last few decades international tourism as a whole arrivals have grown rapidly. While 436 million arrivals were recorded in 2000, in 2019 (before COVID-19 pandemic) there were 1,419 million (United Nations World Tourism Organization, 2021) and thus the highest number of arrivals was achieved. After a significant drop during the COVID-19 pandemic, tourism began to recover, and the number of arrivals began to rise again from 2021. With the growth of people's fondness for travel, the competition between companies offering tourism services has increased and they are trying to offer new and more interesting products (Pilotti et al., 2011). As indicated by Lamoureux et al. (2018), more than 25% of all tourist offerings encompass an element of adventure travel provision, with projections suggesting that this proportion could rise to 50% of all journeys by 2050. Adventure tourism encompasses a combination of a minimum of two of the following components: natural surroundings, physical activity, and cultural interlace. Among a list of 34 adventure tourism activities defined by Adventure Travel Trade Association (2015), hunting tourism is recognized as one of them.

1.1 Hunting within forestry sector

Game hunting has been a traditional part of mankind since ancient times. Hunting of game play an integral role in the forestry sector, contributing to ecological management, biodiversity conservation, economic sustainability and also cultural heritage (Petroman et al., 2009). The intersection of these activities with forestry management creates a complex system where environmental, social, and economic factors converge (Heckbert et al., 2009; Neumann et al., 2022). Hunting plays a crucial role in managing wildlife populations and promoting healthy forest ecosystems. Studies have shown that deer hunting can positively influence tree regeneration in temperate forests (Martin and Baltzinger, 2002; Ward and Williams, 2020). In areas with higher hunting pressure, browsing stress on certain tree species is lower, leading to better regeneration (Martin and Baltzinger, 2002). However, managing deer-forest systems remains challenging due to conflicting stakeholder demands and the disconnect between forest and hoofed population management (Beguín et al., 2016). To address these issues, an integrated management approach combining actions on both hoofed populations and forests is recommended (Beguín et al., 2016). One of the key challenges is balancing hunting with conservation goals. Sustainable practices, such as regulated numbers of individuals in population and scientific monitoring, are critical to ensure that hunting contributes positively to forest management. Hunting can be classified into several types depending on its purpose, method, and target species. We can

perceive these types of hunting, although they may overlap and complement each other:

- Subsistence hunting - hunting primarily for food, survival, and local consumption, often practiced by indigenous and rural communities (Santos-Fita et al., 2012; Anthony and Varner, 2019; Santos-Fita, 2023).
- Recreational (Sport) hunting as non-commercial hunting performed for leisure, challenge, and tradition (Carr and Young, 2018; Cohen 2014).
- Trophy hunting—selective hunting of specific animals, often targeting males with large antlers, horns, or other distinguishing features, where the trophy (e.g., antlers, horns, skin) is preserved as a souvenir (Vora, 2018; Batavia et al., 2018).
- Commercial hunting—hunting conducted for the sale of animal products such as meat, fur, or other body parts. This form is often regulated or prohibited in many countries due to conservation concerns (Stearman and Redford, 1992).
- Population control (management) hunting - targeted hunting aimed at regulating wildlife populations to prevent overgrazing, crop damage, or ecological imbalance. This is frequently integrated into forestry and wildlife management programs (Chee and Wintle, 2010; Rosenfield and Pizzutto, 2018).
- Culling - the removal of specific individuals or groups of animals (often diseased, invasive, or overpopulated) to improve the health of ecosystems or reduce human-wildlife conflicts (Bolzoni and De Leo, 2013).
- Traditional and cultural hunting - hunting associated with cultural, spiritual, or ceremonial practices, often with deep-rooted significance in indigenous or local traditions (Pattiselanno et al., 2016).

Although the role of hunting has changed over time, since the twentieth century hunting has begun to develop as a recreational phenomenon (Cury and Cayré, 2001). The role of hunting in nature conservation and how to approach hunting tourism to make it sustainable has begun to be discussed (Petroman et al., 2015; Gallego, 2010; Chapagain and Poudyal, 2020). Due to the diversity of hunting species depending on the location (Lovell, 2007), the diversification of tourism (Desbiolles, 2020), and the growth of people's spending on tourism (Risso, 2018), a new form of tourism as a business opportunity has emerged, namely hunting tourism (Matilainen, 2007). Hunting tourism is defined as a specific form of tourism where the main goal of travelling is game hunting for a fee (Buckley and Mossaz, 2015; Ristić et al., 2009). Hunting tourism is suitable and vital for undeveloped rural areas in particular and can play a significant role for economic survival and future development of an area (Kalábová, 2016; Prentovic et al., 2016). A hunting tourist is someone who hunts outside the place where they are authorized to hunt all year round and pays a fee for the hunt, including accompanying services (Ristić et al., 2009). A hunting tourist can be both domestic or and foreigner (Matilainen, 2007).

With the decreasing number of local domestic hunters, effective wildlife management becomes critical for ensuring successful forest regeneration and maintaining ecosystem balance. Unchecked populations of species of hoofed game can damage trees and disrupt biodiversity, threatening forestry sustainability (Reimoser, 2003). Hunting tourism offers a practical solution by

attracting fee hunters to help control wildlife populations while generating economic benefits for rural and forested areas (Matejević et al., 2023; Naidoo et al., 2016). Revenues from hunting licenses, guided hunting, and accommodation support rural economies and provide forest owners with an additional income stream, which can be reinvested into sustainable forest management, reforestation, and conservation efforts. This dual approach not only supports wildlife management but also contributes to the economic vitality of forestry areas. Hunting tourism incentivizes the preservation of natural forest habitats, as healthy wildlife populations are directly dependent on a well-managed environment. Forest owners or managers should have a vested interest in maintaining and protecting these ecosystems to ensure a thriving hunting economy.

The relationship between hunting and tourism has been increasingly recognized as a key component of sustainable wildlife management and rural development, especially in regions where alternative economic activities are limited (Lindsey et al., 2007b; Naidoo et al., 2016). Globally, hunting tourism generates significant revenues — for example, trophy hunting alone contributes an estimated \$201 million annually across sub-Saharan Africa, supporting both conservation and local livelihoods (Lindsey et al., 2007b). In Europe, hunting is strongly linked to traditional land-use practices, biodiversity conservation, and rural areas. Hunting tourism thus has been developing in recent years and is particularly relevant in countries such as Sweden, Finland, Germany, and Spain, where it not only contributes to rural income but also serves as a wildlife management tool to control populations of deer, wild boar, and other ungulates (Brainerd, 2007). However, differences in national regulations, cultural perceptions, and hunting traditions result in regional variations in the role and significance of hunting tourism (Gunnarsdotter, 2007). Hunting tourism can bring both positive benefits and negative aspects on forest restoration and rural development depending on how it is managed (Petroman et al., 2015; Naidoo et al., 2016). The importance and indispensability of hunting tourism is proved and discussed in African countries in particular, where hunting tourism offers several significant benefits, including generating income for conservation management, providing food for local communities, and creating employment opportunities in the accommodation and related sectors (Naidoo et al., 2016; Lindsey et al., 2006; Lindsey et al., 2007b; Snyman, 2012; Hurt and Ravn, 2000). A decline in hunting tourism revenue can lead to reduced funding for conservation activities as there would be inadequate financial support (Naidoo et al., 2016). Moreover, hunting tourism (especially trophy hunting) can enhance the value of wildlife as a competitive land-use option (Lindsey et al., 2006; Baldus and Cauldwell, 2004). There is a big debate among governments about whether hunting tourism leads to the exploitation of wildlife (Buckley and Mossaz, 2015; Petroman et al., 2015; Deere, 2011) or if it is an important economic source (Pérez et al., 2015; Pešić, 2021). In some countries there has been an attempt to ban hunting completely, leading to losses of income. For example, the ban on hunting in Namibia from 2014 to 2019 not only resulted in an increase in wildlife populations but also led to a rise in damage caused by wildlife and conflicts with humans (Gargallo, 2021). Implementing a sustainable hunting strategy proves to be a valuable tool in managing wildlife effectively (Mokgalo and van der Merwe, 2022). The goal of hunting tourism must thus always be its long-term sustainability in connection with wildlife management.

1.2 Three pillars of sustainability in hunting tourism

Hunting tourism is subject to debates about whether it fulfils the principles of sustainability (Tickle and Essen, 2020). Hunting tourism stands out as a specialized form of tourism centered on the utilization of natural resources. The driving force behind this type of tourism is the pursuit of game and the conservation of natural habitats for wildlife at the same time (Petroman et al., 2015). Therefore, the planning of hunting tourism must receive greater emphasis compared to how it was approached in the past. Hunting and hunting tourism share a strong connection, with their progress being mutually dependent. To foster the growth of hunting tourism, it is imperative for hunting tourism destinations to boast appealing wildlife species along with a well-preserved natural setting (Buckley and Mossaz, 2015). However, concerning investment in hunting, which includes protecting wildlife, setting up technical and breeding amenities, improving infrastructure and other aspects, hunting (i.e., hunting tourism) is the most crucial financial function (Matilainen, 2007; Matilainen et al., 2016; Pešić, 2021). This is because a portion of the funds derived from hunting tourism reliably returns to the hunting grounds, being reinvested for activities related to game nurturing (Baker, 1997). Sustainability is a key and indispensable factor in the development of hunting tourism (Matilainen, 2007; Martín-Delgado et al., 2022). Neglecting sustainability principles, particularly from environmental and social perspectives, in favor of economic gains can result in a dramatic decline in hunted game species and, in the long run, diminish the benefits derived from hunting tourism (Martín-Delgado et al., 2022; Matilainen, 2007). A notable instance is the hunting of argali *Ovis ammon* and ibex *Capra sibirica* in Kyrgyzstan, where hunting tourism practices have pushed these species to the brink of extinction (Nordbo et al., 2018).

1.2.1 Environmental impact of hunting tourism

Hunting tourism presents a complex and multifaceted environmental impact that requires careful consideration. While it can contribute positively to conservation efforts by generating funds for habitat preservation and species management, it also carries the risk of ecological disruption if not managed responsibly and sustainably (Petroman et al., 2015; Buckley and Mossaz, 2015). Balancing the interests of maintaining biodiversity, minimizing habitat disturbance, and ensuring sustainable hunting practices is crucial for mitigating the environmental implications associated with hunting tourism (Buckley and Mossaz, 2015). Strict regulations and proper control are imperative for the responsible conduct of hunting tourism. Without such measures, unregulated and excessive hunting tourism can lead to detrimental effects on ecosystems, causing pollution and disrupting the balance of wildlife populations (Adhikari et al., 2021). If some of those impacts occur, there is a need to consider ceasing hunting tourism to prevent further harm. Maintaining balanced numbers of game populations is crucial for the sustainable management of forests (Yemshanov et al., 2021; Lehaire et al., 2013).

1.2.2 Social aspects of hunting tourism

Social sustainability of hunting tourism plays an important role for long-term development in many regions (Matilainen, 2007). Public opinion can have significant effects on the advancement of hunting tourism in any country as it is essential to portray hunting as a necessary component of sustainable wildlife management. A survey

conducted among residents in Canada revealed that people generally hold a positive attitude toward hunting tourism, though not necessarily in a commercial context (MacKay and Campbell, 2004). Similarly, in some European countries (i.e., Serbia and Sweden) residents are slightly positive in favor of hunting tourism revitalization (Matejević et al., 2022; Willebrand, 2008); however, in some countries (i.e., Finland), a significant social sustainability problem exists among Finnish hunters, who view hunting tourism as a threat. This perception acts as a major barrier, hindering the future development of hunting tourism within the country (Nygård and Uthardt, 2011). Providers of hunting experiences for tourists face a delicate balancing act between moral and economic values (Cederholm and Sjöholm, 2021).

1.2.3 Economical impact of hunting tourism

The ongoing debate surrounding the economic impact of hunting tourism on conservation projects is divided between researchers: while some emphasize its potential benefits (Samuelsson and Stage, 2007; Naidoo et al., 2016; Willebrand, 2008; Pešić, 2021), others are more inclined to downplay its significance (Tickle and Essen, 2020; Lovelock, 2003; Boulé and Mason, 2019). From an economic point of view, hunting tourism can contribute significant value to many regions and play a crucial role in generating jobs within sectors related to hunting activities (Matilainen et al., 2016). This form of tourism holds economic importance at the local level. While small-scale enterprises engaged in hunting-related businesses are essential in the regional context, their impact may not be as noticeable on an industry-wide scale (Matilainen et al., 2016). Furthermore, there is evidence of enterprises involved in the commercializing of wildlife experiencing growth and development (Gallego, 2008).

To better understand the real significance of hunting tourism, it is useful to examine existing studies that have sought to quantify its economic effects. The following section summarizes key findings from the literature.

1.3 Calculation of hunting tourism economic impact

Several studies have been conducted that deal with calculating the economic impact of hunting tourism, mostly in African countries, where hunting tourism is an irreplaceable component of income. Saayman et al. (2011) carried out a study to estimate the economic impact of hunting tourism on South Africa's Northern Cape province. The findings revealed that hunting tourism brought in 43 million euros in 2007 and created 9,072 jobs that depended on hunting activities. In the same spirit, van der Merwe et al. (2014) assessed the economic impact of hunting tourism in three provinces of South Africa, where hunting tourism, particularly based on large private game preserves and farms, is a core tourism industry in the country. They reported a multiplier of 2.08 for the Free State province of South Africa, indicating the economic impact of hunting tourism in that region. Moreover, it aids rural development and serves as an essential tool in combating poverty in the country (Saayman et al., 2018). Game farm tourism significantly contributes to South Africa's economy (van der Merwe and Saayman, 2003). In Namibia, trophy hunting represents more than 14% of the total tourism sector, and it plays a vital role in supporting impoverished communities in remote areas. Samuelsson and Stage (2007) conducted a study to analyze the economic impacts of hunting tourism in Namibia,

focusing on both communal land conservancies and private land. Using a Social Accounting Matrix (SAM) based on data from a five-year survey of hunters visiting Namibia, the study found that each extra N\$ spent by survey respondents resulted in approximately one extra N\$ in national income. The additional income generated by hunting tourism mainly benefited rural households and urban wage earners more than capital owners, resulting in a more favorable income distribution compared to the average economy. Humavindu and Barnes (2003) found that 24% of the revenues from trophy hunting go towards wages for the poor, while 21% is collected by the government in taxes and fees.

Some calculations of the impact of hunting tourism have already been made in Europe as well, mostly on a local scale. However, there is no study involving the whole territory of a European state. During the 2018/2019 hunting season, the journeys of hunters from Extremadura in Spain resulted in considerable income, with variations observed between the two travelers' profiles. The average expense per person for hunting trippers amounted to 800 euros, whereas it increased to 1,182 euros for hunting tourists. These findings highlight the economic significance of hunting as an activity and its substantial contribution to tourist destinations in Extremadura (Martín-Delgado et al., 2022). In particular, Matejević et al. (2023) estimated the direct economic impact of roe deer hunting tourism, with a focus on the regional level, by applying the Nordic Model. The results showed that one hunting tourist spent an average of 2,121 euros per hunting day in Serbia. In 2019 the direct economic income of roe deer hunting tourism in Vojvodina was 623,574 euros. According to Pešić (2021), the annual increase in the number of hunters, both domestic and foreign, has led to a corresponding rise in financial profits and economic impacts derived from this resource. Crucially, the distribution of these profits holds great importance. Proper allocation of income plays a pivotal role in preserving and ensuring the necessary resources for game bird procurement, as well as the construction and maintenance of hunting and technical facilities for game breeding and the accommodation of foreign tourists. Although data on the impacts of trophy hunting are limited, some studies have made efforts to estimate these effects by conducting surveys of trophy hunters and outfitters, often in case study contexts (Lindsey et al., 2007a; Samuelsson and Stage, 2007; Jorge et al., 2013). Nonetheless, the economic importance of these relatively small-scale companies may not be readily apparent when assessed at the industry level. Nevertheless, they could offer a sustainable solution to address rural challenges at the local scale (Matilainen et al., 2016). In 2016, the hunting industry in Europe was valued at around 16 billion euros, according to European Federation for Hunting and Conservation (FACE, 2016). This substantial sum of money comes directly from the expenditures of Europe's 7 million hunters, who use it for various purposes such as licenses, purchasing firearms and ammunition, acquiring equipment, as well as for hunting tourism expenses. Additionally, the efforts of these hunters play a significant role in fostering the growth of rural regions across Europe. This is achieved through the creation of job opportunities, enhancing social connections within rural communities, and preserving and passing down cultural heritage and traditions (FACE, 2016).

1.4 Research gap and necessity of the study

Hunting and hunting tourism have been integral to wildlife management and forest conservation for centuries. As human

development expands and traditional hunting practices decline, there is an increasing need to reassess the role of regulated hunting within sustainable forestry management. This study aims to bridge gaps in current research by analyzing the economic, ecological, and social implications of hunting and hunting tourism in forest ecosystems.

A substantial body of literature underscores the significance of hunting in wildlife management. Baskin (2016) highlighted that regulated hunting can act as an effective tool for controlling wildlife populations, preventing overgrazing, and maintaining biodiversity. Hardalau et al. (2024) further emphasize that ungulate overpopulation due to declining predator numbers and reduced hunting pressure has resulted in severe forest degradation, affecting timber production and reforestation efforts. In regions where large carnivores are scarce, hunting serves as a necessary measure to mitigate the negative impact of overabundant herbivore populations.

From an economic perspective, Gunnarsdotter (2007) discusses how hunting tourism provides substantial revenue streams, particularly in regions where traditional forestry practices alone do not suffice. Forestry should be approached more holistically to support sustainable development, considering both environmental and economic factors, and involving cooperation between different stakeholders (Raihan, 2023). However, while economic benefits are well-documented, research addressing the long-term integration of hunting tourism with sustainable forestry strategies remains limited.

Socially, the decline in domestic hunting participation poses challenges for effective wildlife management. Larson et al. (2014), von Essen (2017) highlighted those modern societal shifts, including urbanization and changing cultural attitudes toward hunting, have led to decreasing numbers of local hunters. This trend increases the need for alternative management approaches, such as attracting foreign hunting tourists through regulated hunting tourism. While studies like those by Lindsey et al. (2007a), Parker et al. (2020), Muboko (2021) focus on the impacts of trophy hunting in Africa, there is a lack of comprehensive analysis on how hunting tourism supports forestry management in Central Europe.

Despite the well-established roles of hunting and hunting tourism in ecological and economic contexts (Matilainen, 2007; Petroman et al., 2015; Florin et al., 2018; Naidoo et al., 2016), there is a research gap in understanding their specific contributions to forestry sustainability. While previous studies have explored individual aspects—such as wildlife population control (Putman et al., 2011b) or the financial impact of hunting tourism (Naidoo et al., 2016)—few have analyzed these components together in the context of European forest ecosystems. Moreover, with declining local hunter participation and increasing pressures on sustainable forest management, it is crucial to explore how hunting tourism can supplement traditional forestry revenue while simultaneously supporting biodiversity conservation.

In the context of hunting and hunting tourism in forestry management, the gap in knowledge lies in the comprehensive analysis of the ecological, economic, and governance aspects of hunting as a tool for sustainable forest management, particularly in the European and Central European context. While various studies have examined the individual aspects of hunting—such as its role in wildlife population control (Putman et al., 2011a), the economic contributions of hunting tourism (Lindsey et al., 2007b), and shifting social attitudes toward hunting (Heberlein and Ericsson, 2005) or against (Raftogianni et al., 2022), —there is limited research that integrates these dimensions into a holistic approach to forestry sustainability.

A specific gap exists regarding the role of hunting tourism as a compensatory mechanism for declining domestic hunter participation. With fewer local hunters available to regulate wildlife populations, there is a need to understand whether and how hunting tourism can provide a sustainable solution that balances ecological conservation with economic viability. This study aims to contribute to a more integrated understanding of hunting and hunting tourism as part of sustainable forestry management, offering insights for policymakers, conservationists, and forest managers seeking to balance environmental protection with economic development.

Based on a comprehensive literature review, it was found that no existing studies specifically address the economic impact of hunting tourism as an integral part of sustainable forest management. While previous research has explored hunting's ecological effects or its contribution to regional economies in broader European or global contexts, no study has comprehensively examined the economic interdependencies of hunting tourism within Czechia's forestry sector using quantitative models like input–output analysis.

This study is crucial because it fills a critical research gap by providing empirical evidence on the economic significance of hunting tourism within Czechia's forestry sector. Given the increasing pressures on forest management—ranging from declining domestic hunting participation to the economic instability caused by external shocks (e.g., the COVID-19 pandemic)—it is essential to evaluate whether hunting tourism can provide a sustainable source of revenue.

Furthermore, hunting tourism plays a key role in rural development, particularly in remote forested areas, where economic diversification is often limited. Understanding the economic multipliers and sectoral linkages of hunting-related activities allows policymakers to make informed decisions that enhance both forest conservation and regional economic stability. Additionally, with growing debates on sustainable wildlife management, this study provides data-driven insights to ensure that hunting tourism remains a well-regulated, beneficial component of forestry policies.

1.5 Aim and objectives of the study

The aim of this study is to analyze the economic impact of hunting tourism as an integral part of sustainable forest management and restoration efforts in Czechia, with a particular focus on its contribution to the national economy between 2019 and 2022. The study seeks to quantify both the direct and indirect economic effects of hunting tourism and highlight its interconnections with other sectors.

The specific objectives of the study are:

- To assess the financial contribution of hunting tourism to Czechia's economy by analyzing revenues generated from hunting-related activities, including tourist expenditures.
- To evaluate the role of hunting tourism within sustainable forest management, particularly its impact on biodiversity conservation, wildlife population control, and forest ecosystem restoration.
- To apply an input–output model and multiplier analysis using symmetric input–output tables (SIOT) to quantify interdependencies between hunting tourism and other economic sectors.

- To analyze the effects of external disruptions (such as the COVID-19 pandemic) on hunting tourism revenues and the subsequent economic implications for rural and forested areas.
- To provide data-driven insights for policymakers and forest managers, enabling them to develop strategic plans that balance economic resilience with ecological sustainability.

The study thus contributes to a deeper understanding of how hunting tourism can be effectively integrated into sustainable forestry policies, ensuring both economic benefits and long-term environmental conservation.

2 Materials and methods

The economic impact of hunting tourism was evaluated in 4 years, namely 2019, 2020, 2021, and 2022 in the territory of Czechia. An input–output model based on the calculation of the multiplier for hunting tourism was used for the evaluation.

To calculate the direct and indirect economic impact, it was necessary to obtain the following data:

- 1 number of both domestic and foreign hunting tourists participating in hunting tourism,
- 2 amount of their direct expenses associated with the hunting stay,
- 3 hunting tourism multiplier based on symmetric input–output tables.

The input–output model has a quantitative approach and is built on the analysis of the inter-industry relationship (Surugiu, 2009). It also explains the inter-dependencies of sectors within the economy and maintaining equilibrium between the demand and supply side of hunting tourism. The advantage of this method is the ability to quantify the multiplier effects that are caused by the relationships of hunting tourism and hunting tourists to other sectors of the economy (Frechtling and Horváth, 1999). This mathematical model designates cross-sectoral money movements within a region's economy. Money flows are determined by assessing the purchases made by one industry from all other industries to produce one unit of output (output worth one monetary unit). The described method involves a comprehensive quantification of the interconnectedness and interdependence within the company's production system, achieved through an equilibrium solution or a balance of resources and usage in the economic system.

The overall impact on production growth is determined by the sum of two components: the direct impact, which is the total product of hunting tourist's initial expenditures, and the indirect impact, represented by the production multipliers for each product purchased. This comprehensive indicator quantifies the total increase in production across the entire economy. It accounts for both the direct augmentation in production resulting from increased demand and the indirect amplification caused by the production of intermediate consumption — referring to all input products necessary for the creation of final products — and subsequent rounds of production involving subcontractors of input products (Şahin et al., 2012). By using this indicator, we can assess how the heightened demand for specific products influences overall production, gross value added (or GDP), employment (job creation),

wage income, and corporate profits throughout the economy (Rusu and György, 2011). The primary data source used to assess cross-sectoral connections is a collection of input–output tables, known as the ESA 1995 European standard. These tables encompass supply and use data, as well as tables that establish connections between supply and use with sector accounts. Among these, symmetric input–output tables (SIOT) are of particular importance as they serve as analytical tools, facilitating the investigation of inter-sectoral ties and quantification of the economy's response to external influences.

2.1 Study area and legislation framework

The Czech Republic is located in the geographical center of Europe, covering an area of 78,866 km² around 34% of the country is covered by forests, making them an important part of the landscape and economy. The majority of Czech forests are composed of coniferous trees, primarily spruce, with significant portions of oak, beech, and pine. These forests play a vital role in biodiversity, carbon sequestration, and providing raw materials for the timber industry, as well as being popular destinations for outdoor recreation, tourism and other ecosystem services (Riedl et al., 2024; Riedl et al., 2020). Over half (54%) of the forests are state-owned. The largest portion, about 44%, is managed by the state enterprise Forests of the Czech Republic. Other state-owned forests include military forests and those within national parks. Forests owned by private individuals make up 19%, with the majority consisting of small properties, where approximately 80% of owners manage forests of less than 1 hectare in size. Additionally, a significant portion of forests, 17%, is comprised of municipal and urban forests. The last category are forests managed by other legal persons, which occupy almost 10% (Ústav pro hospodářskou úpravu lesů, 2024; Palátová et al., 2023). During the last 10 years, Czech forests have experienced a significant bark beetle outbreak, and therefore huge areas have appeared that need to be reforested (Hlásny et al., 2021). Forest restoration efforts are supported by the state and their policies through various economic subsidy instruments (Rinn et al., 2023a; Rinn et al., 2023b; Rinn and Jarský, 2022). However, it is also necessary to ensure that the resources spent on afforestation are used effectively, i.e., that the forested areas are not damaged again by animals, for example.

The hunting area in Czechia covers a substantial expanse of 6,887,798 hectares, making up an impressive 88% of the country's total area. Out of the total hunting area in Czechia, 57% is comprised of agricultural land, 38% is forest land, 1.4% covers water surfaces, and 4.3% constitutes other types of land. Within this territory, 49,314 hectares are designated as game preserves, while 90,874 hectares are designated as pheasantries, leaving the remaining portion as free hunting grounds. The entire hunting area is subdivided into 5,787 hunting grounds, with 201 being game preserves and 286 being pheasantries (Czech Statistical Office, 2022). On average, each hunting ground encompasses approximately 1,190 hectares, with the minimum being 500 ha (Czech Republic, 2001). The most important species for hunting tourism in Czechia are red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*), sika deer (*Cervus nippon*), fallow deer (*Dama dama*), mouflon (*Ovis musimon*), and wild boar (*Sus scrofa*). The number of annual hunts of main hunting tourism game species is presented in Figure 1.

Hunting in the Czech Republic is managed by several key institutions to ensure sustainable wildlife management and compliance with national regulations. The Ministry of Agriculture serves as the primary governing body, overseeing hunting laws, quotas, and conservation policies. The Czech-Moravian Hunting Union (ČMMJ), the largest national hunting organization, plays a crucial role in hunter education, licensing, and ethical hunting practices. At the regional and municipal levels, municipality with extended jurisdiction regulate hunting districts and enforce game management laws. In state-owned forests, Lesy České republiky (Forests of the Czech Republic, s.p.) grants hunting leases and manages game populations, while Military Forests and Estates (Vojenské lesy a statky ČR, s.p.) oversee hunting activities in military zones. Additionally, national park administrations enforce stricter regulations to balance biodiversity conservation with hunting practices. Compliance with hunting laws is monitored by game wardens and environmental inspectors, ensuring sustainable hunting and preventing illegal activities.

In the Czech Republic (Czech Republic, 2001), hunting is regulated by Act No. 449/2001 Coll., on Game Management, which establishes the legal framework for hunting activities, including licensing, game species, which is possible to hunt, hunting seasons, and methods of hunting. To participate in hunting, individuals must obtain a hunting license and a hunting permit specific to the area where the hunt will occur. Domestic hunters are required to pass a comprehensive examination that assesses their knowledge of wildlife management, hunting laws, firearm handling, and safety protocols. Upon successful completion, a hunting license is issued, typically for an indefinite period. Foreign hunting tourists are required to obtain a Czech hunting license in order to legally engage in hunting activities within the country. To acquire a Czech hunting license, they must provide a valid hunting license from their

home country. Czech hunting license is always temporary and can be issued for periods ranging from 1 day to 1 year. This process often involves submitting necessary documents, such as a valid passport and proof of hunting qualifications in home country, to the relevant Czech authorities—municipality with extended jurisdiction.

Poaching or illegal hunting in the Czech Republic, while present, are not as severe as in some other countries. However, it still poses a threat to protected species like lynxes, wolves, and birds of prey. The main drivers of illegal hunting include trophy collection and conflicts with livestock or game populations. One of the biggest challenges has been the low success rate of investigations due to a lack of specialized training for law enforcement. The Czech Republic is actively working on improving enforcement and reducing poaching through stronger legislation and cooperation, making the situation more controlled compared to other regions with higher levels of illegal hunting.

2.2 Survey methodology

The survey methodology is integrated as an essential part of this research, directly complementing the input–output analysis. The data were collected through a structured questionnaires conducted between 2019 and 2022. The questionnaires consisted of three sections:

- 1 socio-demographic characteristics of hunters,
- 2 hunting participation and travel behavior,
- 3 expenditures related to hunting tourism.

Questionnaires were inspired by validated research instruments used in previous studies, particularly Matilainen (2007), Samuelsson and Stage

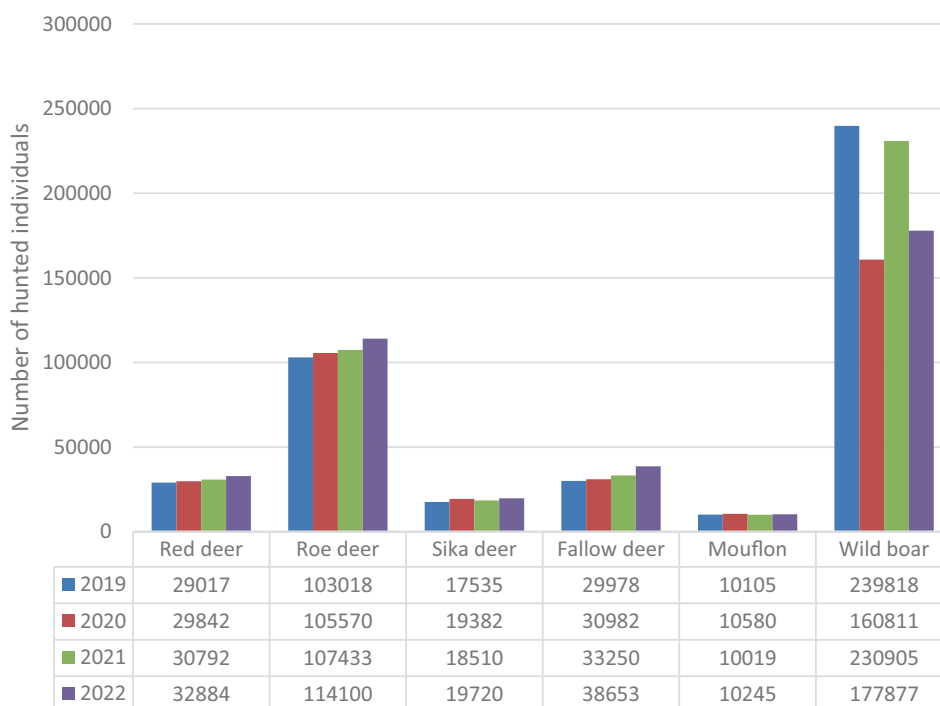


FIGURE 1

Number of main hunted species in Czechia. Source: Czech Statistical Office (2020, 2021, 2022, 2023).

(2007), and Matejević et al. (2023), who analyzed the economic impact of hunting tourism in Nordic and Balkan countries. This ensured comparability of results and partial validation of the questions used.

The survey targeted both domestic and foreign hunters participating in organized hunting events, individual hunts, or hunting stays in Czechia. Both questionnaires used in this study were carefully designed to align with ethical research principles, ensuring informed consent, voluntary participation, anonymity, and data confidentiality. Questionnaires were submitted for evaluation and approval by CZU Ethical Committee to verify that the research adheres to ethical guidelines, particularly concerning data collection and participant rights. The study also complies with General Data Protection Regulation (GDPR) and other applicable data privacy laws, ensuring that participants' responses remain confidential and are used solely for academic and analytical purposes.

2.2.1 Data collection among foreign hunting tourists

The number of foreign hunters who went to Czechia to hunt in the monitored years was obtained from municipalities with extended jurisdiction, which are responsible for issuing hunting licenses to foreigners. A total of 205 municipalities were addressed based on Act 106/1999Sb on freedom of access to information. The survey instrument aimed at foreign hunters was disseminated across 12 sampling sites that exemplify fee-based hunting opportunities. These locations comprised 6 state enterprises, of which 3 were associated with Military Forests and Estates of the Czech Republic and 3 with Forests of the Czech Republic. Additionally, 2 sites were privately-owned hunting grounds, while 4 others were hunting clubs. Data collection from foreign hunters commenced as early as 2017; however, for the specific objectives of this article, only responses gathered between 2019 and 2022 were utilized for the analysis. The first part of the questionnaire consisted of demographic questions, the next part focused on participation in hunting tourism in Czechia, and the last part focused on expenses, their amount and structure. Total number of respondents to the questionnaire is presented in Table 1.

A drop in the number of hunting tourist arrivals in the Czech Republic during the Covid-19 pandemic was also recorded at

all collection points, which was also reflected in the number of respondents to the questionnaire. A total of 622 foreign hunters answered the questionnaire over the course of 4 years.

The questionnaire was opened a total of 1,163 times; subsequently 623 responses were completed, which means that the questionnaire response rate was 53%. One response had to be deleted because it was answered by a Czech hunter by mistake. The response rate is little bit higher than the questionnaire for domestic hunters, probably because of the individual and personal request to fill out a questionnaire at the hunting site. There was also a larger number of men ($n = 598$) than women ($n = 24$) who answered the questionnaire, which also corresponds with the overall very small number of women travelling to a foreign country to hunt. Respondents were most often aged 51–60 years ($n = 208$), 41–50 years ($n = 187$), and 61–70 years ($n = 96$). Other age categories were represented as follows: 31–40 years ($n = 72$), 19–30 years ($n = 5$), 71–80 years ($n = 39$), and over 81 years ($n = 15$), up to and including 18 years ($n = 0$). The respondents had secondary school education ($n = 325$), followed by university education ($n = 247$), and at least basic education ($n = 50$). Respondent come from Austria ($n = 284$), Germany ($n = 128$), Slovakia ($n = 107$), Netherlands ($n = 47$), Belgium ($n = 23$), Finland ($n = 18$), Switzerland ($n = 5$), Denmark ($n = 2$), Sweden ($n = 6$) and Serbia ($n = 2$).

2.2.2 Data collection among domestic hunters

The number of domestic hunting tourists who participated in paid hunting in individual years was obtained through a questionnaire survey. In the questionnaire, domestic hunters indicated whether they participated in fee hunting in 2019, 2020, 2021, and 2022. The share of hunters who participated in paid hunting in the monitored years, was recalculated to the entire population of hunters in the monitored year. The value of hunting tourist expenses and their structure were found through a questionnaire survey. Data collection through a questionnaire survey for domestic hunters took place from November 2022 to May 2023. The questionnaire was divided into three parts. The first part consisted of demographic questions, the next part focused on participation in national or international hunting tourism, and the last part focused on expenses, their amount and structure in monitored years. The questionnaire for domestic hunters was distributed using

TABLE 1 Number of foreign hunting tourist respondents in years 2019–2022.

| Type of hunting ground - site | 2019 | 2020 | 2021 | 2022 |
|---|------|------|------|------|
| Military forests and estates of the Czech Republic—Mimoň | 41 | 18 | 22 | 35 |
| Military forests and estates of the Czech Republic—Karlový Vary | 28 | 16 | 14 | 21 |
| Military forests and estates of the Czech Republic—Plumlov | 12 | 4 | 9 | 17 |
| Forests of the Czech Republic—Konopiště | 41 | 29 | 32 | 51 |
| Forests of the Czech Republic—Kladská | 22 | 9 | 5 | 16 |
| Forests of the Czech Republic—Židlochovice | 36 | 24 | 32 | 41 |
| Kapinos | 6 | 0 | 2 | 6 |
| Jandovka | 8 | 0 | 0 | 4 |
| Hunting club Chotěbudice | 3 | 1 | 0 | 2 |
| Hunting club Dobrá Voda | 2 | 0 | 0 | 3 |
| Hunting club Měřín | 4 | 0 | 0 | 2 |
| Hunting club Vožice | 4 | 0 | 0 | 0 |
| Total | 207 | 101 | 116 | 198 |

the CAWI (Computer Assisted Web Interviewing) method using Survio platform. The Czech-Moravian Hunting Union, serving as the hunting association that unites all hunters in Czechia, played a crucial role in facilitating the distribution of the questionnaire. It accomplished this by sending the survey to all district hunting associations through email addresses and, subsequently, these associations forwarded the questionnaire to the hunting club managers. This effective process enabled the questionnaire to reach a wide and substantial number of hunters. In addition to email distribution, the questionnaire was also made accessible through cards featuring a QR code. These QR code cards allowed hunters to conveniently access the questionnaire on their mobile phones. The cards were distributed at 13 driven hunts, where a total of 957 hunters participated. In total, the survey received active participation from a total of 1,245 domestic hunters. The questionnaire was opened a total of 2,766 times; subsequently 1,245 responses were completed, which means that the questionnaire response rate was 45%. A larger number of men ($n = 1,087$) than women ($n = 158$) answered the questionnaire, which corresponds to the fact that hunting is a male-oriented activity in the Czech Republic. The number of women with a valid hunting license is 8% (Czech Statistical Office, 2022). Respondents were most often aged 41–50 years ($n = 345$), 51–60 years ($n = 234$), and 61–70 years ($n = 208$). Other age categories were represented as follows: 31–40 years ($n = 186$), 19–30 years ($n = 171$), 71–80 years ($n = 83$), and over 81 years ($n = 12$), up to and including 18 years ($n = 6$). Most respondents had secondary school education ($n = 671$), followed by university education ($n = 467$), and at least basic education ($n = 107$).

2.3 Methodology of symmetric input–output tables for calculating the multiplier in hunting tourism

Tables of supply and use are an integral part of the national accounts of Czechia, which are compiled annually at $t + 6$ months (preliminary compilation of national accounts) and $t + 18$ months (definitive compilation of national accounts) after the end of the reference period (Czech Statistical Office, 2023). In national accounts, they are used for balancing products and deflating aggregates.

From a content point of view, supply and use tables provide a detailed description of the transactions of goods and services realized during the year and give an idea of the flows of produced goods and services exchanged with non-residents and used by all resident units during the monitored period (year). The basis of the construction of the supply table and the table of use is a matrix (product \times branch of activity) enabling an analysis, on the one hand of production by sector and resources by products, and, on the other hand, intermediate consumption, and components of gross added value by sector and final use of individual products. Both tables, by their basic construction, allow a detailed description of the cost structure of individual branches of activity and the income derived from production created by these activities, the flows of goods and services within the national economy, and the exchange of goods and services with non-residents (imports and exports).

To quantify the economic impact of hunting tourism, we follow a series of steps involving the normalization of a symmetric input–output table. This process is achieved by dividing each element of the table (z_{ij}) by the corresponding output value (x_j). The resulting matrix

of input coefficients (A) represents the consumption of each intermediate product needed to produce one unit of a specific product. Beyond direct production, our analysis extends to indirect production, considering subsequent rounds of subcontractors. The total production required to meet the initial demand is the combination of both direct and indirect production.

To calculate the coefficients of total production, we subtract the matrix of input coefficients (A) from the unit matrix (I) and then compute the inverse of this resulting matrix, which we refer to as the Leontief inverse matrix (L) (Leonhard, 2001).

In mathematical terms, these steps can be summarized as follows:

- 1 Normalize the symmetric input–output table:

$$a_{ij} = \frac{z_{ij}}{x_j}$$

- 2 Compute the matrix of input coefficients (A):

“ A ” indicates the consumption of each intermediate product to produce one unit of a given product.

- 3 Monitor indirect production:

Account for production by secondary and subsequent subcontractors.

- 4 Calculate the coefficients of total production (L):

“ L ” is determined by finding the inverse of $(I - A)$, where “ I ” is the unit matrix.

The final expression for the Leontief inverse matrix (L) can be written as:

$$L = (I - A)^{-1}$$

Next, it becomes imperative to identify the key sectors relevant to hunting tourism and calculate the overall multiplier, which is derived as the average of all individual multipliers. This comprehensive multiplier is then applied to the total expenditures of hunting tourists, enabling us to assess the overall impact of hunting tourism on the entire economy, encompassing both the direct and indirect effects.

3 Results

3.1 Number of domestic and foreign hunting tourists participating in hunting tourism in Czechia

The number of foreign hunters who came to Czechia dropped significantly in 2020 and 2021 due to the ongoing COVID-19 pandemic and associated travel restrictions. Specific numbers of domestic hunting tourists in individual years are presented in Figure 2.

The number of holders of hunting licenses in Czechia is decreasing year by year. While in 2019 a total of 90,033 persons exercised the right to hunt, the following year it was 88,876, in 2021 88,793 and in 2022 only 88,702 (Czech Statistical Office, 2022). So, there has been a decrease of 1.5% over the last 4 years. In view of the increasing numbers of game

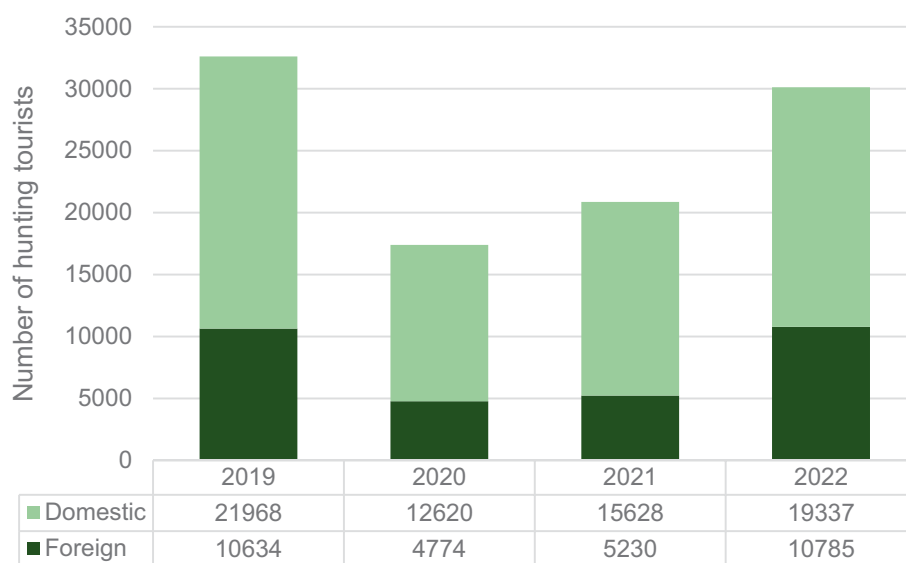


FIGURE 2
Number of hunting tourists in years 2019–2022.

(Czech Statistical Office, 2022), hunting tourism appears to be a solution for the future operation of hunting in the territory of Czechia. Using data obtained from a questionnaire survey, participation rates in fee hunting were analyzed for the monitored years. In 2019, approximately 24.4% of respondents reported engaging in hunting tourism at least once. However, the percentage experienced a decline to 14.2% in 2020, largely attributed to the ongoing COVID-19 pandemic. Nevertheless, there was a slight rebound in 2021, with the participation rate rising to 17.6%. In 2022, the percentage of respondents involved in hunting tourism increased further to 21.8%. By considering these participation rates, the number of hunters engaged in hunting tourism was then calculated relative to the total number of hunting license holders in the country.

3.2 The amount of direct expenses associated with the hunting stay

The amount of expenses is based on questionnaire surveys conducted among domestic and foreign hunters. Foreign hunters spent an average of 1,727 euros in last 4 years in direct expenses related to their hunting stay. During the pandemic, the amount of expenditure decreased slightly, but it is evident that it did not have a significant effect on the amount of expenditure. Domestic hunters spent an average of 1,128 euros on a hunting trip over the last 4 years, which represents 65% of the value of foreign hunters' expenses. The reason is shorter stays and more participation in small game hunting. Specific average values of expenses determined by questionnaire surveys are shown in Figure 3.

3.3 Figures symmetrical input output tables (SIOT) for calculating the multiplier in hunting tourism

The Czech Statistical Office (CZSO) compiles the SIOT according to the Eurostat manual regularly at least every 5 years, which is

required by the EU transmission program (always years ending in 0 and 5). For the purposes of calculating the multiplier for hunting tourism, tables compiled for 2015 and 2020 which are publicly available at the CZSO were used.

The following CZ-NACE industries were included in the calculation of the industry multiplier: Agriculture, production of food products, other processing industry, land and pipeline transport, air Transport, accommodation, catering and Hospitality, telecommunication activities, activities in the field of information technology, insurance, assurance, legal and accounting activities, advertising and market research, activities of travel agencies, offices, public administration and defense; compulsory social security, sports, entertainment, and recreational activities.

The multipliers based on SIOT for the observed years were computed and are presented in Table 2, below.

As evident from the data, there has been a marginal decrease in the multiplier, indicating an overall reduction in output within the industry. The decline can be attributed to the impact of the Covid-19 pandemic and production restrictions enforced by various companies.

With the established multiplier in place, it becomes possible to compute the annual economic benefit derived from hunting tourism, presented in Figure 4. The biggest total economic income from hunting tourism was recorded in 2019, before the COVID-19 pandemic, although income is already reaching a similar level in 2022. In 2020 and 2021, a decrease was recorded in both domestic and foreign hunter income, mainly related to a decrease in the number of hunting tourists who participated in hunting tourism. Overall, in 2020, the amount of income reached only 44% of 2019 and thus meant a loss of 46,314,147.36 euros for Czechia. Although total income from foreign hunters is lower than that of domestic hunters in each of the monitored years, this type of tourism also forms an interesting part of foreign inbound tourism, as only a relatively small number of clients generate significant income. Overall, hunting tourism can bring more than 80 million euros to the Czech economy.

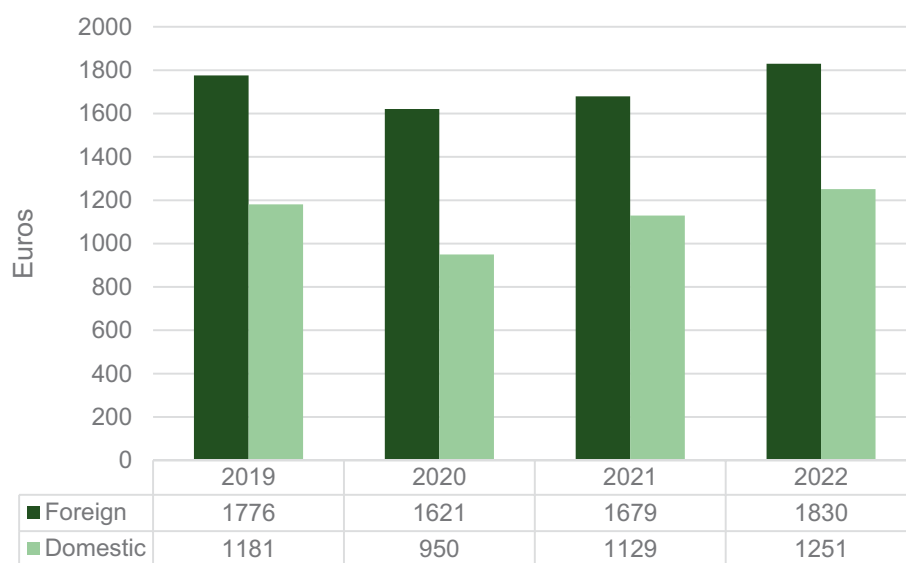


FIGURE 3
Direct expenses of hunting tourists in 2019–2022 in euros.

TABLE 2 Multipliers for 2019–2022.

| Multiplier based on SIOT 2015–2019 | Multiplier based on SIOT 2020–2024 |
|------------------------------------|------------------------------------|
| 1,837 | 1,828 |

4 Discussion

Our study estimated that hunting tourism contributes over 80 million euros annually to Czechia's economy, demonstrating its significance in rural development, forest management financing, and job creation. This result is consistent with studies such as [Lindsey et al. \(2007b\)](#), who found that hunting tourism generates significant revenues in Southern African countries, supporting conservation efforts and local livelihoods. Although the economic magnitude differs due to geographical and ecological factors, the underlying principle—that hunting tourism creates economic value beyond direct expenditures—remains the same. Similarly, [Brainerd and Kaltenborn \(2010\)](#) assessed the role of hunting in Northern Europe and found that, when integrated with sustainable forestry practices, hunting tourism enhances local economies, wildlife management funding, and land-use efficiency. Our study reinforces this perspective by applying input–output modelling and SIOT analysis, which further quantifies intersectoral linkages and multiplier effects. Unlike previous studies that primarily focused on direct revenues, our approach provides a more comprehensive evaluation of hunting tourism's role in the broader country economy, highlighting its connections to hospitality, game processing, and rural business development.

However, our study differs from [Naidoo et al. \(2016\)](#), who found that in some African regions, trophy hunting revenues contribute disproportionately higher amounts to conservation funds than general eco-tourism activities. In Czechia, while hunting tourism remains an important contributor to forest management, it does not outweigh other forestry-related economic activities such as timber production.

This indicates that while hunting tourism provides supplementary financial benefits, its economic impact is not dominant compared to primary forestry activities.

The significant decline in hunting tourism revenue during 2020 and 2021 due to the COVID-19 pandemic aligns with findings from [Newsome \(2021\)](#), who examined the impact of travel restrictions on wildlife tourism worldwide. Similarly, [Spalding et al. \(2020\)](#) noted that nature tourism were among the most affected industries due to their reliance on international travel and in-person experiences. Our results confirm that the economic vulnerability of hunting tourism was evident in Czechia, with a sharp 56% decline in income compared to pre-pandemic levels. However, the near full recovery of hunting tourism by 2022 suggests a high level of resilience, which contrasts with some studies indicating a long-term downturn in other tourism sectors (e.g., general eco-tourism, which has faced more prolonged recovery periods) ([Alagon, 2021](#)). This resilience may be attributed to the high spending power of a relatively small number of hunting tourists, who contribute significantly per capita compared to mass tourism.

In terms of biodiversity conservation, our study aligns with [Putman et al. \(2011a\)](#), who emphasized that regulated hunting can serve as a critical wildlife management tool, particularly in regions where overabundant ungulate populations threaten forest regeneration. In Czechia, deer and wild boar populations pose challenges to young forest growth, and hunting tourism provides an effective mechanism for population control while generating economic benefits. Similar results were found in [Hothorn and Müller \(2010\)](#), who discussed how overgrazing by large herbivores in European forests necessitates controlled hunting to ensure sustainable forest ecosystems. Our study reinforces this argument, showing that hunting tourism not only supports local economies but also indirectly benefits sustainable forestry by preventing habitat degradation. However, unlike studies from Africa ([Lindsey et al., 2006](#); [Novelli et al., 2006](#)) and North America ([Heffelfinger et al., 2013](#)), which often emphasize the conservation benefits of trophy hunting for rare and endangered species, Czechia's hunting tourism primarily focuses on species population management

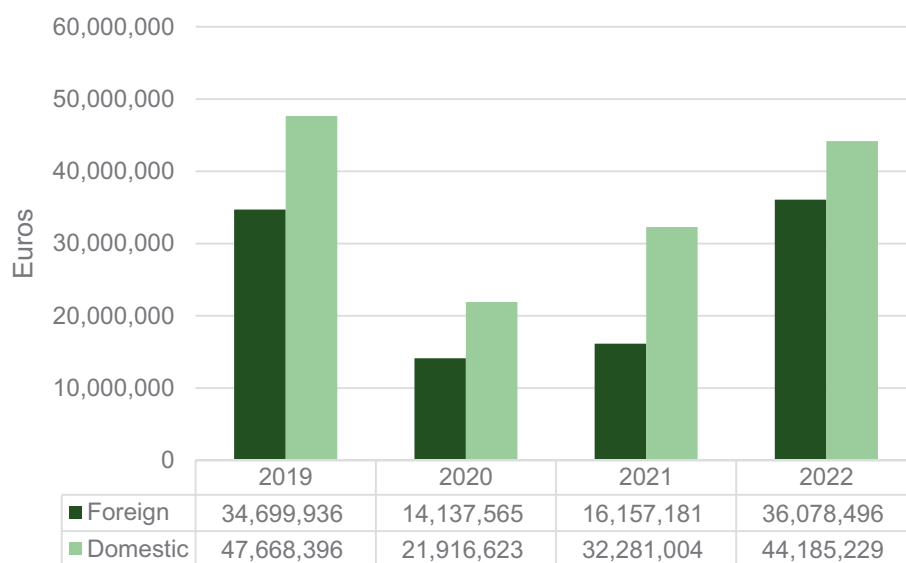


FIGURE 4
Economic impact from foreign and domestic hunting tourists in 2019–2022 in euros.

rather than generating conservation funds for rare wildlife. While trophy hunting is present, it does not constitute the primary wildlife management strategy as seen in other parts of the world.

Assessment of the economic effects of hunting tourism holds significant importance for both the hunting tourism sector and the economy of a destination or region known for hunting activities. Hunting tourism has a substantial direct and indirect economic impact, which is consistent with [Matilainen et al. \(2016\)](#) who stated that hunting tourism in Finland can contribute significant value to many regions and play a crucial role in generating jobs within sectors related to hunting activities, even though this form of tourism holds economic importance at the local level. However, in Czechia during the years 2020 and 2021, there was a considerable decline in its effects due to the COVID-19 pandemic and the restrictive measures implemented by various countries; by 2022, the industry began showing signs of recovery, as the economic indicators approached pre-pandemic levels. The same trend in tourism was noticed by countries around the world ([Davis et al., 2023](#); [Newsome, 2021](#); [Sumanapala and Wolf, 2021](#)).

Based on questionnaire surveys, it was found that the Czech fee hunter spent an average of 1,128 euros for the entire hunting stay over the last 4 years, while for a foreign hunter this figure reached the value of 1,727 euros. The expenditure of a foreign hunter in Czechia is thus higher than in the study of the Extremadura region from Spain ([Martín-Delgado et al., 2022](#)), where hunting tourists pay an average of 1,182 Euros per hunting stay. The highest noticed value of hunter expenditure was reported for Serbia ([Matejević et al., 2023](#)), where a hunting tourist spends 2,121 euros per hunting day for roe deer hunting, which, from the long-term perspective of sustainable development of hunting tourism, is relatively uncompetitive for the future. The overall economic impact of the country cannot be compared with any other study, as the studies carried out in Africa only dealt with a regional location; however, it can be stated that the hunting tourism multiplier found was slightly lower in Czechia (1.837 in 2019 and 1.828 in the following years) than found in the Free State Province of South Africa (2.08) ([van der Merwe et al.,](#)

2014). It also follows from this difference that the Euro spent in South Africa on game hunting multiplies more within the production of the entire country than in the Czechia.

The funds generated from hunting tourism can play a subsequent role in areas, serving as direct investment and a means for promoting sustainable wildlife management practices, which is closely tied to the health of the forestry sector and its long-term economic viability ([Matejević et al., 2023](#)). Although the economic impact of hunting tourism on a national scale may seem relatively small in Czechia (0.03% GDP (CZSU, 2022)), its impact on regional development can be very significant, especially in rural regions where other production is left behind. While small-scale enterprises engaged in hunting-related businesses are essential in the regional context, their impact may not be as noticeable on an industry-wide scale ([Matilainen et al., 2016](#)). Another important aspect is that this economic contribution is made by only a small group of consumers comparing number of arrivals of tourists to Czechia (11 mil. in 2019; [Czech Statistical Office, 2021](#); 3,77 mil. in 2021; [Czech Statistical Office, 2023](#)), which means hunting tourists pay more money to consume hunting tourism products than regular tourists. For that reason, in the future there is the opportunity to focus more attention and especially investment on the development of hunting tourism. Czechia has excellent prerequisites in terms of natural resources, i.e., enough different game species, which it can offer as part of hunting tourism ([Kalábová, 2016](#)). [Ružić et al. \(2016\)](#) also perceives that there is not enough investment into hunting tourism, poor promotion in foreign and domestic media so the local citizens are not well informed about possibilities of how to use their own natural resources. According to [FACE \(2016\)](#), in the European context, hunting and related activities directly contribute a substantial 16 billion euros to the economy. This figure highlights the scale and economic importance of hunting within forest management in Europe as a whole.

While hunting tourism can provide significant economic and ecological benefits, it is essential to consider potential challenges such as over-reliance on external hunters and the cultural shifts away from traditional hunting practices in rural communities ([Di Minin et al.,](#)

2021). Additionally, the impact of increased hunting pressure from tourism on local wildlife populations needs to be carefully monitored to avoid overexploitation. Policies should ensure that hunting quotas remain sustainable and aligned with conservation goals. There's also the question of how to integrate hunting tourism with other forest uses, such as recreation and timber production, to avoid conflicts and ensure balanced forest management. The long-term sustainability of hunting tourism as a solution hinge on maintaining a balance between economic interests, wildlife conservation, and the ecological health of forest ecosystems (Nagle and Vidon, 2022).

Simulation models are means of simplifying reality by making specific assumptions. To utilize such models effectively, it is essential to ensure that the given assumptions of the model are met. The method of input–output analysis exists, which involves using the costs incurred by organizations providing all hunting tourism services to understand the flow of inputs and outputs in an economy (Fletcher, 1989). It aims to track how various industries purchase goods and services from one another and how these transactions contribute to the overall economic activity. To apply this method, data on the expenses and costs of individual organizations across different sectors are collected. These expenses typically include purchases of raw materials, intermediate goods, and services necessary for production. By analyzing these expenditure patterns, economists can construct an expenditure matrix that showcases how each sector's spending contributes to the production and revenue generation of other sectors. The expenditure matrix reveals the interdependence and linkages between different industries, as well as the overall structure of the economy. It allows for the calculation of different economic indicators, such as production multipliers, which help estimate the ripple effects of changes in demand or investments in specific sectors. However, one significant challenge with this method is the difficulty in obtaining accurate and comprehensive data on organizations' expenses. Many organizations consider this information sensitive and may be reluctant to share it, making data collection challenging and often incomplete. This limitation can restrict the application of this method, especially when detailed financial information is not readily available.

The need for data-driven policy interventions highlighted in our study aligns with recommendations from Ericsson et al. (2003), who suggested that declining domestic hunter participation in Europe necessitates innovative approaches, such as enhancing rural development and resilient rural communities. Similarly, our study supports the idea that policymakers must integrate hunting tourism into broader economic and conservation frameworks, ensuring a balance between ecological sustainability and economic viability. However, Misakov and Zherukova (2019) highlighted the organizational, legal, and ecological challenges associated with expanding hunting tourism industries, particularly in Europe. Our findings confirm that as hunting tourism grows in Czechia, there is an increasing need to address legal regulations, sustainability concerns, and public perceptions of hunting as a conservation tool. While our study suggests that hunting tourism clusters could help enhance coordination and investment, further research is required to determine the best governance models for long-term sustainability.

5 Conclusion

The study found that hunting tourism contributes over 80 million euros annually to Czechia's economy. The highest income from

hunting tourism was recorded in 2019, before the COVID-19 pandemic, demonstrating its economic potential in stable conditions. The pandemic led to a significant decline in 2020 and 2021, with income falling to 44% of 2019 levels, resulting in an estimated loss of 46.3 million euros. By 2022, income levels nearly returned to pre-pandemic figures, indicating sector resilience and recovery. The study confirmed that hunting tourism plays an essential role in managing wildlife populations, reducing overgrazing, and maintaining biodiversity. The revenue from hunting tourism supports forest restoration efforts, demonstrating its integration into sustainable forest management practices. While income from foreign hunters is consistently lower than from domestic hunters, foreign hunting tourism remains significant, as a relatively small number of foreign clients generate substantial income for the sector. The input–output model and SIOT tables identified strong interdependencies between hunting tourism and other economic sectors. Hunting tourism stimulates value-added services such as guided hunting, game processing, accommodation, catering, and equipment provision, benefiting rural and forestry-dependent economies. The use of SIOT multipliers provided a detailed economic evaluation, emphasizing hunting tourism's contribution to local and regional economic development. The study demonstrated how external factors such as the COVID-19 pandemic significantly impact hunting tourism. The rapid decline in revenues during 2020 and 2021 highlights the vulnerability of the sector, but its near recovery by 2022 shows resilience and adaptability. The study underscores the importance of data-driven decision-making, enabling policymakers to develop strategies that balance economic growth with ecological sustainability. It suggests the creation of stakeholder clusters (government and private sector) to actively support hunting tourism through investment and policy initiatives. As the industry expands, organizational, legal, social, and ecological challenges must be addressed to ensure long-term sustainability. Future research should explore comparative analyses in other European countries and investigate the integration of hunting tourism into bioeconomy-based tourism, emphasizing sustainable resource use and economic benefits. The study successfully meets its stated objectives by providing a comprehensive economic assessment of hunting tourism in Czechia and its role in sustainable forest management. The findings demonstrate the significant economic contributions, intersectoral linkages, and the sector's resilience to external disruptions. Moreover, the research highlights the need for strategic policy interventions, investment in sustainable hunting tourism, and future research on bioeconomy integration. Ultimately, the study contributes valuable insights for policymakers, forest managers, and stakeholders aiming to balance economic resilience with ecological conservation in the forestry sector.

Policy makers and stakeholders can rely on such data to gauge the industry's performance accurately and design appropriate strategies for growth. The findings could prompt discussions around sustainable practices in hunting tourism. Balancing economic benefits with environmental and wildlife conservation measures may be crucial to ensure the long-term viability of the sector. Overall, these consequences highlight the dynamic nature of hunting tourism as an economic sector and provide valuable insights for stakeholders to make informed decisions for its future development and resilience.

Considering the confirmation of the importance of hunting tourism, an alternative is offered to create a group of interested entities that will actively support hunting tourism. The public sector (government, regional governments) has room for financing these

clusters or for investments in the development of hunting tourism. However, with the growth of companies that offer hunting tourism, there is also a need to address organizational, legal, social and ecological issues related to this sector (Misakov et al., 2019). Other possibilities of support and possible legislative amendments related to hunting tourism may be the subject of further study. It is certainly possible to find a space for greater involvement of hunting tourism in regional development.

This study effectively quantifies the economic impact of hunting tourism in Czechia but faces several limitations due to data availability and methodological constraints. In the Czech Republic, there is currently no systematic and centralized collection of hunting tourism data at the national level. Data on hunting licenses and participation were collected locally from municipalities with extended jurisdiction that issue hunting licenses, but these data are not aggregated or archived beyond a 5-year statutory retention period. As a result, obtaining consistent data for years prior to this period was no longer possible at the time of the study. Additionally, collecting data thus requires time-consuming and financially demanding efforts, involving individual data acquisition from hundreds of municipalities, which is beyond the scope and resources of this research. We believe this study highlights a relevant systemic issue and therefore recommend that responsible authorities consider implementing a legal obligation for centralized data collection and reporting regarding hunting tourism in the Czech Republic. Such data would greatly support long-term strategic planning and development of sustainable hunting tourism.

Other limitation is the lack of granular economic data, particularly detailed expenditure breakdowns and regional variations in hunting revenues, which could refine the input–output analysis. Additionally, while the study distinguishes between domestic and foreign hunters, missing data on individual spending patterns, demographics, and motivations limits a deeper comparative assessment. The ecological dimension of hunting tourism, including its impact on biodiversity and wildlife population control, remains underexplored due to insufficient conservation data. Furthermore, external factors such as policy interventions and post-COVID-19 recovery trends could not be fully analyzed due to limited long-term datasets. To address these gaps, future research should incorporate primary data collection, cross-country comparisons, ecological impact assessments, and policy evaluations to provide a more comprehensive understanding of the role of hunting tourism in sustainable forest management.

Since we dealt with the issue of economic impact in connection with hunting tourism, it is also possible to study hunting tourism from the perspective of the new phenomenon of bioeconomy. Bioeconomy places great emphasis on the sustainable use of natural resources and, at the same time, on the economic benefit for society (e.g., Böcher et al., 2020; Bugge et al., 2020). A study dealing with tourism and bioeconomy identifying bioeconomy-based tourism already exists (Rinn et al., 2023a; Rinn et al., 2023b). Given that hunting tourism places great emphasis on the economic component of sustainability, it would be appropriate to study the connection with bioeconomy-based tourism in the future.

Hunting tourism creates a market for value-added services like guided hunting, game processing, accommodation, and catering. Specialized businesses, such as those providing equipment or expertise, benefit from this sector, further stimulating economic growth in forestry-dependent regions. Hunting tourism in the forestry sector offers both opportunities and challenges. When managed

properly, it can contribute to wildlife conservation, provide economic benefits to rural areas, and enhance biodiversity. However, sustainable practices and careful management are essential to ensure that these activities do not harm the very ecosystems they depend on. As global interest in nature-based tourism grows, hunting in forested areas will likely remain an important element of the broader relationship between forestry and wildlife management.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the [patients/ participants OR patients/participants legal guardian/next of kin] was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

MK: Formal analysis, Supervision, Writing – original draft, Writing – review & editing, Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Resources, Validation. RR: Formal analysis, Project administration, Supervision, Visualization, Writing – original draft, Writing – review & editing. MM: Conceptualization, Methodology, Writing – review & editing. VM: Conceptualization, Methodology, Supervision, Writing – review & editing. TK: Data curation, Investigation, Writing – review & editing. RL: Data curation, Investigation, Writing – review & editing. DL: Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The authors declare that no Gen AI was used in the creation of this manuscript.

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