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INCOME OF ATHLETES AND THE MULTIPLICATIVE EFFECT: SAM-CGE ANALYSIS

Анотація. *Глобальний ринок професійного спорту еволюціонував від сегмента індустрії дозвілля до високоприбуткової галузі. У деяких країнах його частка у ВВП перевищує два відсотки. Водночас чинні системи національних рахунків відображають спортивну діяльність фрагментарно, що знижує точність оцінки її макроекономічного внеску та збільшує ризик неефективного бюджетного субсидіювання інфраструктурних проектів. Метою статті є розроблення інтегрованої методичної рамки, яка дозволить кількісно виміряти економічний вплив професійних спортсменів шляхом поєднання аналізу структури їхніх доходів із багаторівневою оцінкою мультиплікативних ефектів.*

Запропонована методологія ґрунтується на комбінованому використанні матриці соціальних рахунків (SAM) для обчислення прямих, опосередкованих та індукованих ефектів, обчислюваних моделей загальної рівноваги (CGE) для моделювання довгострокових ресурсних та цінових шоків, а також методу синтетичного контролю для перевірки результатів після настання події. Основну конструкцію доповнюють модуль людського капіталу та аналіз податкового навантаження. Емпірична база даних сформована з джерел OECD, Eurostat, Transfermarkt, Forbes та національних податкових реєстрів. У дослідженні систематизовано десять основних способів отримання доходів спортсменами та кількісно оцінено їх внесок у валову додану вартість. Результати показують, що спонсорські угоди та медіаправа генерують найвищі мультиплікатори, перевищуючи показники креативного та туристичного секторів. Водночас ефективність трансферних платежів і призових коштів залежить від податкового режиму країни-отримувача. Запропонована модель дозволяє оцінювати фіскальний ефект спортивних інвестицій та формувати прозорі вимоги до звітності для ліг і клубів.

Науковий внесок статті полягає в інтеграції трьох взаємодоповнюючих методів - SAM, CGE та синтетичного контролю — в єдину аналітичну конструкцію, яка пом'якшує їхні

індивідуальні обмеження та забезпечує можливість міжкраїнових порівнянь. Практична значущість результатів полягає у потенціалі гармонізації статистичних стандартів, оптимізації фіскальних механізмів підтримки спорту та забезпеченні доказової економічної політики для розвитку спортивної індустрії.

Ключові слова: *міжнародна економіка, міжнародна торгівля, економіка спорту, мультиплікатор, модель SAM, сценарій CGE, синтетичний контроль, фіскальна політика.*

JEL Classification: L83, Z21, E01, O57

Absztrakt. *A globális hivatásos sportpiac a szabadidőipar egyik szegmenséből magas jövedelmezőségű ágazattá fejlődött. Egyes országokban részesedése a GDP-ből meghaladja a két százalékot. Ugyanakkor a jelenlegi nemzeti számlarendszerek a sporttevékenységet töredékesen tükrözik, ami csökkenti makrogazdasági hozzájárulásának mérési pontosságát, és növeli az infrastrukturális projektek nem hatékony költségvetési támogatásának kockázatát. A tanulmány célja egy integrált módszertani keret kidolgozása, amely lehetővé teszi a hivatásos sportolók gazdasági hatásának számszerűsítését a bevételi struktúrájuk elemzésének és a multiplikátorhatások többszintű értékelésének kombinációjával.*

A javasolt módszertan a társadalmi elszámolási mátrix (SAM) kombinált alkalmazásán alapul a közvetlen, közvetett és indukált hatások számítására, az általános egyensúlyi modelleken (CGE) a hosszú távú erőforrás- és árhatások modellezésére, valamint a szintetikus kontroll módszeren az esemény utáni eredmények ellenőrzésére. Az alapstruktúrát kiegészíti a humántőke-modul és az adóterhelés-elemzés. Az empirikus adatbázis az OECD, az Eurostat, a Transfermarkt, a Forbes és a nemzeti adónyilvántartások forrásain alapul. A kutatás tíz fő sportolói jövedelemszerzési módot rendszerez, és számszerűsíti hozzájárulásukat a bruttó hozzáadott értékhez. Az eredmények azt mutatják, hogy a szponzori szerződések és a médiájogok hozzák a legmagasabb multiplikátorokat, meghaladva a kreatív és turisztikai ágazatok mutatóit. Ugyanakkor az átigazolási díjak és a nyeremények hatékonysága a fogadó ország adózási rendszerétől függ. A javasolt modell lehetővé teszi a sportberuházások fiskális hatásának értékelését és átlátható beszámolási követelmények megfogalmazását a ligák és klubok számára.

A tanulmány tudományos hozzájárulása három egymást kiegészítő módszer – a SAM, a CGE és a szintetikus kontroll – integrációjában rejlik egyetlen analitikai keretben, amely mérsékli egyedi korlátaikat, és lehetővé teszi az országok közötti összehasonlítást. Az eredmények gyakorlati jelentősége a statisztikai standardok harmonizálásában, a sport fiskális támogatói mechanizmusainak optimalizálásában, valamint a sportipar fejlesztését szolgáló bizonyítékokon alapuló gazdaságpolitika kialakításának potenciáljában rejlik.

Kulcsszavak: *nemzetközi gazdaság, nemzetközi kereskedelem, sportgazdaság, multiplikátor, SAM-modell, CGE-szcenárió, szintetikus kontroll, fiskális politika.*

Abstract*. The global professional sports market has evolved from a leisure economy segment into a highly profitable industry. In certain countries, its share of the GDP exceeds two percent. However, current national accounting systems only partially record sports activity, which impairs the precision of macroeconomic assessments and increases the risk of inefficiently subsidizing infrastructure projects. This article aims to develop an integrated methodological framework that can quantitatively measure the economic impact of professional athletes by combining an analysis of their income structure with a multi-level evaluation of multiplier effects. This methodology relies on the combined use of a social accounting matrix (SAM) to calculate direct, indirect, and induced effects, computable general equilibrium (CGE) models to simulate long-term resource and price shocks, and the synthetic control method to verify results after the event. A human capital module and a tax incidence analysis complement the core design. The empirical dataset is compiled from the OECD, Eurostat, Transfermarkt, Forbes, and national tax registers.*

The study systematizes the ten main ways athletes generate income and ranks their contribution to gross value added quantitatively. The findings reveal that sponsorship agreements and media rights generate the highest multipliers, outperforming the creative and tourism sectors. However, the effectiveness of transfer fees and prize money depends on the recipient country's tax regime. The proposed model allows for the evaluation of the fiscal impact of sports investments and the establishment of transparent reporting requirements for leagues and clubs.

This article's scientific contribution lies in integrating three complementary methods—SAM, CGE, and synthetic control—into a single analytical construct that mitigates their individual limitations and ensures cross-country comparability. The results are practically relevant in that they have the potential to harmonize statistical standards, optimize fiscal mechanisms that support sports, and inform evidence-based economic policy for developing the sports industry.

***Keywords**: international economics, international trade, economics of sports, multiplier, SAM model, CGE scenario, synthetic control, fiscal policy.*

Problem Statement. In recent decades, the global market for sports services has evolved from a niche in the leisure economy into a highly profitable sector. Its share of certain national GDPs exceeds two percent, and its growth rates rival those of the creative industries and the information and communications technology sector. Professional athletes operate at the intersection of labor, entertainment, and financial markets and generate diversified income streams, including contractual salaries, transfer fees, sponsorship agreements, and image-rights licensing revenues. These revenues produce multiplier effects that diffuse into related economic activities, such as media, tourism, and real estate. However, current national accounting systems only partially record the sports economy, making it impossible to comprehensively measure its macroeconomic contribution.

Despite its significant financial and economic scale, the scholarly literature primarily focuses on individual leagues or mega-events. This neglects comparative assessments of industry performance and the role of athletes as carriers of human capital. Without integrated data on income composition, tax receipts, and multiplier coefficients, the risk of misguided policy decisions increases. Public investment in sports infrastructure is often undertaken without adequate forecasts of socioeconomic returns, and subsidized professional franchises do not always deliver the expected increases in employment or regional gross value added.

Accordingly, there is a need for research integrating multiplier theory (input-output models and social accounting matrices), the concept of human capital, and modern scientometric techniques. Such a study would systematize the channels through which athletes' incomes are formed, quantify direct, indirect, and induced effects for a sample of economies at different stages of development, and identify determinants of economic returns. This would include the role of women's professional leagues as an emerging driver. The proposed analytical framework aims to establish a foundation of evidence for adjusting state sports policy and improving statistical standards. This transformation would elevate sports from a "hidden" category in national accounts to a fully recognized object of macroeconomic planning.

Literature Review. A bibliometric study by Kudinska, Soloviova, and Korde [1] published in Frontiers in Sports and Active Living identified 299 peer-reviewed

articles on the economic impact of sports. The study revealed the dominance of two research streams, "athlete earnings" and "multiplier effects," as well as a highly uneven geographical distribution of studies (United States, United Kingdom, and China). The European Commission's report [2] attributes 1.76 percent of EU GDP and 2.72 percent of employment to sports, underscoring the need to update measurement methodologies in light of the sector's growing financial scale.

The methodological limitations of conventional economic assessments are highlighted in Lee's survey in The Sport Journal [3], which points to the overestimation of direct effects and the neglect of induced expenditures. In their conceptual article in the Journal of Sport Management, Agha and Taks demonstrate a causal chain whereby inflated economic reports lead to fiscal losses and suboptimal subsidy allocation. The authors advocate transitioning from traditional input-output tables to a comprehensive social cost-benefit framework.

The most extensive systematic review to date, conducted by Bradbury, Coates, and Humphreys [5], synthesized over 130 empirical studies. Using synthetic control methods, the researchers confirmed that subsidized franchises rarely generate sustained growth in local GDP or employment.

At the macro level, Rookerby's monograph [6] values the global professional sports market at USD 2.3 trillion and emphasizes that athletes' human capital is the primary generator of sectoral value added. A study by Aygun, Savaş [7], and Savaş in Humanities and Social Sciences Communications uses wavelet spectral analysis to show a correlation between football club valuations and economic growth rates in advanced economies.

Finally, Kirante and colleagues [8] conducted a case study on the Badminton World Championships in Huelva, which recorded a significant but short-lived increase in regional GDP driven by tourist expenditure and public investment. The study also stressed the need to standardize multiplier calculations across events of different scales.

Identification of previously unresolved facets of the overarching problem. Three outstanding research avenues are outlined in contemporary academic discourse: the incorporation of athletes' earnings into the System of National Accounts, the harmonization of multiplier estimates capable of capturing indirect and induced effects, and the standardization of methodological approaches to quantifying the tax impact of sporting activity.

Research aims and objectives. This study aims to quantify the economic contributions of professional athletes to national economies. To achieve this goal, the study will analyze the structure of athletes' income streams and test an integrated methodological framework that combines three components: a social accounting matrix (SAM) module to estimate direct, indirect, and induced effects, computable general equilibrium (CGE) models to simulate long-term shocks, and the synthetic control method to validate results under alternative scenarios. These findings will support evidence-based recommendations for public economic policies that recognize professional sports as a distinct sector within the System of National Accounts.

The research objectives are to conduct a critical review of theoretical and applied approaches to measuring the economic role of professional sports, outlining their methodological advantages and limitations, and to build an integrated model with a SAM core, CGE scenarios, and validation via the synthetic control method. The information base will be defined using data from the OECD, Eurostat, Transfermarkt, etc.); systematize the key channels through which athletes' incomes are generated, and quantify their contribution to gross value added across three spheres of impact: direct, indirect, and induced; develop practical recommendations on the statistical integration of sports accounts, the optimization of fiscal mechanisms, and the support of human capital in the sports industry; identify avenues for further research, primarily a micro-panel analysis of athletes' income life cycles and an expansion of country coverage to include emerging economies.

Results and discussions. Contemporary economic scholarship offers a variety of methods for quantifying the contribution of professional sports and athletes to the national economy. Analyzing these approaches (Table 1) allows us to assess their suitability for cross-country comparisons, determine their areas of application, and identify gaps in methodology that future research should address.

Table 1.

Theoretical approaches to assessing the economic contribution of professional sports and athletes: a comparative analysis*

№	Theoretical approach	Features	Advantages	Disadvantages	Applications
1	Interindustry balance (IO tables)	Static "output-expenditure" diagram; assesses direct and partially indirect effects	Transparency of calculations; suitability for regional level	Does not take into account behavioral changes in consumers; sensitivity to the level of aggregation	Assessment of the impact of the construction of an NBA or La Liga stadium on local GDP
2	Social Account Matrix (SAM model)	Expands the inter-industry balance (input–output), includes households, the state, investments; allows income multipliers	Enables measurement of induced effect; integrates tax flows	High requirements for detailed statistics; complexity of calibration	National estimates of sports multipliers for OECD countries
3	Computational models of general equilibrium (CGE models)	Dynamic simulation of the entire economy with supply and demand elasticities	Takes into account substitution effects and price changes; allows	High demand for SAM data and elasticities; complexity of interpretation	Macro assessment of the impact of the 2024 Olympics (Paris) or the 2026 World Cup

№	Theoretical approach	Features	Advantages	Disadvantages	Applications
			scenario analysis		(FIFA)
4	Econometric panels and the synthetic control method	Statistical comparison of regions "with event / without event"	Minimizes selection bias; measures the actual "net" effect	Requires long time series; difficult to account for global shocks	The impact of the new MLS franchise on urban employment; the effect of Euro 2012
5	Cos-benefit analysis (CBA)	Discounting benefit/cost flows; calculating net present value	Evaluates fiscal returns; takes intangible benefits into account	Subjectivity in monetizing intangible benefits; risk of double counting	Justification for state subsidies for the construction of sports complexes
6	Human capital models (such as Mintzler's)	An athlete's income as a function of education, training, and experience	Provides a micro-level picture of return on investment	Difficult to aggregate to macro level; depends on the quality of individual data	Gender pay gap in the WNBA/NBA; comparison between the NHL and KHL
7	Tax incident analysis	Measures budget revenues from salaries, transfers, commerce	Clear fiscal focus; suitable for international comparisons	Ignores indirect effects; considers only the "top" link of the value chain	Comparison of tax regimes for footballers in Spain and the UAE

** Compiled by the author based on sources [1-9]*

The analysis showed that no single method yields an exhaustive assessment of the macroeconomic contribution of professional sports. Each conceptual paradigm has specific advantages and limitations. Input-output tables and social accounting matrices (SAMs) provide transparent measurements of direct and indirect effects. However, they do not sufficiently capture the behavioral reactions of economic agents and price adjustments. Computable general equilibrium (CGE) models accurately reproduce the reallocation of resources across sectors through endogenous price formation. However, their results depend heavily on the quality of the initial SAM matrix and the accuracy of elasticity parameters. The synthetic-control method and other econometric panel approaches enable researchers to identify net causal post-event effects. However, they require long, comprehensive time series, which limits their forecasting capacity. Cost-benefit analysis (CBA) is useful for calculating the fiscal and social returns of individual projects; however, its results are sensitive to the subjective valuation of intangible benefits. Human capital models provide a detailed picture of athletes'

income structures but are difficult to aggregate at the macro level. In contrast, tax incidence analysis primarily focuses on the upper tier of fiscal flows and omits indirect multiplier effects.

Accordingly, a combined research design is advisable for a representative, cross-country assessment. A SAM module should be used to compute multipliers and budgetary revenues. CGE scenarios should model long-term shocks. The synthetic-control method should be used for post-event verification. Human-capital models and tax schemes should be used as auxiliary instruments to specify micro- and fiscal-level components. This integration minimizes the shortcomings of individual approaches, ensuring a comprehensive interpretation of the economic role of professional athletes within multi-layered economic systems.

Figure 1 visually presents the integrated model and illustrates the interaction among the macro-, meso-, and microanalytical blocks. It demonstrates the logistical links between the methodological modules and the final analytical outputs, which can be directly employed in shaping state economic and fiscal policy.

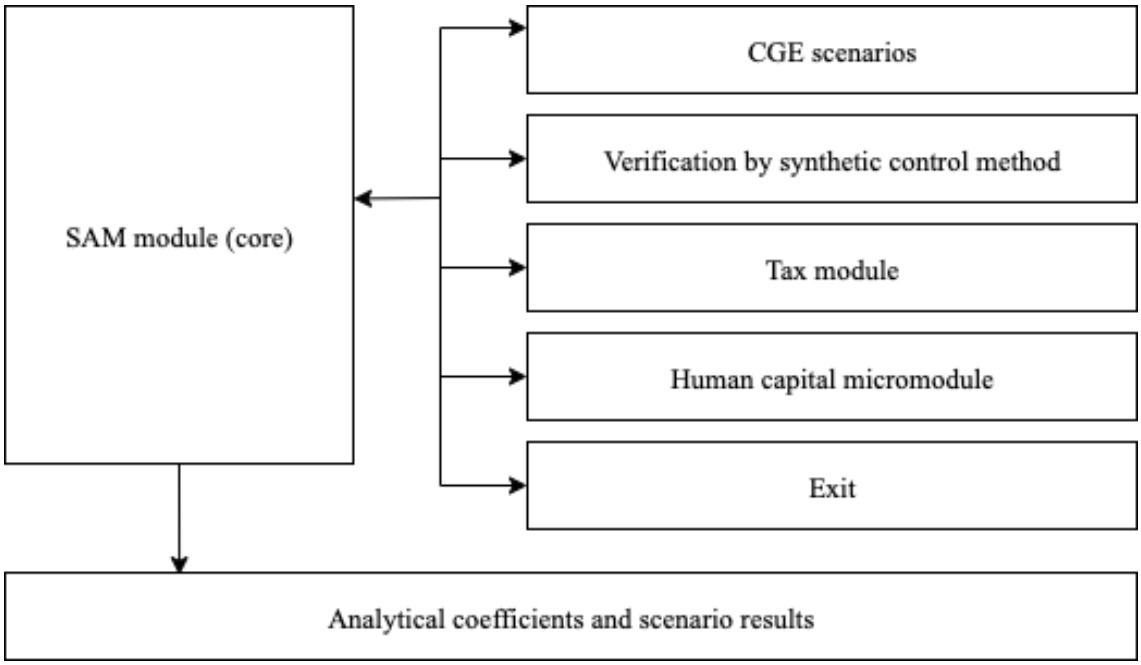

Fig. 1. A conceptual diagram of an integrated model for assessing the economic impact of professional sports

Source: [2, 5, 6, 10, 11, 12, 14, 15, 17, 21].

The logical architecture of Figure 1 is anchored in a SAM module that aggregates inter-industry and socio-fiscal flows and computes baseline multipliers. Four functional blocks are attached to this core. First, computable-general-equilibrium (CGE) scenarios reproduce long-term shocks by incorporating resource and price shifts. Second, validation through the synthetic-control method juxtaposes the actual post-event dynamics of the "treated" country or region with those of a "synthetic

twin," thereby enhancing the credibility of the estimated effects. Third, a human-capital micromodule disaggregates athletes' income structures, including gender and league differentials. Fourth, a tax module assesses how alternative fiscal regimes influence budgetary revenues and redistribution effects. All subsystems draw on data from authoritative international statistical and industry sources [17–19] and convert the raw information into numerical estimates and scenario outputs suitable for subsequent econometric interpretation and the formulation of applied economic-policy recommendations.

The synthetic-control method estimates the causal impact of a "major" event, such as hosting the Olympic Games, changing a tax regime, or launching a professional sports league, on a specific region, country, or firm. The procedure creates a "synthetic twin," which is a weighted combination of several uncorrelated observational units (such as countries, regions, or firms) that collectively approximate the pre-event characteristics of the treated unit across key indicators (such as GDP, unemployment, and investment).

Abadie and co-authors [20], for example, employed synthetic control to assess the impact of the 1992 Barcelona Olympic Games on Catalonia's regional GDP, finding a persistent additional increase of roughly two percentage points relative to the "synthetic Catalonia". Within the proposed framework, the synthetic-control check serves as an external audit of the computed multipliers. It verifies that the theoretically derived effects align with the actual post-event dynamics of economic indicators in the host country or region. After confirming the reliability of the multipliers, the next step is to examine the income streams that feed them. In other words, the next step is to examine the ways in which athletes' earnings spread through the economy.

Professional athletes' incomes are generated through several channels that translate into direct, indirect, and induced economic effects to varying degrees. Direct effects include immediate payments such as salaries and prize money. Indirect effects stem from the spending of clubs, sponsors, and suppliers. Induced effects reflect household consumption financed by these primary incomes. According to the Forbes 2025 list, the top ten athletes earn 46 percent of their income from salaries and prize money, and 54 percent from commercial contracts, such as endorsements and licensing [16]. This highlights the multi-channel nature of financial flows. Therefore, understanding the relative weight of these channels is essential for translating micro-level earnings into macro-level policy insights.

To understand the multifaceted contributions of professional athletes to national economies, it is crucial to look beyond headline salary figures and examine the various revenue sources that permeate supply chains, labor markets, and household consumption. Table 2 lists ten main ways to make money, from salaries to government grants. It puts these into a three-layer multiplier framework — direct, indirect, and induced. This framework works with the Social Accounting Matrix (SAM) architecture and Computable General Equilibrium (CGE) simulations. The "+++ / ++ / + / -" scoring system provides a transparent, semi-quantitative proxy for each channel's share of incremental output or GDP growth relative to the initial expenditure. This

system offers analysts, who often face limited or fragmented microdata, a first-pass calibration tool.

A second rationale for the table is cross-country comparability. Since the underlying categories correspond to internationally available data categories (e.g., FIFA TMS for transfers, Forbes for sponsorship income, and OECD tourism satellite accounts for appearance fees), the matrix can be used to analyze advanced, emerging, and small open economies. The uniform taxonomy is crucial because it mitigates the risk of double counting when the table is embedded in SAM software or fed into CGE models. It also allows policymakers to benchmark the relative efficiency of different income streams across sports or jurisdictions.

Table 2.

Channels of income generation for professional athletes and the extent of their macroeconomic impact *

№	Income channel	Direct effect	Indirect effect	Induced effect
1	Salaries and bonus payments	+++	++	+
2	Sponsorship contracts (endorsements)	++	+++	++
3	Broadcasting rights / revenue-sharing	++	++	+
4	Transfer and sign-on bonuses	++	++	+
5	Merchandise sales and licensing	+	++	++
6	Prize money (tournaments, bonus pools)	+	++	+
7	Income from online platforms and content	+	+	+
8	Image rights	+	+	+
9	Sports tourism (appearance fees, tours)	++	++	++
10	Government support / grants	-	+	+

Legend for effect magnitude: +++ — significant impact (share in output/GDP growth > 0.6 of initial expenditure); ++ — moderate impact (0.3–0.6); + — weak impact (< 0.3); — — statistically insignificant or no effect.

** Compiled by the author based on sources [10-17, 21]*

As shown in Table 2, sponsorship and endorsement deals generate powerful multipliers. Beyond athletes' direct earnings, these deals outsource creative work to advertising agencies and stimulate the production of branded merchandise, adding value throughout manufacturing, wholesale, and retail supply chains. While broadcast-rights income is only moderate in the first round, it magnifies demand for OTT platforms and advertising slots. Stream-friendly regulation could therefore unlock substantial secondary gains. In contrast, transfer fees routed through low-tax jurisdictions result in the loss of domestic value added. A centralized FIFA-style clearinghouse for fiscal reporting would increase transparency and help revenue authorities capture a larger share of indirect and induced effects. Sports tourism channels, such as appearance fees, exhibition tours, and training camps, deliver balanced multipliers across all three impact layers. These channels can be incorporated

into shoulder-season tourism strategies to stabilize hospitality and transportation jobs. Finally, Spain's Beckham Law [22] and the UAE's zero-income-tax regime [23] demonstrate that temporary, narrowly targeted incentives can attract talent without permanently eroding the tax base.

Based on the study's findings, it is advisable to establish a unified methodological platform for multiplier estimation. A Social Accounting Matrix (SAM) module should form the analytical foundation, and long-term shocks should be simulated using Computable General Equilibrium (CGE) scenarios, which should then be validated using the synthetic-control method. Publishing detailed technical guidelines would ensure comparability across sports and jurisdictions and minimize the risk of double counting.

Disclosing information in a consistent manner is also essential for achieving greater transparency. Leagues and clubs should report athletes' earnings from the ten income channels specified in Table 2, along with the taxes paid. Integrating this data into fiscal models will significantly improve the accuracy of revenue forecasts.

Regarding fiscal incentives, shifting from blanket zero-tax regimes to temporary, sunset-dated credits modeled on Spain's Beckham Law [22] is recommended. This approach retains top talent without permanently draining public funds.

Reforms are needed in media rights and transfer governance. Streamlining over-the-top (OTT) licensing procedures would keep a larger share of broadcast value within the domestic economy. A centralized clearinghouse for transfer fees would curb capital leakage to low-tax jurisdictions and strengthen tax compliance.

Finally, integrating sports tourism into regional destination marketing programs can redistribute visitor flows to shoulder seasons, thereby stabilizing employment in the hospitality and transportation sectors.

Conclusions and prospects for further research in this area. The study achieved its stated objective and fulfilled its associated research tasks. It provided a critical review of methods for assessing the economic role of professional sports and developed an integrated SAM-CGE-synthetic control framework. This framework quantifies direct, indirect, and induced effects and uses external causal validation via the synthetic control method. We systematized the ten channels through which athletes earn income and proposed a standardized, semi-quantitative scale to measure their contribution to gross value added. Based on these findings, we formulated actionable recommendations for statistical integration and fiscal design.

The study's theoretical contribution lies in integrating complementary tools—SAM, CGE, and synthetic control—into a coherent framework. This framework mitigates the biases inherent in single-method approaches and enhances reproducibility and cross-country comparability. In practice, the results suggest that sponsorship and media rights generate the largest aggregate multipliers. The impact of transfer fees and prize money is heavily influenced by tax design. Policies that localize production and services, such as media content and merchandising, amplify indirect and induced effects.

The recommended measures are as follows: iintroduce standardized reporting for leagues and clubs across ten channels; simplify OTT licensing to keep broadcasting costs within the country; create a centralized mechanism for transfer payments; apply temporary tax incentives; integrate sports tourism into regional programs to smooth out the impact of seasonality.

The limitations relate to the fragmentation of microdata and the heterogeneity of statistical standards. Further research should calibrate the proposed model using a broader sample of economies and take into account institutional quality and tax regimes. Additionally, long panels of career earnings and investment behavior of athletes should be formed for a more accurate assessment of returns on human capital and redistributive effects. The proposed framework provides the necessary tools to accurately measure the contribution of athletes and translate the results into effective economic policy.

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