Macroeconomic Factors and Elite Female Tennis Successes in the BRICS Countries: A Correlation Analysis

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Abstract

Background: The 5 members of the BRICS-alliance play an ever-increasing role in shaping today's global economy. On the other hand, players stemming from these countries have a disproportionately low share among the top-ranked female tennis players. **Objectives:** The paper seeks to reveal whether the recent economic expansion of these countries is associated with more flourishing sports advancements of female tennis players. **Methods:** Based on the data encompassing the period 2012-2021 and stemming from the WTA-rankings and the World Bank Database, a correlation analysis has been executed with the purpose of investigating whether macroeconomic and socio-political indicators explain the advancements of female tennis players stemming from these countries. **Results:** Some macroeconomic indicators, like

per-capita GDP are positively, while others, like the gross national expenditure, and the alternatives offered to be educated are negatively correlated with the advancements of the players, hence, a clear-cut decision as to whether economic well-being fosters sport successes or not could not be reached. **Conclusion:** While a certain level of well-being, indeed, is needed to succeed in the field of sports, after having reached a certain level of well-being, achieving outstanding performance is not considered any more as a prosperous way to elevate social status and as such, players from less developed countries might be more motivated to strive for outstanding results. **Applicable remarks:** Elevated levels of well-being are not sufficient to expect outstanding sport successes. Provision of coaching and the development of talent pools are needed to nurture advancements in the field of elite sports.

Keywords: Economic Development, Tennis, Professional Athletes, Athletic Performance, Developing Countries,

1. Introduction

In today's globalised world, the tennis industry has become a huge business. The world's best players achieve not only outstanding results but also make a huge amount of money. On the other hand, (1) have recently demonstrated that the top performing players usually stem from a small core group of nations as the lack of appropriate financial resources, inadequate competition structures, and limited support from various stakeholders pose several challenges to less developed tennis nations. While witnessing substantial economic development in recent years, players stemming from the BRICS-countries still possess a disproportionately low share among the top-ranked players, especially when the size of these countries is also considered.

Several papers have already examined whether sport boosts economic growth or fosters social development. In the case of developing countries, (2) concluded that investments in sports accompanied with adequate policies, in fact, contribute to economic expansion.

On the other hand, only a few authors (3-8) have investigated the opposite effect so far, that is, whether economic development and social well-being nurture sport successes. Even thought, these factors should not be deemed as the only determinants of success, a prior study (6) has already concluded that to some extent, certain macroeconomic indicators do play a role in promoting sport successes. In the case of tennis, (7) found some empirical pieces of evidence that economic prosperity expressed in terms of the *GDP* contributes to more successful career paths.

BRICS is an intergovernmental organization comprising Brazil, Russia, India, China and South Africa. Economic development of these countries is primarily driven by the cheap labour in China and India, as well as the huge reserves of mineral resources in Brazil and Russia (9). The alliance is increasingly recognized as the foremost geopolitical rival to the Western G7 as all of its member countries possess considerable political and economic potential. The combined share of the alliance in the global economic output has risen from 5.85% to 21.5% in the recent decades. As of 2023, the BRICS' economies collectively accounted for over 25% of

global economic output with a cumulative nominal GDP of $14.9 trillion (10) and as such, the alliance plays a compelling role in shaping today's economy.

The BRICS Council for Exercise and Sport Science aims at the enhancement of quality of life by promoting exercise, physical activities, and sport (11). As human capital and its well-being are increasingly recognized to be essential to nurture economic expansion (12), several incentives with the purpose of fostering physical activities have been developed (13); for instance, Russia's sport strategy for the period up to 2030 foresees an increasing participation in mass sports (14). On the other hand, (15) concluded that there are several major obstacles in promoting physical activity in China.

Owing to the recent economic expansion coupled with rising educational and income levels, the number of spectators of various championships is continuously growing in India (16). On the other hand, (17) argue that the government's sport policy is outdated and the country failed to achieve mass participation or outstanding results in elite sports.

Until 1993, South Africa has been dominated by apartheid. In the decades thereafter, sport has been increasingly recognized as a tool for reconciliation and international success. The role of sport in boosting tourism has been recognized in time, so that a flourishing relationship between sports and tourism exists in the country (18).

In Brazil, sport plays a crucial role in facilitating social transformation and addressing social challenges (19), however (20) argue that despite several advancements in this field, there is room for further improvement especially concerning strategic planning.

Despite the fact that (21, p. 385) argue that quite often 'hosting mega events promises the economy more than it delivers', these 'mega' sports events significantly contribute to the growth of the tourism sector of these economies (22) and also play a pivotal role in the foreign politics of them (23). Achieving outstanding successes in the field of elite sport is crucial also in order to promote physical activities and to provide role models for younger talents as evidenced by (24).

While economic advancements of the BRICS countries are getting increasing attention, their successes in the field of sports are seldom studied and it has not been clarified yet, why these countries possess a disproportionately low share among the top-ranked tennis players (1) especially since (16) posit that increases in income are associated with increasing popularity of sports. Despite the ever-growing economic role of these countries, only a few studies have been examining so far how macroeconomic and socio-political factors influence elite tennis success in these countries. Therefore, this paper seeks to reveal whether the recent economic expansion of the BRICS countries implies a more successful future career path of players stemming from these countries. Understanding how macroeconomic development shapes sport successes offers valuable input for the development of sport policies that are intended to promote physical activity and to enhance the global competitiveness of players stemming from these countries as well (11-13). Moreover, considering that the vast majority of prior studies (3-5, 6, 8) focuses on Olympic successes or football, it is worth investigating whether economic well-being shapes individual advancements in tennis in the same way as it fosters Olympic successes or the success of national football teams.

2. Materials and methods

2.1. Study design

Based on various macroeconomic factors, the paper attempts to predict the success of elite women players listed in WTA-rankings for singles and originating from BRICS countries by examining the correlation between socio-economic indicators and the success of the athletes. The success of a player in a given year is expressed in terms of three indicators, namely, (i) the *total prize money won by the player,* (ii) the *prize money per match,* and (iii) the *normalised score in the WTA-rankings in the given year* (25), respectively. In order to facilitate the comparison of the players' performances across several years, the WTA-scores have been normalized to the [0,1] domain; since the top 800 contains at least one player from each of the investigated economies, the normalized score of the 800th ranked player is considered to be 0. It should be noted that only the results of the best performer in each country have been further analysed in the research.

The indicators used as measures of success are not self-evident, especially on the grounds that no consensus is likely to have been reached on how to measure individual sport successes so that the resulting indicator simultaneously measures the performance of the player along with the financial 'benefits' gained. In a recent paper, (8) concluded that the number of medals won is used most often as a measure of success, however, this concept is not directly applicable in the case of tennis, and it is unsuitable to 'capture' the financial 'rewards' originating from outstanding performance. By relying on the aforementioned three indicators, both individual performances and the associated financial benefits could be taken into account.

Having identified those macroeconomic indicators that might shape sport successes, the paper also attempts to disclose the mechanisms through which these indicators affect the advancements of the athletes.

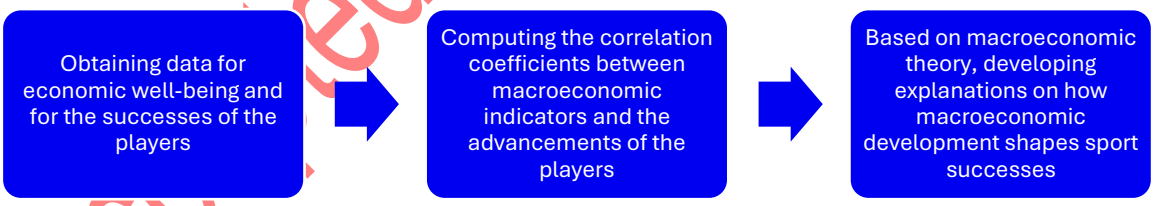

Figure 1. **Study design**

2.2. Participants and data collection

In order to investigate the relationship between various macroeconomic indicators, social well-being and the achievements of women tennis players during the 10-year-long period between 2012-2021, several macroeconomic indicators have been collected from the World Bank Database (26). An indicator is selected to be incorporated into the analysis if and only if it meets the following criteria: (i) it is directly related to the economic development (e.g. *per-capita GDP, foreign direct investment*), or to the political environment (*control of corruption, government effectiveness*) or the broader social well-being of the country (*life expectancy at birth, income),* (ii) data are available for at least one year for each of the investigated economies

and (iii) no more than 20% of the dataset is missing. Missing data are replaced by the average value of the time series for the investigated country; if there is no data for at least one of the countries, then this variable is excluded from subsequent analyses. Altogether 39 variables meet these criteria (see Table 1); for a proper definition of these indicators refer to the World Bank Glossary (27). Therefore, the final sample size is 50, encompassing a 10 year-long period for each of the 5 countries; data for 2022, 2023 and 2024 had not been available at the time of investigation. Data are processed with Gretl and MATLAB 2024b software.

3. Results

With the purpose of revealing which macroeconomic indicators might be associated with the success of female tennis players, based on 50 observations encompassing a 10 year-long period for each of the 5 investigated countries, Pearson's product moment correlation coefficients have been computed that are listed in Table 1 and are displayed on a heatmap on Figure 1.

Table 1. **Bivariate correlation coefficients and the corresponding p −values (in parentheses) between various macroeconomic variables obtained from the World Bank Database and indicators measuring the successes of the elite female players stemming from the BRICS countries**.

Variable	Prize money	Prize money/match	Normalised score
Access to electricity (% of total population)	0.345 (0.007)***	0.391 (0.002)***	0.451 (0.001)***
Adjusted net national income	-0.094 (0.257)	-0.133 (0.179)	-0.062 (0.334)
Birth rate (per 1000 inhabitants)	-0.355 (0.006)***	-0.444 (0.001)***	-0.480 (0.000)***
Control of corruption	-0.664 (0.000)***	-0.685 (0.000)***	-0.685 (0.000)***
Current account balance (% of GDP)	0.518 (0.000)***	0.575 (0.000)***	0.592 (0.000)***
Employment rate of 15–24-year-olds (%)	0.183 (0.102)	0.204 (0.078)*	0.263 (0.033)**
Exports - goods and services (% of GDP)	0.305 (0.016)**	0.313 (0.013)**	0.289 (0.021)**
Final consumption expenditure (% of GDP)	-0.261 (0.034)**	-0.309 (0.014)**	-0.335 (0.006)***
GDP per capita PPP ($)	0.534 (0.000)***	0.605 (0.000)***	0.614 (0.000)***
GDP growth (annual %)	-0.009 (0.474)	-0.033 (0.411)	0.020 (0.446)
General government final consumption expenditure as % of GDP	0.135 (0.175)	0.158 (0.136)	0.161 (0.132)
GNI growth (annual %)	0.009 (0.475)	-0.012 (0.466)	0.042 (0.387)
GNI on PPP basis ($)	0.532 (0.000)***	0.605 (0.000)***	0.614 (0.000)***
Government efficiency index	-0.285 (0.022)**	-0.229 (0.055)*	-0.213 (0.069)*
Government expenditure on education (% of GDP)	-0.377 (0.003)***	-0.415 (0.001)***	-0.425 (0.001)***
Gross domestic savings (% of GDP)	0.261 (0.034)**	0.309 (0.014)**	0.355 (0.006)***
Gross national expenditure (% of GDP)	-0.562 (0.000)***	-0.610 (0.000)***	-0.627 (0.000)***
Gross savings (% of GDP)	0.188 (0.095)*	0.230 (0.054)*	0.274 (0.027)**
Import value index (2015 = 100%)	0.476 (0.000)***	0.473 (0.000)***	0.481 (0.000)***
Imports - goods and services (% of GDP)	-0.082 (0.285)	-0.111 (0.221)	-0.144 (0.159)
Industrial and construction production volume (% of GDP)	0.280 (0.024)**	0.333 (0.009)***	0.384 (0.003)***
Industrial production volume (% of GDP)	0.031 (0.415)	0.073 (0.307)	0.125 (0.194)
Inflation (consumer prices, %)	0.203 (0.079)*	0.202 (0.080)*	0.093 (0.259)
Inflation (GDP deflator, %)	0.165 (0.126)	0.150 (0.149)	0.147 (0.155)
Inflation based on base year 2010	-0.197 (0.085)	-0.153 (0.144)	-0.168 (0.121)
Inward foreign direct investment (% of GDP)	-0.113 (0.218)	-0.154 (0.143)	-0.120 (0.202)

Life expectancy at birth	0.132 (0.181)	0.182 (0.103)	0.237 (0.049)**
Net external assets (in current currency)	0.351 (0.006)***	0.444 (0.001)***	0.462 (0.000)***
Net primary income (Bop, current USD)	-0.262 (0.033)**	-0.312 (0.014)**	-0.303 (0.016)**
Net secondary income (Bop, current USD)	-0.316 (0.013)**	-0.348 (0.007)***	-0.376 (0.004)***
Political stability and crime/terrorism deficit	-0.274 (0.027)**	-0.268 (0.030)**	-0.235 (0.050)*
Ratio of female workers to male workers	0.310 (0.014)**	0.358 (0.005)***	0.382 (0.003)***
Real interest rate (%)	-0.235 (0.050)*	-0.257 (0.036)**	-0.253(0.038)**
S&P Global Capital Markets Index (annual % change)	-0.080 (0.290)	-0.086 (0.275)	-0.046 (0.377)
Services sector output (% of GDP)	-0.126 (0.192)	-0.127 (0.189)	-0.159 (0.135)
Total self-employed (% of total employed)	-0.444 (0.001)***	-0.476 (0.000)***	-0.473 (0.000)***
Trade turnover (% of GDP)	0.090 (0.266)	0.087 (0.275)	0.066 (0.324)
Value of women's business and legal index (scale 1-100)	-0.270 (0.029)**	-0.290 (0.020)**	-0.300 (0.017)**
Working age population	-0.082 (0.286)	-0.056 (0.349)	-0.019 (0.049)

Remarks: relationship marked with *** are significant at the 1% level of significance, relationships marked with ** at the 5% level of significance, while relationships marked with * at the 10% level of significance.

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Based on the results shown in Table 1, the bulk of the investigated variables exhibit a statistically significant ($p < 0.1$) relationship with all the three variables used to capture the advancements of the players and as such, economic or social well-being, in fact, explain to some extent the successes of the players.

A heatmap for the bivariate correlation coefficients is shown in Figure 2, which shows that several variables, like *per-capita GPD* are positively correlated with the advancements of the players, while there are a bunch of variables, like the *ability to control corruption* or the *government expenditure on education as a percentage of GDP,* and the *female business and legal index* that are negatively related to the players' performance; that is, if the investigated country performs better in terms of these dimensions, then the advancements of that country's players are expected to decline. Hence, in spite of the fact that economic and social well-being shape sport successes, the direction of their impact is unclear.

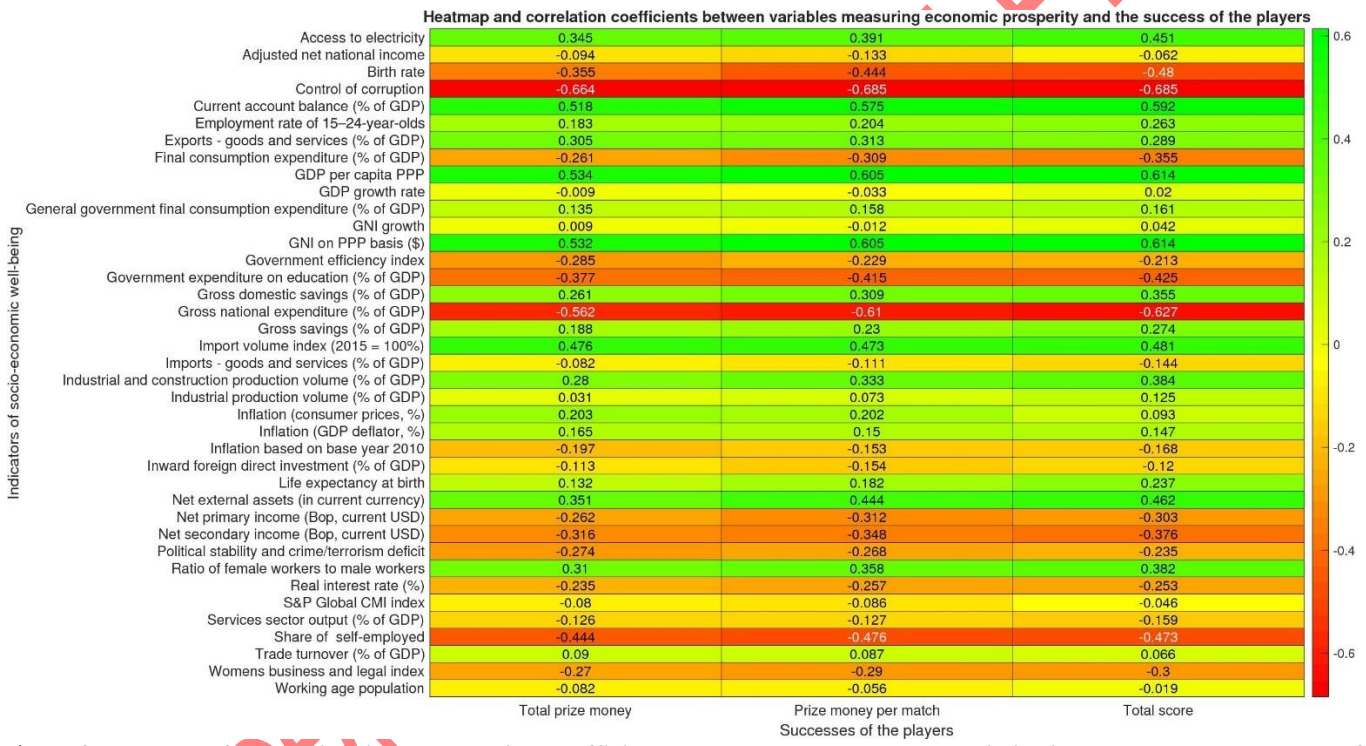

Figure 2. **Heatmap for the bivariate correlation coefficients between the macroeconomic indicators and the successes of the players. The legend on the strength of the correlations is shown on the right-hand side of the Figure.**

Based on the bivariate correlations, a multiple regression has also been set up. In this case, the (i) development of the infrastructure is represented by the variable *access to electricity*, (ii) economic well-being in terms of *per-capita GDP,* the (iii) openness of the economy in terms of *import volume index,* while *government expenditure on education* and the *ratio of female to male workers* are intended to capture (iv) alternative educational and (v) employment opportunities. These variables have been chosen on the grounds that they exhibit at least a moderately strong relationship with the advancements of the players (see Table 1) and none of them exhibits elevated levels of multicollinearity with the remaining explanatory variables (all VIF −values are under 3); since the majority of economic indicators are highly correlated with one other, special attention is to be devoted for any potential multicollinearity. It is worth

mentioning that *control of corruption* has a so strong effect on the success of the players that it suppresses the effect of economic variables; after the incorporation of this variable into the model, the coefficient of *per-capita GDP* changes its sign. The (within) R^2 −values for the total prize money, for the prize money per match and for the normalized points are $R^2 = 0.37, R^2 = 0.46$ and $R^2 = 0.50$, respectively and based on the associated F −values, all models possess sufficient explanatory capability.

Table 2. **Variables in the multiple regression along with their coefficients, the standard error of the coefficients, the t −ratio and the p −value used to assess their significance**

Dependent variable: total prize money $R^2 = 0.37; F(5, 44) = 6.661; p < 0.001$				
Variable	**Coefficient**	**Std. error**	**t −ratio**	**p −value**
Constant	-1.175e+06	2.897e+06	-0.406	0.687
Access to electricity	4661.22	271912.2	0.167	0.868
GDP per capita	61.745	35.079	1.760	0.085*
Government expenditure on education (% of GDP)	-375067	167127	-2.244	0.030**
Import value index	13744.3	8703.56	1.579	0.122
Ratio of female to male workers	10127.2	12722.3	0.796	0.430
Dependent variable: prize money per match $R^2 = 0.46; F(5, 44) = 9.517; p < 0.001$				
Variable	**Coefficient**	**Std. error**	**t −ratio**	**p −value**
Constant	-11391.5	37946.3	-0.300	0.7654
Access to electricity	106.631	365.532	0.292	0.772
GDP per capita	1.125	0.459	2.449	0.018**
Government expenditure on education (% of GDP)	-6271.44	2188.65	-2.865	0.006***
Import value index	140.255	113.980	1.231	0.225
Ratio of female to male workers	141.238	166.608	0.848	0.401
Dependent variable: normalized points $R^2 = 0.50; F(5, 44) = 10.811; p < 0.001$				
Variable	**Coefficient**	**Std. error**	**t −ratio**	**p −value**
Constant	-0.303	0.376	-0.805	0.425
Access to electricity	0.003	0.004	0.898	0.374
GDP per capita	1.017e-05	4.555e-06	2.233	0.031**
Government expenditure on education (% of GDP)	-0.065	0.022	-2.996	0.005***
Import value index	0.001	0.001	1.308	0.198
Ratio of female to male workers	0.002	0.002	1.105	0.275

Remarks: relationship marked with *** are significant at the 1% level of significance, relationships marked with ** at the 5% level of significance, while relationships marked with * at the 10% level of significance.

4. Discussion

Considering the results showcased in Table 1 and Table 2, no clear-cut decision could be reached as to whether macroeconomic development and elevated levels of social well-being fosters or tappers off the players' achievements as some of the studied indicators are positively associated with players' performances, while others negatively. Even though, these results seem to contradict one another, one might argue that a certain level of macroeconomic well-being is crucial for success underpinned by the positive relationships. On the other hand, following the arguments by (6, 28), players stemming from less developed environments might be more motivated to reach outstanding results that provide them the opportunity to elevate their social status as evidenced by several variables associated negatively with success. Hence, one might argue that the advancements of the players are driven by two effects. While economic well-being seems to nurture sport successes, alternative educational or job opportunities might

diminish the motivation of the players to succeed and as such, the two primary drivers of advancements shape the players' success in opposite directions. It should also be mentioned that the strongest effect on the players advancements has the ability to control corruption; however, the negative bivariate correlation paradoxically suggests that the better corruption is controlled, the worse results are to be expected.

4.1. Positive correlations

The variables exhibiting a positive relationship with the players' advancements include the *current account balance, per-capita GDP, GNI on a PPP basis, gross domestic savings (% of GDP), import volume index, industrial and construction production volume, current value of net foreign assets* and *access to electricity.* Most of these indicators are highly correlated with one other as well, and are economic variables related to the financial performance of the country, its role in international trade as well as to the development of its infrastructure. By suggesting that a certain level of well-being is pivotal to succeed, these variables seem to support one of the key conclusions drawn by (8, p. 12) who argue that 'the higher the budget, the better the results' and partially align with the findings stemming from (7) as well.

The positive association with these variables suggests that marked-based economic performance and more developed infrastructure might significantly contribute to more prosperous outcomes. A prior study (3) found a positive association between economic prosperity and sporting success, while in the case of tennis (7) witnessed a positive association between the *GDP* and the successes of the players; the authors in (7) and (28), however, also argue that sport is often considered as a tool to elevate social status in less promising environments. A quite interesting finding is a moderately strong positive relationship with the *ratio of female to male workers*, which suggests that the more emancipated a society becomes, i.e. the greater the share of women in the labour market and the higher the diversity of women's roles in the society, the more likely is that a woman from that country will excel and achieves outstanding success in tennis. A possible explanation for this phenomenon is that as women are provided more opportunities, the self-confidence of players, which is proven to significantly contribute to triumphs (29), is raised yielding to more outstanding results.

4.2. Negative correlations

While the majority of indicators that are positively correlated with the players' advancements is related to the economic well-being in the investigated country, the bulk of the variables that exhibit negative correlation with the players' success is related to the broader social well-being.

- *Government consumption expenditure as a percentage of GDP:* since this indicator encompasses all current expenditures of the government for purchases of goods and services, significant government expenditures originate either from significant tax revenues or from debt. A large amount of redistribution customarily arises from a powerful centralisation, usually at the expense of market mechanisms that seems to dwindle sport success. Elevated levels of indebtedness, especially when it is not in domestic currency, usually lead to uncertainty which also poses the country to a country-specific risk premium; the aforementioned uncertainty seems to reduce the likelihood of any sport success.

- *Gross national expenditures as a percentage of GDP*: increases of this indicator indicate more elevated levels of well-being. This outcome seems to contradict to the previous findings; as residents become richer and as the government spends more to foster social well-being, sport is not considered any more as a viable way to 'break-out' from poverty and as such, the motivation of the players to excel seems to be diminished (28), which is manifested later on in less successful career paths.
- *General government expenditure on education*: the findings suggest that the more money is spent on education, the less likely it becomes that a female tennis player will excel and reaches superior performance. One might argue that *increasing educational expenses* provides a wider range of possibilities to excel and as such, impressive performance in the field of sports is not considered any more as the single viable way to succeed (28).

Elevated levels of the three aforementioned indicators suggest a more promising standards of living. A recent study (7, p. 135) argues that players stemming from less developed economies might 'perceive a sports career as a significant progress in [their] social status'. Hence, these outcomes trigger the conclusion that while economic well-being nurtures, elevated levels of standards of living rather diminishes sport advancements.

Related to the socio-political development of the countries, the following indicators also exhibit a negative relationship with the players' success.

- *Birth rate per 1,000 people:* the data unveil that higher birth rates are associated with declining performance of the players; however, this variable has certainly rather a lagged effect on sport advancements. In addition to that, political interventions, like China's former one-child policy accounted for several profound social and economic challenges (30). Up to now, no reliable explanation for the direction of this relationship could by developed, therefore, subsequent analysis is needed to discover the nature of this relationship.
- *Control of corruption*: it is an estimated indicator, high values of which indicating that corruption is controlled strictly in a country. *Corruption* in the field of sports is studied extensively (31) and is usually accompanied with a significant counterselection of future talents since the investments and possibilities required to start a professional career are granted by corrupt decision-makers, who do not necessarily favour the most talented players; instead, candidates who manage to bribe the decision-makers are granted viable opportunities. This counterselection, however, significantly harms any further triumphs and as (32, p. 133) pinpoints 'the damage done by problematic agents eventually translates into poor performance on the field'. Nepotism is also considered as an additional form of *corruption* which results in that special attention is devoted to less talented family associates or friends, who fail to perform well subsequently (33). Paradoxically, players stemming from countries where *corruption* is more prevalent seem to outperform players originating from countries where *corruption* does not play a pivotal role. Considering these findings, the outcomes deserve particular attention in further studies.

- *Percentage of self-employed (as a percentage of total employment):* even though, (34) found some empirical pieces of evidence that sports participation is associated with more flourishing outcomes on the labour market, increases or steadily high shares of self-employment are usually the result of either unbearable public burdens or less promising offers on the labour market, both forcing several people to work as self-employed. Whichever phenomenon leads to increases in *self-employment*; it carries some social risk ultimately manifested in less successful career paths. In addition to that, (35) argue that *entrepreneurship* plays a significant role in boosting the economic development of the BRICS economies. Consequently, potential future talents might rather choose the more prosperous way of starting an own enterprise than striving to maintain a less promising sport career.
- *Women's Business and Legal Index Score:* it tracks how regulations, laws and ordinances are affecting women's prosperities so that 100 represents the highest possible score. Whereas in the case of the *ratio of female to male workers*, a positive relationship had been detected, this index shows a negative correlation with the advancements of the players. This phenomenon is likely to reflect the fact that as women are provided more opportunities to succeed, they become less motivated to strive for outstanding sport advancements.

4.3. Outcomes of the multiple regression

The outcomes of the multiple regression provide some additional pieces of evidence to conclude that economic prosperity, in fact, nurtures sport successes at least to some extent. While roughly half of the variance of the (normalized) points could be explained based on the *per-capita GDP* and the *government expenses on education*, the prize money could be predicted with a significantly higher uncertainty. Since the bulk of other variables capturing economic well-being are at least moderately correlated with the GDP, their effect on advancements in the field of sports is similar to the effect of GDP. On the other hand, increasing the *expenses on education* decreases the likely successes of the players. While *access to electricity, import value index* and the *ratio of female to male workforce* exhibit a moderately strong bivariate correlation with the advancements of the players, these variables remain insignificant in a multiple regression setting which triggers the conclusion that there are two mechanisms that drive advancements in the fields of sports: economic prosperity and the alternatives offered on the labour market, especially opportunities to be educated. While the former one fosters, the latter tappers off sport successes. However, elevated levels of well-being usually yield to more prosperous possibilities on the labour market (36). Therefore, while a positive effect of economic well-being on sport successes on the short-term might be anticipated, on the long run, these beneficial effects seem to be diminished by more viable alternatives offered on the labour market. These findings align with the prior findings stemming from (28) who argue that the choice between an academic and a sports career has an ample effect on how one's sports career progresses.

In conclusion, the results underpin the assumption that a certain level of well-being is essential to expect success in the field of sports. However, as women are provided more opportunities to excel in the society as a whole, these additional opportunities might mitigate the motivation of the players to excel and as such, seem to harm any potential future

advancements. Consequently, elevated levels of well-being are a necessary, but not a sufficient condition to reach outstanding results in the field of sport especially on the long run and the primary driver of flourishing sport advancements is not economic or social well-being. Despite the fact that the lack of financial resources is usually argued to be manifested in less prosperous career paths, a recent study by (1) also calls attention to the fact that the inadequate competition structures, and the limited support from various stakeholders also pose several challenges to less developed tennis nations. Hence, progress in economic well-being alone is not sufficient to expect outstanding results if it is not coupled with adequate sport policies. As such, the disproportionately low share of players stemming from the BRICS-alliance among the top-ranked tennis players is not the direct consequence of the less developed economies, either; rather, inadequate sport policies might be responsible for less prosperous victories (17, 20). In addition to that, the ample effect of corruption on the athlete's advancements deserves special attention in subsequent studies especially since (37) note that the reform of sports governing bodies is urgently needed.

5. Conclusion

By examining the advancements of professional women players stemming from the BRICS-countries, this paper discusses in detail which macroeconomic and socio-cultural welfare factors affect and to what extent the successes of female tennis players so that the data encompass a 10-year-long period between 2012 and 2021. The development of the national economies, their domestic political environment and the overall social well-being are characterized by 39 indicators stemming from the World Bank Database (26). Despite the fact that the economic advancements of the five countries forming the BRICS alliance are getting increasing recognition in scientific literature, the present study is the first one which links sport successes to the economic development of these countries.

The variables that are positively correlated with the players' performance, like the *per-capita GDP,* underpin the hypothesis that a certain degree of macroeconomic well-being is essential for superior results and as such, are in line with the findings stemming from (6, 7, 38). Besides that, the *higher the proportion of female workforce in the labour market* is, the more outstanding results are expected.

On the other hand, several variables show a negative correlation with achievements in sports, like the *government's spendings on education* or the *women's business and legal index,* both of them suggesting that the more opportunities are provided 'outside the court', the less likely is that one will earn a triumph 'on the court'. Based on these findings, one might form a tentative assumption that players stemming from economically less developed environments might be more motivated to strive for advancements being high enough to grant the possibility to 'escape' from poverty (28). On the other hand, a certain level of economic development, indeed, is needed to consider a professional sports career as a viable alternative to 'traditional' forms of employment. In addition to that, a certain level of wages is also needed to ensure that parents are able to finance the costs associated with trainings (7) as evidenced by (39).

Following the line of reasoning by (1), besides a certain level of well-being, adequate policies and tournament systems are also needed to reach international recognition in the field of tennis. Coach provision and the development of a talent pool have been shown (37) to significantly contribute to advancements. (40, p. 1251) also argue that 'flexible schooling program during the teens, a supportive national tennis federation, and benevolent sponsors' are also crucial to excel. Tournament systems that 'allow athletes to move up the ranks through successive event levels' (41, p. 133) are also urgently needed to enhance the global competitiveness of players stemming from these countries.

5.1. Limitations of the study and further research directions

Even though, this research has shed light on several aspects of the players' successes, a more elaborate treatment of these relationships is needed in subsequent research. One of the main limitations of the study is the missing data for 2022 and the subsequent years. The missing data for several years also hinder the development of a panel structure for the dataset, even though, investigating how the relationship between macroeconomic development and sport successes evolves over time could reveal some additional insights despite the fact that (38, p. 316) argue that 'predictors of international success in women's football can be identified by looking at differences across countries, while less explanatory power is provided by changes occurring within each country'. Fuzzy logic-based prediction might also be applied since it is better suited to handle the uncertainty and the complex nature of sport successes (42), especially, if no objectivised ways of assessing players' performances exist (43) and has already been proven to outperform traditional statistical methods (44). Moreover, some indicators capturing the advancements achieved in the field of sport development are also to be incorporated into successive analyses, like the *government expenses on sports, or the budget of national tennis associations* for which no reliable data could be obtained which might cause a biased effect of the predictors on sport advancements. The single player-focus might also be extended in subsequent work; it should be noted, however, that in several cases, only a single player stemming from these countries managed to be ranked among the top 800 on the WTA-rankings. (45, p. 1) criticized 'the "winner-takes-all" reward system that enhances the disparities between the first classified players and the others in major competitions', which might cause a biased picture on the relationship between the players advancements and their socio-economic background. Further research is needed to address the question what motivates the player when she has to choose between a traditional career path or thriving for a professional career as a tennis player and to solve the 'corruption-paradox' by revealing why players stemming from societies where corruption is more prevalent tend to outperform their competitors.

6. Applicable remarks

- A certain level of well-being is, indeed, needed, but more prosperous opportunities outside the field of sports might mitigate the motivations of the players to excel.
- In order to nurture advancements in the field of elite sports, adequate sport policies are urgently needed besides a certain level of well-being. Coach provision and the development of a talent pool, a supportive national tennis federation, and benevolent sponsors are also crucial to excel.

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