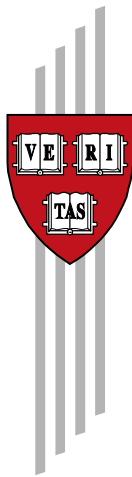


**More Goals, More Growth?**  
**A Take on the Mexican Sports  
Economy through the Economic  
Complexity Framework**

Alfredo Guerra

CID Research Fellow and Graduate  
Student Working Paper No. 73  
July 2016

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# **More Goals, More Growth? A Take on the Mexican Sports Economy through the Economic Complexity Framework**

Alfredo Guerra

Harvard Kennedy School  
July 2016

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## Introduction

In order to appropriately understand the sports sector, its magnitude, embeddedness in the economy, and strategic value, it is necessary to develop a framework through which to study it. Having a standardized and comprehensive methodology to analyze the sports sector will allow policymakers, academics, and other stakeholders to look at the sports sector at a new level of detail and rigor.

Previous work has outlined the numerous data quality and aggregation challenges currently present in the sports economy literature (Russell, Barrios & Andrews 2016). In light of these challenges, this paper attempts to build on the suggested categorization of the sports industry and develop a sound strategy to analyze the sector through an empirical exercise in a specific context: the Mexican Economy.

To this end, we first attempt to understand how *connected* the sports sector is to other activities in the economy and identify which sectors share similar know-how with it<sup>1</sup>. Additionally, we attempt to determine the relative magnitude of the sports sector through variables such as value added and employment.

Similarly, we consider study the spatial considerations around sports related economic activities at a subnational level. The advancement of spatial economics has allowed us to understand a new dimension of how an economic sector can develop and how characteristics inherent to a given geography can play a role in determining why some activities end up appearing and developing in the places they do.

Lastly, some descriptive and regression analysis efforts in this paper enabled us to better understand and characterize the sports sector. Such exercises allow us to learn what type of workers typically comprises the sports sector, and whether such profile is different across the different categories of sports activities. Among the variables analyzed in the descriptive exercise, we can look at education level and wages—among others—of those who work on this sector, and compare them to the overall employed population.

This paper is structured as follows: Section 1 will make the case for how publicly available data in Mexico meets the level of detail required for this type of study. Section 2 will look at the way in which the sports sector is nested in the overall economy. Section 3 studies the magnitude of the sports sector through different metrics. Section 4 looks at the type of jobs that comprise the sports sector. Section 5 looks at the differences in intensity of sports activities and early work on its potential causal roots. Section 6 provides some conclusions.

## Section 1. Description of Data Required for Analysis: The Case for Mexico

The data required to fully study sports-related economic activities demand an elevated level of detail and disaggregation (Russell, Barrios & Andrews 2016). In order to meet these standards, we turned to Mexico, which has made available a number of granular and

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<sup>1</sup> “Know-how”, as a term, makes reference to the intangible agglomeration of knowledge around a given economic activity (Hausmann and Rodrik, 2002).

complementary data sources that facilitate a multi-dimensional analysis. More precisely, we focused on:

- Mexico's Economic Census: This source provides information on 800+ economic activities in Mexico. Out of these, 30+ are sports related economic activities. The information is disaggregated for the 2,438 municipalities in the country. It includes information on different metrics of production at the industry-location level. Namely, it provides the production value of each industry under the NAICS classification within each municipality in Mexico.

This type of information could allow researchers to: (i) Gain an understanding on the relative size of the sector and its composition, (ii) Determine places with existing and potential relative comparative advantage in different sporting activities and (iii) Determine the relative complexity gain for a place in engaging in sports. We have this information for 2004, 2009 and we expect to update it with data for 2013.

- Mexico's Social Security: This source provides information on 800+ economic activities in Mexico. Out of these, 30+ are sports-related economic activities. The information is disaggregated for the 2,438 municipalities in the country. It includes information at the worker-level for each formal establishment and firm in the country.

This type of information could allow researchers to: (i) Gain an understanding on the relative size of the sector and its composition, (ii) Identify establishment-level trends per sports-related activity, (iii) Identify non-sports industries that tend to co-locate with sports activities, (iv) Determine places with an existing or potential relative comparative advantage in different sporting activities, and (v) Discovering linkages between different economic activities through labor flows. This is a yearly dataset, available for the period 2004-2013, and we expect to update it with data for 2014.

- Mexico's Population Census: This source provides information on population engaged in one of 150+ economic activities in Mexico. Out of these, 10+ are sports related economic activities. The information is descriptive at an individual level but can be aggregated for most of the 2,438 municipalities of the country. It includes information regarding gender, years of education, years of experience, occupation, and urbanization amongst others.

This type of information could allow researchers to: (i) Gain an understanding on the underlying characteristics of the labor force associated to different sporting activities, (ii) Identify characteristics intrinsic to locations.

Those datasets, in addition to extensive spatial work compiled for Mexico from other sources, has allowed us to begin this suggested approach to the sports sector with Mexico.

More so, in the future these sources could be complemented with municipality-level data that would allow a more in-depth look at different topics at a more disaggregated level.

The datasets we leveraged in Mexico have three main characteristics that make them particularly suitable for the type of analyses we are focused on:

### A. Sector disaggregation

Through the Mexican Social Security Data and the Economic Census Data, we have access to a specific six-digit level code for each economic activity performed by formal establishments in the country. This allows us to go into great depths in terms of fully and accurately understanding the different activities that encompass the sports sector in the country. This level of disaggregation allows us to study the sports sector as suggested in Russell, Barrios & Andrews (2016): core sports (professional sports, fitness and recreation sports) and sports periphery. Nevertheless, given that the Mexican population Census presents its data in a four-digit level of aggregation, not every analysis presented in this paper is done at the greatest possible level of disaggregation as to maintain consistency across databases.

### B. Spatial disaggregation

Another essential component to better grasp the factors behind the intensiveness of the sports sector in a given place is the level of spatial disaggregation of our data. Namely, the fact that we have access to employment-and-production-related variables from the Mexican Social Security Administration at the municipal level allows us to study more profoundly what relationships we find in areas that are intensive on sports<sup>2</sup>. Similarly, other municipal-level datasets measuring several social and economic variables are also incorporated into our analysis of municipalities and the sports sector. Lastly, geographic variables, also at the municipal level, such as average terrain slope, precipitation levels, or distances to means of transportation, are included in our study.

### C. Database complementarity

We are then leveraging in this paper the numerous variables we have available to study the sports sector. Namely, we have access to databases on value added, number of companies, and value of production, alongside databases with number of employed people and the characteristics of the employed people. Lastly, we also have data on the characteristics of Mexican municipalities. Given that all of these different databases have a sector and a geography identifier, they can therefore be merged into a broader dataset that has complementary information facilitating a more holistic view of the sports sector.

In a sense, any place that can produce statistics with at least this level of industry and geographic granularity could easily replicate the analysis presented in this paper and potentially expand it to focus, not only on broader characterizations of the sector, but on specific sports-related activities in a given geography.

## **Section 2. Skill-Based Clustering of the Sports Sector in Mexico.**

One of the main contributions to how we think of sectors' value to the economic ecosystem that surrounds them is the notion of economic geography. Krugman (1991) highlighted the astonishing geographic concentration rates of economic activity. Alongside Krugman's

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<sup>2</sup> This analysis is not constrained to municipalities, since a similar exercise can then be extended to larger administrative units, such as states or Metropolitan Statistical Areas. All these analysis and the tradeoffs involved in each are mentioned later in this paper.

work, early studies paved the way for deeper analyses of patterns of agglomeration and of co-location of activities within the same space. The lessons from the line of work on economic agglomeration allowed us to understand how some economic activities connect to others to others (Audretsch and Feldman 2003). This analysis could also be seen strictly through a rural-urban lens when we try to understand through economics how people, despite vast amount of space on our world, choose to agglomerate in cities and what does this tells us about the value of connectedness (Glaeser 2009). This literature has in time highlighted the importance of understanding how connected, central, or strategic a given economic sector can be.

In order to analyze how connected a given sector is to the rest of the economy, we can rely on a variety of metrics that have been developed to determine how similar one industry is to another. Some studies in this direction have looked at the co-location patterns in the economy for a given sector (Neffke and Henning 2008), trying to find patterns of sectors that are usually present in the economy when the sector under study is also present. Namely, co-location is meant as a term for the clustering of firms that mutually benefit from being located in the proximity of each other, despite not belonging to the same industry (McCann, 2001). The aforementioned studies have then expanded their work to the analysis of the co-location of sectors.

Another metric of how “close” two sectors can be is the *skill-relatedness* of two sectors (Neffke and Henning, 2013). This metric, as it name suggests, aims to understand how similar are the skills workers need in order to participate in each of these sectors. To come up with such an estimate, we look at the flow of workers, through time, between every combination of sectors possible. By looking at those sectors where there are higher bilateral flows than what we would otherwise expect (given sectors’ size with regards to the overall economy), we can then infer that those pairs of sectors must have a significant *skill similarity*.

## **2.1. Clustering of sports-related activities at a four-digit level**

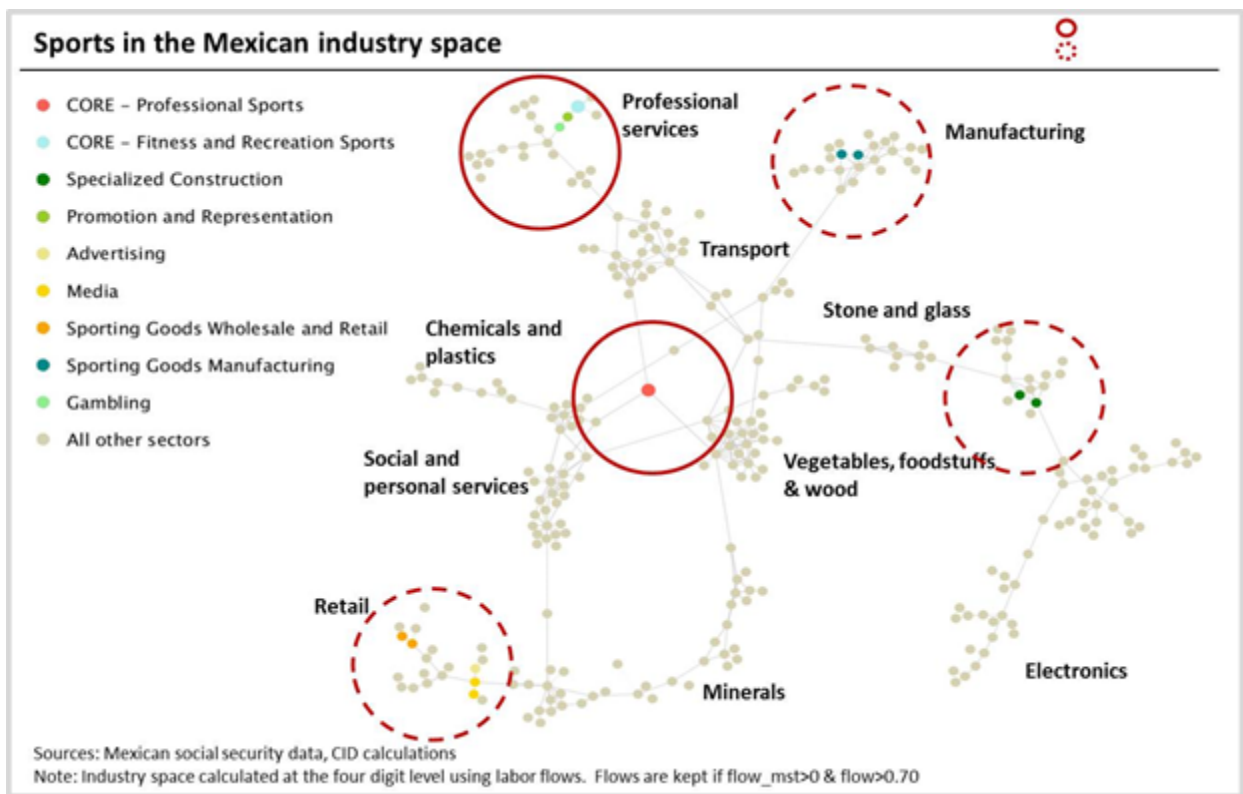
In this study we applied the skill-similarity framework to the data available from the Mexican Social Security Administration. Through the Social Security data we have access to detailed industry-level data of labor flows between 2009 and 2013. We used this information to develop what we call an *industry space*, which allows us to visually understand the relationships between industries in the Mexican economy, based on how “similar” two sectors are between themselves. For this purpose, we looked for an appropriate threshold for which only the strongest connections are graphed between sectors. We performed this exercise through our previously explained classification of core sports and sports periphery. As described in Russell, Barrios & Andrews (2016), core sports activities are those that require knowledge that is highly specific to sports, while sports periphery activities are those that only possess partial sports-specific knowhow and are primarily embedded in other types of activities. The difference between them lies in that the knowledge and skills required to participate in core sports activities is primarily about sports itself, whereas the knowledge needed to participate in sports periphery activities is more about a broader type activity that happens to overlap with sports.

In Figure 2.1 we see that this exercise suggests the existence of clear clustering patterns

between some sports activities and related industries. More specifically, we can see from the graph that in general activities that have certain level of similarity seem to cluster together. We observe close to eight broad clusters in the industry space. Out of these, we find that sports-related activities are embedded in at least four of them. Furthermore, we see that non-core sporting activities are not clustered together, but rather are embedded in clusters of other types of activities with which they overlap. Such is the case of the “retail” sector and the “media” and “sporting retail” activities.

Meanwhile, the core sports sector in Mexico shows a different behavior. On one hand, professional sports show no apparent clustering but instead seems to play a connector role between different groups of activities. Meanwhile, fitness and recreation activities appear to be embedded within a broader professional services cluster. This might mean that, at least in the context of Mexico, the type of skills required for different activities that constitute the core sports sector, actually differ substantially. These results suggest that there is still significant diversity between the activities that comprise the core sports sector, which reinforces the importance of developing the appropriate level of analysis through which to study this sector.

**Figure 2.1. Sports in the Mexican industry space (four-digit level)**



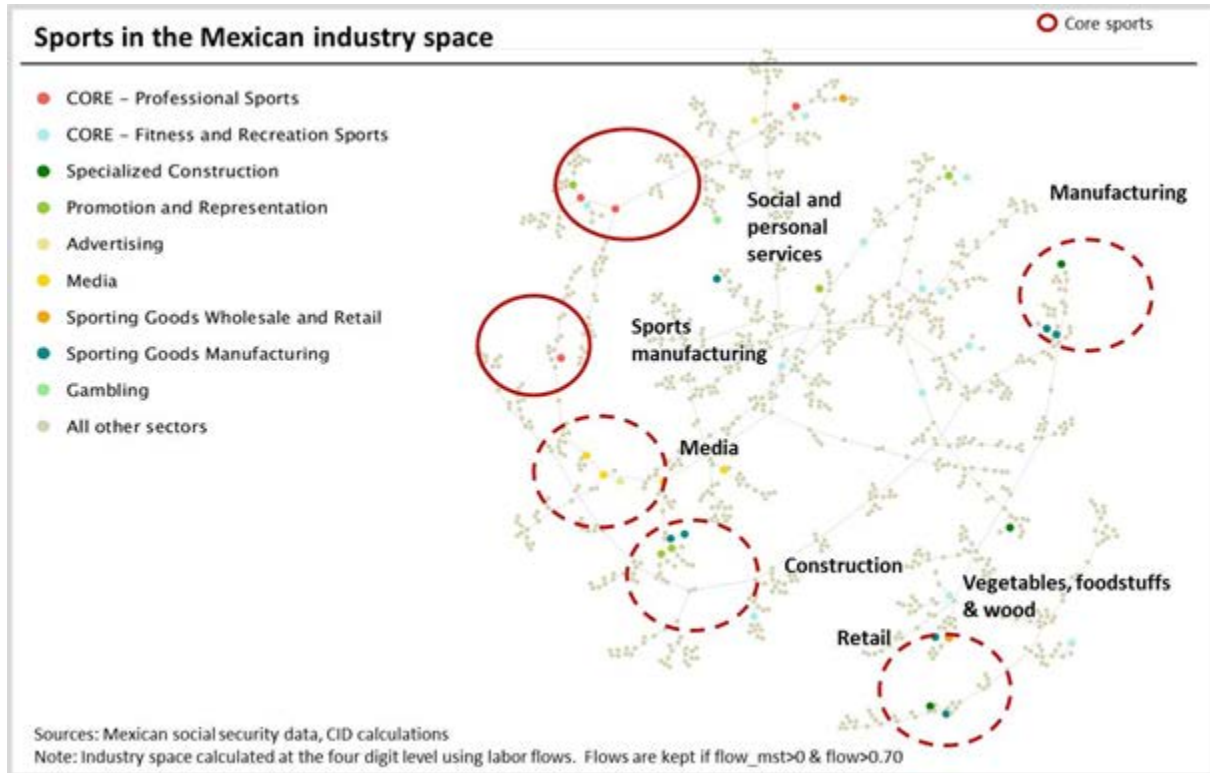
## 2.2. Clustering of sports related activities at a six-digit level

The previous exercise could also be performed at different levels of aggregation, depending on how detailed is the data one has access to. In the Mexican case, there is information on the economic activities performed by businesses at a six-digit level, which allows the division of economic activities into much more specific classifications. Under this



classification, we can find 42 activities that are related into sports activities<sup>3</sup>. Even though some clustering persists at this aggregation level in areas like “media” and “manufacturing”, their agglomeration is less clear under this more detailed lens.

Figure 2.2. Sports in the Mexican industry space (six-digit level)



After looking at the *connections* between sports activities and those around them, we can see that the sports sector is not isolated. It frequently evidences strong connections to more than one sector as opposed to being at the *end of the branches* on an industry space.

However, it is also evident that the sports activities do not cluster with each other. This might provide further evidence that sports-related activities hold stronger connections to broader industry clusters than they do with other sports-related activities (see Russell, Barrios & Andrews (2016), for more details and examples).

As a result, caution must be exercised when talking about the sports sector as a whole, since such classification encompasses activities that have structural differences in the skills that are required and the requirements needed for its pursuit. Hence, further analyses should be mindful of this and focus on the particularities of each relevant sports activity. Therefore, this paper analyzes the sector through the suggested classification of core and

<sup>3</sup> As we move forward with approximations to what might be seen as sports-related activities, it is important to bear in mind the trade-offs such a practice involves. While proxies allow us to study phenomena that is often times unobservable, it comes at the expense of accuracy and certainty. Namely, while approximating what categories might be deemed as “sports related” might help overcome the challenge of no standard framework to study the sports economy, it also comes with the risk of reading into these chosen proxies as purely related to the sports economy, when it could be the case that much of what we observe in variables at the sector level might have to do with other non-sports sectors that comprised our approximation.

sports periphery. An improved version of this analysis would break it down further to specific activities, however, given that this paper seeks to demonstrate what type of analyses could be carried out and the type of insights that could be obtained, we simplify the analyses in the aforementioned categories.

Lastly, it is important to keep in mind differences between industry spaces from different economies. By looking at the example of an industry space presented in Russell, Barrios & Andrews (2016), we see that the Dutch Industry Space experienced a strong clustering of sports activities between themselves. The differences we observe can be driven by several factors. On one hand, the classification used by European countries differs from that used by Mexico (the North American Industry Classification System —NAICS) whose data is also presented at different levels of aggregation. But also, the nuances of the composition of an economy can differ greatly from country to country, which undoubtedly raises concerns of external validity to this type of exercises. As a result, we underscore the value of this exercise as a way of developing a framework with which to look at the sports sector in the economy of a given context while not necessarily extrapolating conclusions from one context to another.

### **Section 3. Magnitude of the Sports Sector in Mexico in Terms of Value Added and Employment**

Another relevant metric for the importance of sports as a productive activity is its economic magnitude. In order to explore this, we analyzed the Mexican Economic Census for 2009 (from INEGI), which collects data on production and value added for each economic activity at the establishment level. This dataset provides the number of employees, production levels, wages, and value added for a given economic activity, for a given geographic location (at the national, state, municipal, or establishment level), or a combination of the two.

All of these variables can give us a sense of the magnitude of economic sectors by telling us how relevant they are in terms of workforce absorption or by providing us an approximation of their contribution to the national economy. In this section we explore the overall magnitude of sports in Mexico and of the economic activities that compose it, whilst drilling down on the core sports sector to better understand differing trends between the activities considered under this classification.

#### **3.1. Overall magnitude and activity-level patterns**

In terms of value added we find that core sports activities account for 0.19% of total value added in the Mexican economy, whereas sports periphery activities account for 0.96%. If we disaggregate this at an activity level, we find that out of a total of 883 activities being reported at a six-digit level of detail, we find that 11 sports-related activities are above the 50th percentile of all activities, while the other 24 sports related activities are below the median.

From those activities above the median, six are sports periphery activities whereas only three are core sports activities. The periphery activities belong mainly to the

manufacturing or media sector, whereas the core sports activities comprise professional sports team, fitness centers, and private sports clubs. Similarly, while the median economic activity is responsible for a 0.23% share of the national production added value in the Mexican Economy, the core and periphery sports activities have a mean added value share of 0.014% and 0.05%, respectively.

In terms of employment, we find that core sports activities account for 0.59% of total employment, while sports periphery activities account for 1.99%. Similarly, at the activity level, we find that out of 33 activities, 12 sports related activities are above the median in terms of employment, while 21 others are below. Out of those activities above the median, eight are sports periphery activities whereas four are core sports.

Another useful exercise is looking at activities similarly ranked in terms of the aforementioned metrics (say, employment) as a way of better grasping the magnitude of sports-related activities. By analyzing the number of employees working in each sector as a share of total employment in Mexico, we see that wholesale and retail of sporting goods is ranked 80<sup>th</sup> out of 179 activities in terms of the jobs it generates, surpassing other sectors such as metallic industry services, commerce of machinery and equipment, among others.

In the case of professional sports (athletes and professional sports teams), it ranked 123<sup>rd</sup>, while sports promotion and representation (promoters of artistic, cultural, sports and similar events) ranked 127<sup>th</sup>. Both sectors are larger under the employment metric than mining-related services, non-residential buildings, orphanages, etc. Nevertheless, these three activities combined still do not represent 1% of Mexico's overall employment, which is very suggestive of the elevated concentration of job posts on few activities<sup>4</sup>.

It is worthwhile mentioning that even within this high-level approximation we can begin to tease out some initial insights. For instance, we see that the activities that accrue the highest share of total value added in the economy are not necessarily the ones that accrue the highest share of employment. For instance, professional sports team is the 7<sup>th</sup> largest sports-related activity in terms of value added, but only the 20<sup>th</sup> in terms of employment. This speaks to some additional differences in modes of production and factor in density of industries that transcend the present discussion of skill differences across economic activities.

### **3.2. Structural differences within core sports activities**

The differences within core sports activities outlined above are not insignificant. If we look at the aggregate picture of the Mexican Economy at the four-digit level from the Economic Census and focus specifically on core sports and its broader sub-sectors —fitness and recreation sports, and professional sports— we can continue to explore these differences.

For one, we find (shown in Figure 2.3 and Figure 2.4) that fitness and recreation sports — when considered as a whole— are substantially larger than professional sports, both in terms of value added (five times larger) and employment (20 times larger). For both of these measures, fitness and recreation sports is above the median for the economy (out of

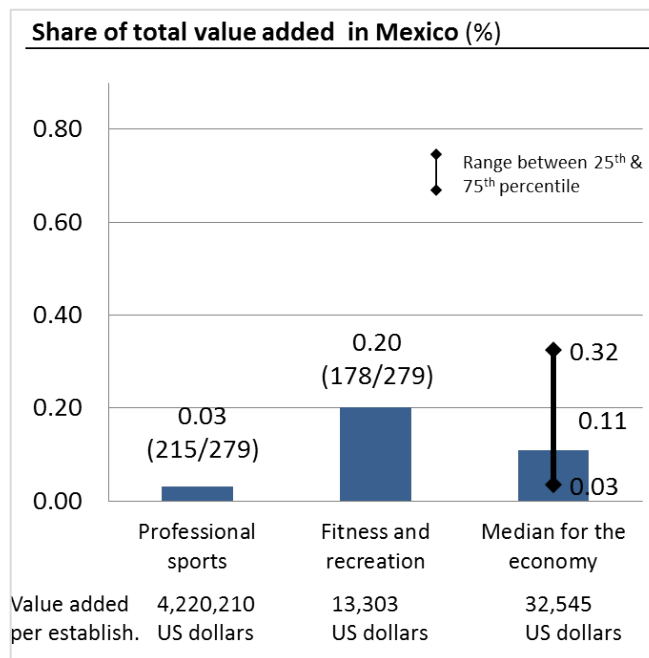
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<sup>4</sup> For a more detailed account at the activity-level of the significance of sports-related activities based on value added, employment, and wages; please refer to the appendix.

279 industries) and in the case of employment it's even amongst the top 60 sources of non-public, non-agriculture employment in the economy. Meanwhile, professional sports barely reach the 25th percentile in share of value added, and not even that for employment.

For references sake, we find that in terms of overall value added, fitness and recreation sports is as large as other sectors such as “nightclubs, bars and similar drinking places” or “fishing”. Meanwhile professional sports are as large as “maritime transportation” or “electronic data processing and hosting”. In terms of employment is as large as the “tobacco industry”, “museums”, “scientific research and development of services”. It should be noted that the relative importance of these industries might vary across geographies; therefore these examples might not easily translate when thinking of other contexts.

**Figure 2.3. Share of total value added in Mexico (%)**



Source: INEGI – Mexico Economic Census (2009), own calculations.

Note: Does not include the public sector or agricultural activities.

Interestingly, if we perform this analysis at an establishment level we see a different picture. Based on this calculation, we find that an average professional sports establishment hires 20 times more people than an average fitness and recreation establishment, and generates 130 times more value added.

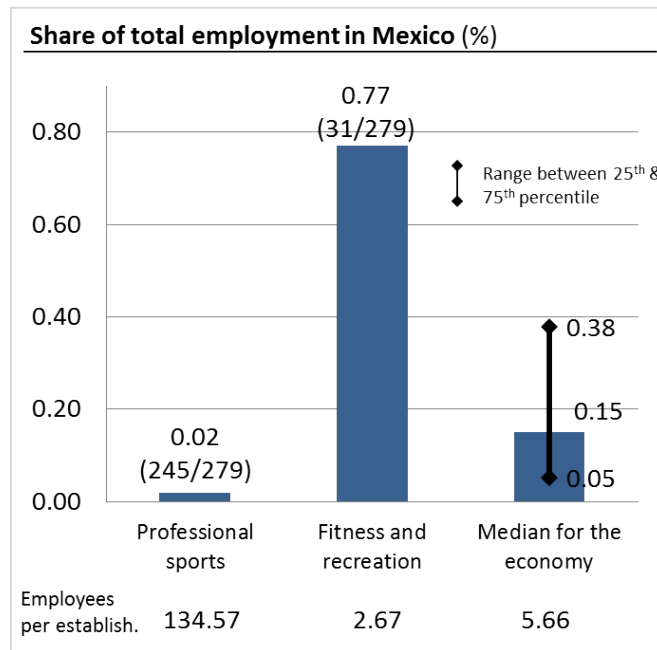
For reference sake, on a per-establishment level in value added, the top activity under this metric is most similar to “aerospace equipment manufacturing”, and “aluminum basic industry”. On the other hand, the bottom three activities are most similar to “retail trade of fish and seafood”, “telephone booth services”, and “porcelain, china and pottery products manufacturing”

Fitness and recreation sports are as large as “retail trade of new automobiles and pickup trucks”, “construction of highways, bridges and similar works”. Similarly, professional sports are most similar in size to “retail trade of carpets, curtains, tapestries and similar

products”, and “other educational services, private sector”.

In other words, it seems as if in Mexico, fitness and recreation sports is a collectively large sector in the economy, with many small establishments, whereas professional sports is a relatively small sector in the economy, with very few establishments each with large individual contributions. It is worth noting that replicating this analysis at a higher level of granularity might provide more precise characterizations of the establishment-level differences between different sports related activities, both in core sports and the sports periphery. In this sense, understanding the differences across sectors in different geographic settings and including more years of data, could also help policymakers identify relevant trends.

**Figure 2.4. Share of total employment in Mexico (%)**



Source: INEGI – Mexico Economic Census (2009), own calculations.

Note: Does not include the public sector or agricultural activities.

Through this initial analysis, we found that in Mexico sports periphery has a total added value five times that of core sports. In the case of employment, this ratio falls somewhat to seven-to-two. Furthermore, when drilling down at an activity level and comparing with the median activity in the economy we find that nine sporting activities are above the median in terms of value added and 12 meet these criteria in terms of employment. Nonetheless, we found that sports-related activities that rank amongst the highest in value added, not necessarily do so as well in terms of production, which might signal further structural differences across sports related economic activities.

We explored these differences by zooming in the sub-sectors of core sports and found that fitness and recreation sports as a whole is substantially larger than professional sports. Also, fitness and recreation sports are above the median size of industries for the economy whereas professional sports are consistently below the median under different definitions of magnitude. Nonetheless, when considering the number of establishments we see that

fitness and recreation sports are about many small establishments with a large collective contribution while Professional sports are about very few large ones with a small collective contribution.

These insights might be relevant for policymakers as they provide further evidence that the individual activities that compose the broader sports sector might be structurally different, not only in terms of the skills required, as suggested in Russell, Barrios & Andrews (2016), but also in terms of their value added contributions, employment absorption capacity and establishment-level mode of production. Furthermore, if there are so many high-level fundamental differences across sports related activities, it begs the question that perhaps the places that are intensive in different sports related activities are also fundamentally different. As a result, policy tools to pursue different sector-related goals might vary significantly depending on the specific sports-related activity being considered.

## **Section 4. Characterization of Employment in the Mexican Sports Sector**

An additional angle, through which we can hope to better understand the sports sector, is through a characterization of the type of employment associated with these activities. In order to pursue this, we leveraged various available datasets. Namely, we based this exercise on wage and employment information, and labor flows at the industry level from the Mexican Social Security Administration alongside individual-level characteristics from the Population Census.

In this section we explore the level of formality associated to sports-related employment in Mexico; a major consideration for Latin American economies. We also compare wages for sports-related employees to those paid in other activities in the Mexican economy. We break down the occupations associated to sports-related employment and identify major *sending* and *receiving* industries in terms of labor flows. Lastly, we provide some additional descriptive statistics on the individuals employed in the sector.

### **4.1. Formal employment and sports**

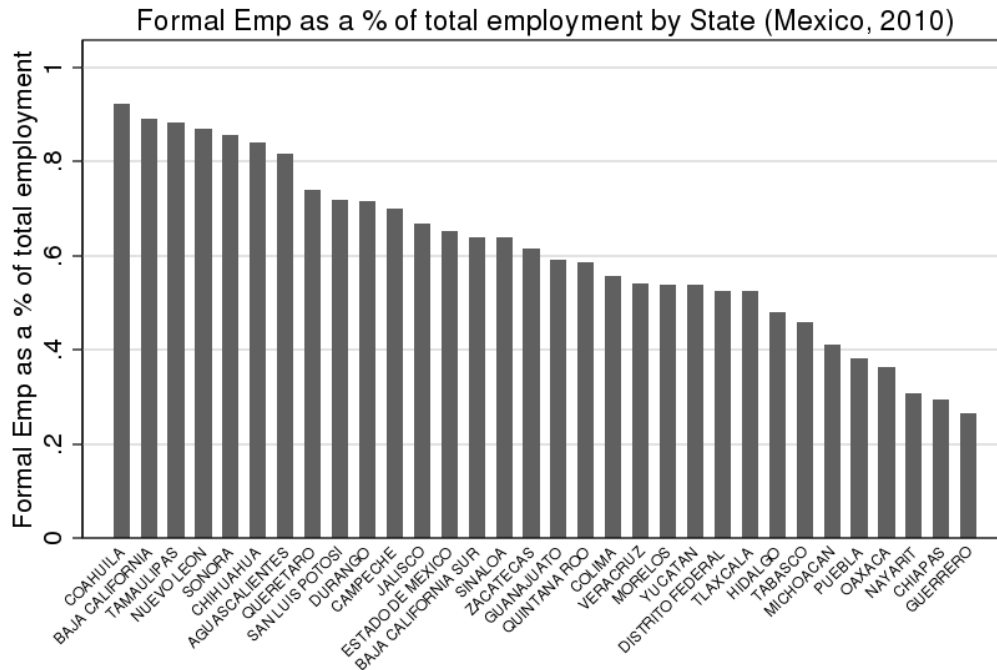
In contexts of low governance or state capacity, the nature of the labor market changes significantly. That is why less-developed economies usually exhibit significant portions of their labor force belonging to unofficial or unregistered businesses that lie beyond the reach of the state. Namely, the World Bank defines the informal economy as “*activities and income that are partially or fully outside government regulation, taxation, and observation*”. (“Labor Markets - Workers in the Informal Economy,” n.d.)

The coexistence of both a formal and informal sector in the workforce is a particularly common phenomenon in Latin America. On one hand, the presence of large corporations provides a segment of the labor force with formal employment opportunities. However, other smaller employers, paid employees, and some self-employed remain in the shadows of the system either to increase their take-home earnings or to reduce their costs by evading taxation and social contributions.

As a result, analyzing sports-related jobs under this dimension becomes particularly

relevant for the Mexican context and can provide insights into how this sector operates on similar contexts elsewhere. Leveraging data from the Population Census, we find that 49.76% of the sampled Mexican population is currently employed. In this group, we also find that the core sports sector has a lower proportion of formal jobs than the average of the economy, while the opposite is true for sports periphery. More precisely, 45% of employees belong to the informal sector in the overall economy, while the same is true for 54.14% of the employees in the core sports sector and for 25.51% of employees in sports periphery activities.

**Figure 2.5. Formal employment in the sports sector as a % of total employment by state (Mexico, 2010)**

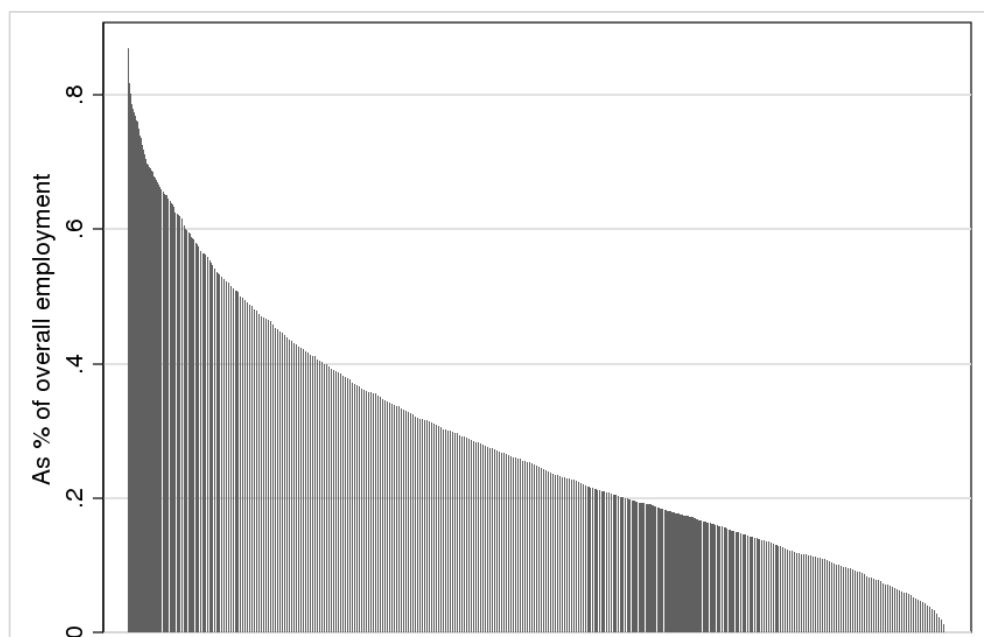


Source: Mexico Population Census 2010.

Differences in levels of job formality also emerge when considering the geographic component of the workforce. Figure 2.5 shows formal employment in the sports sector (core and periphery) as a percentage of the overall employment in each state of Mexico, with the X-axis identifying each Mexican state. Similarly, Figure 2.6 carries out the same exercise but for Mexican municipalities with the X-axis showing one bar for each municipality in the country.

At the state level, there is considerable dispersion between states in terms of job formality. While some states have more than 85% of their sports sector work force employed informally, the same is true for less than 35% in other states. This dispersion is even wider at the municipality level, where there is over an order of magnitude difference on formality shares between municipalities.

**Figure 2.6. Formal employment in the sports sector as a % of total employment by Municipality (Mexico)**



*Source: Mexico Population Census 2010.*

Given the type of data available for this analysis, we are unable to break down formality by type of sports-related activity and geographic dimension, since the results would not be representative. However, given these preliminary findings, it would follow that there are bound to be substantial differences in levels of formality not only across sports-related activities and geographic areas, but that these would be even larger across combinations of these variables (i.e.: sports periphery activities in Baja California in comparison to core sports in Puebla).

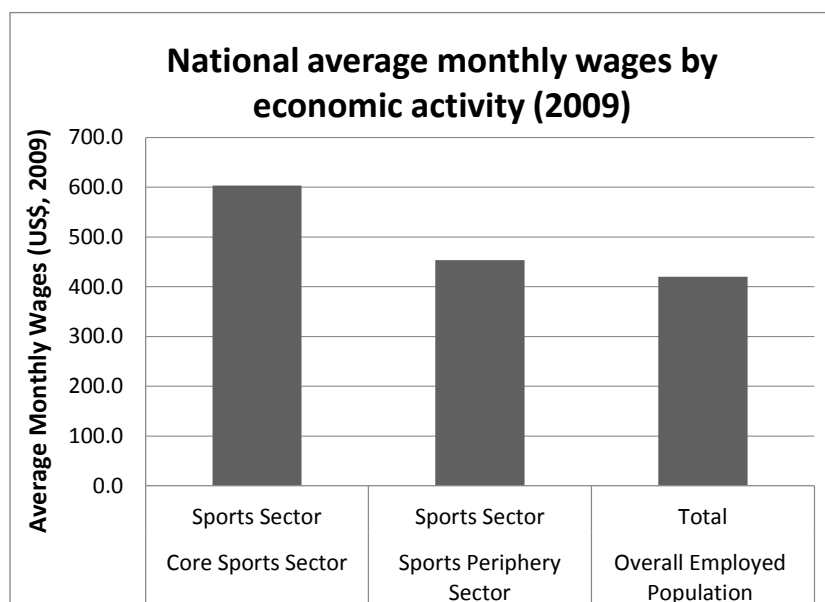
## **4.2. Relative wages**

In terms of remuneration, figure 2.7 shows that, on average, the sports sector employees earn higher wages than the average employed person. Namely, wages for employees in the core sports sector were 8,132 Mexican pesos (\$603) and 6,109 pesos (\$453) for those employed in the sports periphery sector (with a mean monthly salary of 6,201 pesos (\$460) for the entire sports sector). In contrast, the average wage of the overall employed population is 5,661 pesos (\$420).

The core sports sector is at the 66<sup>th</sup> percentile for wages amongst economic activities, which in Mexico is similar to industries like “wholesale trade of small and major household appliances” and “wholesale trade of cigarettes, cigars and tobacco”. Meanwhile, the sports periphery is at the 74<sup>th</sup> percentile, which is similar to industries like “dental offices, private sector” and “plastic bottles manufacturing”.



**Figure 2.7. Formal employment in the sports sector as a % of total employment by Municipality (Mexico)**



Source: Mexican Social Security Administration (2009).

If we break down the analysis at an activity level, we would find that out of 33 activities, 11 sports-related activities are above the median. Out of those, four are core sports activities and seven are sports periphery.

These differences in wages across sports-related activities can also be observed within common broad core sports categories. For instance, the mean wage for Professional sports in Mexico is 340,599 pesos while the mean wage for Fitness and recreation sports is 408,600 pesos.

This type of analysis is indicative of the significant differences in remuneration faced by employees in the sport sector. With a more expansive dataset, it might be worthwhile to explore differences across geographies, differences between occupations within a similar sporting activity, and significant trends over time.

### 4.3. Occupational breakdown of employment

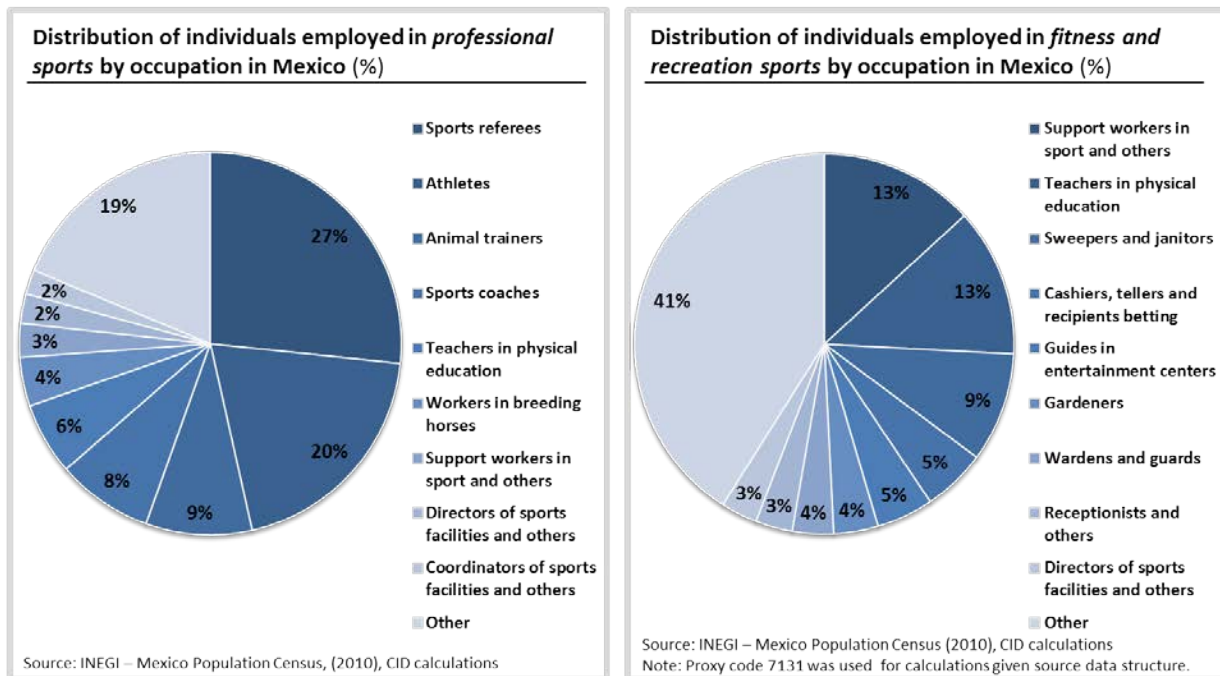
An additional dimension through which we can analyze the sports sector is by looking beyond sports-related economic activities and determining the occupations employed by these activities. Given the breadth of sports periphery activities, the vastly differing occupations associated to these activities, and the limitations of our data, we chose to focus our analyses within the broader activities that encompass core sports. Specifically, we leveraged the 2010 Mexico Population Census to identify the most common occupations in the professional and fitness and recreation sports activities.

For this purpose, we computed the share of employees that have a certain occupation in a given economic activity. By looking at the most common occupations in professional sports, we found that more than half of employees in this activity have sports-related occupations such as: Sports referees, athletes, etc. This is not the case for fitness and

recreation sports facilities, where the majority of top occupations are not exclusively sports related, but rather seem to be more common across other types of activities (i.e.: Sweepers and janitors, cashiers, etc.)

Moreover, the overall distribution of employment in professional sports is highly concentrated in the most common occupations. Namely, more than 60% of the overall employment in professional sports is clustered in the top four occupations for the activity. Meanwhile, employment in fitness and recreation is somewhat more diversified, with around 40% of employment concentrated in the top four occupations. In this same regard, fitness and recreation hires a much broader set of occupations (261 in total, three times more than professional sports), which —much like the top occupations— are not necessarily specific to sports and that are more common across various industries.

**Figure 2.8. Distribution of individuals employed in professional sports (panel a) and fitness and recreation sports (panel b) by occupation in Mexico (%)**



It is reasonable to assume that this high concentration of sports-related occupations in professional sports relates back to the insights drawn from the clustering exercise in Section 2. Back then, we observed that professional sports activities were not necessarily embedded within broader clusters but instead stood largely on their own. Meanwhile, fitness and recreation encompasses a much broader set of sport-related activities, that go from gyms and amateur clubs to golf clubs and ski resorts and that required a broader set of occupations that are not sports specific, but rather focused on professional services. This is notable because in the Section 2 exercise, this is precisely the broader cluster in which fitness and recreation sports are nested.

It is worth noting that even though we do not explore it further in this paper, the occupational prism might add an additional level of detail to the other analyses featured.

Namely, it is entirely possible that the high-level findings of diversity across geographies and sports-related activities would also hold for occupations. Therefore, future cross-section analyses that consider geography, industry, and occupation should provide a more detailed characterization of the sports-related workforce. Furthermore, future analyses would also benefit from attempting to understand the relative importance of sports related occupations in non-sports related industries.

#### **4.4. Outflows and inflows of employment to other industries**

Another key component of a thorough analysis of the sports sector is to better understand to which activities it relates the most. To perform this exercise in the context of Mexico, we relied on recorded labor flows between different economic activities from the Mexican Social Security Administration (IMSS). In order to then obtain those activities most closely related to the sports sector, we look for the activities with highest labor flows for each specific sports activity<sup>5</sup>. Similarly to the case of occupations, for the demonstrative purposes of this paper, we limit the portrayed analysis to core sports and its respective subdivisions.

In performing this analysis, we find that professional sports activities are closely related to a mix of other sports activities and enabling activities (sound services, credit unions, etc.) Meanwhile, fitness and recreation activities are primarily related to a more varied basket of activities, from banking to manufacture, to real estate and other sports activities. If we break down the analysis at an activity level, some interesting insights emerge. For instance, a number of sports activities are closely related to “natural” sectors for which there is an expected relation. Such is the case of “golf courses” which is related to “landscape installation”, and the case of “tourist marinas” which are related to “sightseeing transportation by water” and “water navigation services”. An additional pattern seems to emerge around products that are simultaneously consumed or that could serve as an input to one another. Such are the cases for “billiard rooms and parlors” and its relationship to “marble mining” or “wood household goods and utensils manufacturing”, and the case of “photographic and videotaping services” and “rental of video tapes and discs”. A list of the top 10 activities related to each sports activity can be found in Appendix B.

These results are illustrative of the type of skills and knowledge required by each sports sector category to operate. In line with our previous findings on the embeddedness of the sports sector, we find that core sports activities are indeed more associated with sports-related activities, which might not be the case for sport periphery activities. These insights are valuable for policymakers seeking to understand which skills from those required by a specific sports activity, are already present in their economy. Namely, this could be the case of a mayor trying to understand what capabilities her city has from those needed to develop professional sports in her jurisdiction.

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<sup>5</sup> Another purpose served by this exercise is a further robustness check on the methodology employed for the categorization of the sports economy.

#### **4.5. Additional descriptive variables under which to analyze the sport sector**

In addition to the previously described analyses, there are, other aspects that could help policymakers better understand the profile of the workers who participate in the sports sector. Among these, the available data can provide a picture on levels of schooling, gender composition of the workforce, age of employees, and share of full time employees. We present below a few highlights from these types of analyses.

In terms of education levels we see that the overall employed population in Mexico has on average 9.8 years of schooling. In comparison, those employed in the core sports sector have 10.8 years of schooling, while those employed in the sports periphery sector average 10.15 years.

Similarly, around 34% of the employed population has at least a high school degree, while the same is true for 57% of employees in the core sports sector and 47% of those employed in the sports periphery sector.

Furthermore, the core sports sector ranks 90<sup>th</sup> out of 179 sectors in terms of percentage of employed population with a high school degree. This is similar to other industries like “individual and family services” and “couriers and messengers”. Within the sports sector itself, we see significant differences between the sports periphery activities, where “sports promotion and representation” has more than twice the proportion of high school graduates among its workforce than “wholesale and retail of sporting athletic goods” has.

When it comes to the gender composition of the workforce, we see that in general men comprise 65.1% of the labor force, whereas 88.8% of the employees in core sports activities are men. In the case of sports periphery, 61.6% of employees are men. It is worth noting that in terms of share of males of total employment, core sports ranks in 36<sup>th</sup> out of 179 sectors, which is similar to industries like “business support services” and “hog and pig farming”. It might be interesting for future research to further explore the gender dynamics behind numbers in sports activities.

In terms of average age of workers, employees in the core sports sector are on average 34.8 years old, ranking 23<sup>rd</sup> out of 179 economic activities, which is similar to “facilities support services” and “consumer goods rentals”. Meanwhile, employees for sports periphery activities are on average 36.1 years old. As a point of reference, the overall employed population is 37.6 years old on average. If we look at this evidence in conjunction with the fact that workers in the sports sector are on average more educated, we can then see that workers participating in the sports economy are also necessarily less experienced than their peers laboring elsewhere. These are the kind of challenges that arise when we try to understand the causality behind the relationships we observe in the sports sector: Are wages different in the sports sector because of their different experience profile, or is there a causal relationship in a different direction?

Lastly, we found that 58% of employees in the core sports sector in Mexico are full-time employees; much lower than the 87.6% of the overall economy. Likewise, employees in the core sports sector worked on average 33.3 hours whereas those employed on the sports periphery sector worked an average of 41.8 hours. These averages are lower than the 45 hours that the overall employed population worked per week.

It is notable that even in this very cursory approximation to the data, some interesting patterns begin to appear. Namely, it seems as if core sports mainly employ young people, primarily male, with higher than average education and in a temporary fashion. However, given the high-level of the exercise, these findings should be interpreted with caution. As with the previous analyses, a more robust approximation to these themes would consider more years of data, geographic variation, differences across specific activities, and occupational specificities.

More generally, the insights from this section allow us to provide an initial profile of the labor force associated to sporting activities in Mexico. We explore a number of different themes including formality, wages, occupational breakdown, labor flows, and descriptive statistics. We find evidence of significant variance across broad and narrow characterizations of the sector and geographical discrepancies. These descriptive approximations of the sector are useful for practitioners seeking to understand the profile of those who work in these activities, which can in turn further inform the types of policies that can be most efficient strengthening these sectors as opposed to a generic labor policy.

Additionally, these findings add further evidence that a thorough understanding of the sports sector requires to ask the question of *how different?* As each sports-related activity might behave substantially different than other activities, these differences might prove to be of paramount importance when trying to formulate policies for specific contexts.

## **Section 5. Geographic Intensity of Sports-Related Activities**

As we mentioned on the beginning of this document, another key dimension that economists have begun to leverage when analyzing economic and social phenomena in the world is the spatial one. Spatial analysis has allowed us to better understand major economic, social, and institutional features of societies at very different levels of aggregation. With this in mind, we performed a spatial analysis at the Metropolitan level<sup>6</sup>. As before, in order to demonstrate the potential of this analysis and to maximize the informative potential of it, we primarily focused on professional, and fitness and recreation sports, which as we mentioned earlier are part of the core sports sector.

### **5.1. Initial overview of the regional dispersion of the sports sector's magnitude**

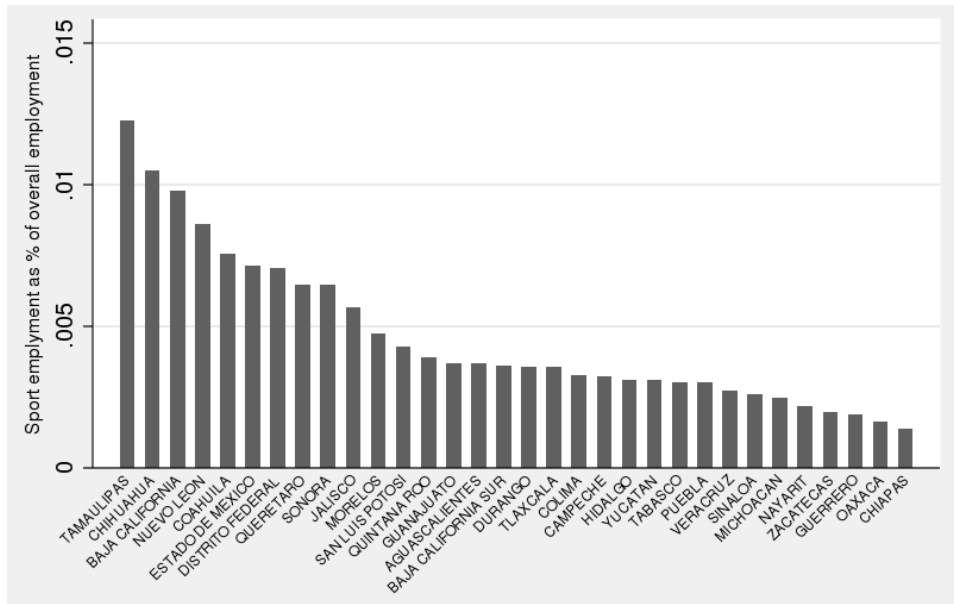
We start this analysis by looking at how the magnitude of the sports economy, based on Section 3 of this paper, changes at the state level in Mexico. Namely, when we look at the relative importance of the sports-related employment (defined as the percentage of all total employment represented by sports-related jobs) at the state level in Mexico, we find that there is significant dispersion between states on the weight sports activities have on their respective economies.

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<sup>6</sup> The exact geographic unit for this analysis is the Metropolitan Statistical Area (MSA) which is part of the classifications performed by the Mexican Statistics Institute (INEGI). We also performed this analysis at the municipal level.

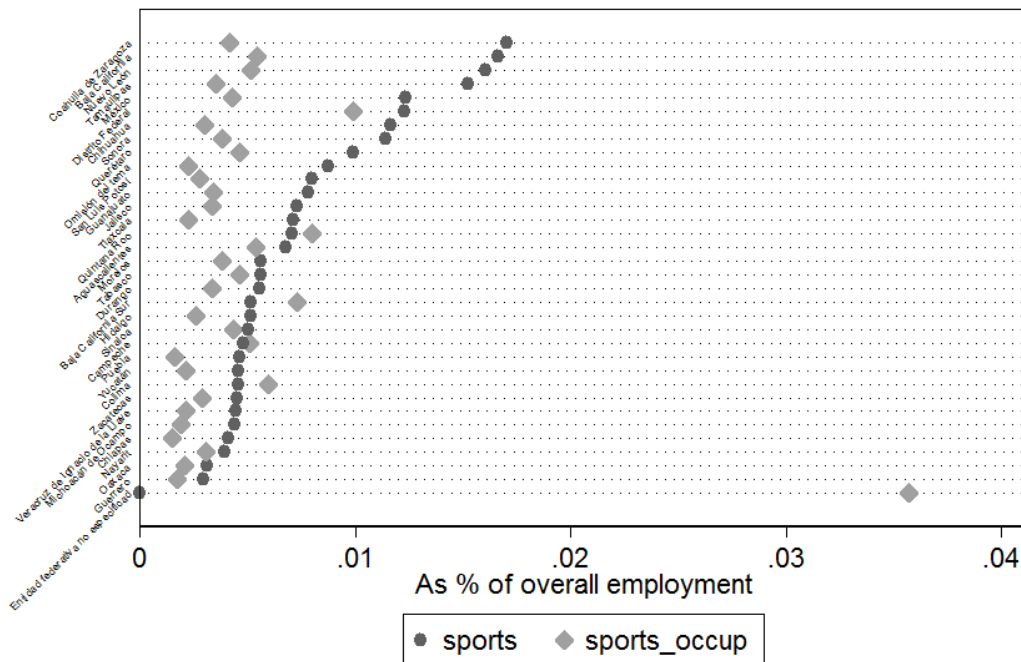
Figure 2.9 shows sports employment as a percentage of the overall employment in each state of Mexico, with the X-axis identifying each Mexican State. Similarly, Figure 2.10 presents the same exercise but comparing sports activities with sports occupations.

**Figure 2.9. Sport activities' employment as a % of total employment by State (Mexico, 2010)**



Source: Mexico Population Census 2010.

**Figure 2.10. Employment in sports occupations as a % of total employment by State (Mexico, 2010)**



Source: Mexico Population Census 2010.

These figures leaves us some insights into what patterns emerge on both activities and occupations, whilst providing a justification for a more in-depth study of what these

differences in magnitude of the sectors might mean. At the state level, there is considerable dispersion between states when it comes to the magnitude of the sports sector in their state economies in terms of employment. Similarly, these differences are much wider in the case of sports activities than in the case of sports occupations. In the case of the sports economic activities, we can observe a range that goes from states that have less than 0.1% of their workforce working on sports-related activities to states where the proportion of employees working for sports-related activities is ten times that.

## **5.2. Methodology and interpretation of an RCA indicator**

The next analysis we perform looks at whether each sports activity under study has a larger-than-expected proportion of employment from what we would expect in each of the metropolitan areas. For this, we first look at the national-level proportion of employment represented by sports, and we then compare that share of employment with the share of the sports-related employment in each metropolitan area. From figure 2.11, the darker the red, the higher the share of employment is in that metropolitan area from what we would have expected<sup>7</sup>.

## **5.3. Comparative RCA for different sporting activities and different levels of geographic disaggregation**

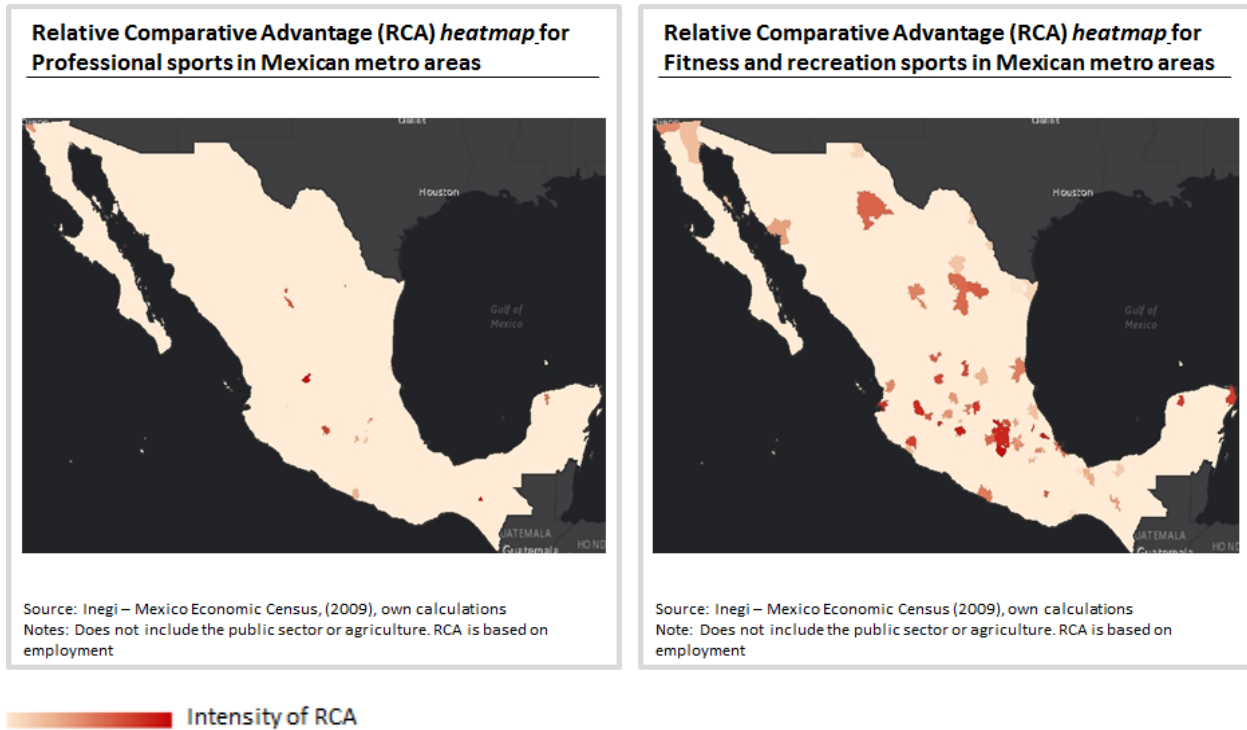
Based on this analysis, we find that there is a significant difference in the relative comparative advantage (RCA) of metropolitan areas between the two different sports activities. These results fall in line with how different core sporting activities are in terms of magnitude, employment, clustering and skills.

Figure 2.11 shows that very few metro areas in the country have high intensity in professional sports. Alternatively, many more are intensive on fitness and recreation. Furthermore, we can attest that the same metropolitan areas are rarely intensive in both.

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<sup>7</sup> The exact measure for this share of employment is the “Revealed Comparative Advantage” (see Balassa 1965; Hausmann, et. al. 2011) which is a measure originally developed as a tool to understand when a country exports more of a product than what you would otherwise expect. In this case, the measure has been adapted to measure “competitiveness” through the employment each activity generates.

Figure 2.7. RCA heat map for professional sports and fitness and recreation sports in Mexican metro areas.



#### 5.4. High-level econometrics to explore dynamics behind intensity of sporting activity

One of the key contributions of exploratory descriptive analysis is the detection of interesting patterns or associations in the data available to us. For one, our analysis of the data in Mexico has allowed us to discover which areas throughout the country are more intensive in sports activities, specifically in professional and recreation sports.

However, these analyses are limited in the sense that we cannot fully tease out the main reasons behind why some places are more intensive than others in these activities nor can we control through mere observation for other factors that may be driving the associations we observe. For instance, it might be the case that we find a strong association between large cities and intensity in professional sports activities. We might at first be tempted to associate such a relationship to the importance of being “connected” to large urban centers and being able to leverage the infrastructure they have to offer. Alternatively, it might be the case that the factor truly driving the relationship is population size.

It is at this stage of the analytical process when regression analysis becomes useful. By accounting for variables that might be driving our initial correlation results, we can better disentangle what factors are individually associated with intensity in different sports activities. In this sense, we proceeded to generate several regression analyses with the data available for Mexico, which are explained in more detail below.



For the purpose of this analysis, we considered whether a municipality is intensive or not in core professional, core recreation, and overall core sports through the data of the Mexican Social Security Administration (IMSS). In addition, we included a number of municipal-level descriptive variables from the Mexican Population Census in order to be able to understand the characteristics of the places that are intensive in sports activities<sup>8</sup>. This decision implied an emphasis on core sports as opposed to sports periphery throughout our study, which is due to the fact that the former category is considered a more accurate measure of primarily sports-related industries whereas the latter is more about other activities that also perform activities for the sports sector. Namely, as mentioned in Russell, Barrios & Andrews (2016), sports periphery is a category that incorporates things as sports manufacturing, which arguable incorporates more capabilities required in the manufacturing sector than what would be required for a sports sector per se. Given this concern, incorporating the analysis of intensity in sports periphery might be subject to significant confounding factors of what truly drives a place to become intensive in sports as opposed to other activities that have a tangential relation to the sports economy.

There are significant considerations when it comes to the appropriate level of geographic aggregation for our analysis. In the case of Mexico, this analysis could be done at the state, metropolitan area, or municipal level<sup>9</sup>. In the case of states, their few numbers make this level of aggregation less suitable for regression analysis given its limited number of observations; in addition to the concern that such level of analysis is too aggregated to be informative of what specific regions are truly intensive in sports activities. On the other hand, municipalities provide a much larger dataset with which to work, and allows us to perform a more granular study of the regions that are more intensive in sports. Nevertheless, this comes at a cost, since it may be the case that some municipalities may be intensive in sports only because they may host the headquarters or branches of big sports businesses that truly operate on a neighboring municipality. Namely, it could be the case that a metropolitan area is, as a whole, intensive in sports but the way those sports activities are distributed de jure and de facto across municipalities might generate a confounding effect. Similarly to the case of states, keeping only observations for metropolitan statistical areas (MSAs), would force us to give up observations on all municipalities that do not belong to a given MSA. As a result, we decided to keep our analysis at the municipal level, whilst accounting for whether a given municipality belongs to an MSA or not (the more detailed specification for this exercise is mentioned below).

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<sup>8</sup> We began our analysis with a full incorporation of variables we had access to, after which our analysis kept only those which were statistically significant for some of our analyses. Such was the case for variables that measured different subcomponents of another aggregate variable (i.e. several variables for types of homicides was available, but they did not provide further explanatory power than an aggregate homicide indicator).

<sup>9</sup> Given that most of our datasets were not available at the establishment level, such level of analysis was not feasible.

We measured intensity of sports through two different mechanisms: employment and production<sup>10</sup>. Namely, those municipalities that employed a higher proportion of their workforce on sports activities than the share of sports employees at the national level are then deemed to be sports-intensive municipalities. The same exercise is performed for production values, which provided a useful exercise for those cases where activities might be particularly sensitive to certain types of measurement avenues for intensity<sup>11</sup>.

To perform our analysis, we decided to specify a probit model, in which we tried to determine the relationship between municipal-level characteristics of a place and the probability that a given municipality is sports-intensive or not<sup>12</sup>. We limit our analysis to the sign of each coefficient as an indicator of the direction of the relationship that each explanatory variable has with respect to the probability of a given sector being intensive. The full set of variables used for our analysis, alongside the set of regression specifications we hereafter explain can be found in Appendix C.

When performing our regression analysis of the intensity of core sports at the municipal level in terms of employment, we found that municipalities that are intensive in core sports activities are also more likely to be unequal, larger in terms of workforce, earn lower salaries on average, but also more educated. Similarly, we found that closeness to an airport is strongly associated with higher intensity in core sports activities<sup>13</sup>. Interestingly, the fact that a municipality belongs or not to an MSA was not a statistical significant factor in our analysis<sup>14</sup>.

Regrettably, it was not possible to study these relationships in more detail for the specific case of professional core sports; given the data limitations (less than 10% of the observations from the core sports activities belong to professional core sports, therefore leaving us with too few observations to successfully perform a regression analysis). This suggests that most of the relationships we observed for the core sports sector hold for the recreation core sports sector as well, which our analysis confirmed.

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<sup>10</sup> We were able to measure intensity also based on: added value, wages, etc. But we deemed more appropriate to focus on the variables that are most accurately reported through the IMSS (with wages being systematically underreported by employers, for instance).

<sup>11</sup> Such a consideration was raised after our exploratory analysis of the data in Section 3, after which we found that the ratio of between professional sports and leisure sports can vary dramatically depending on how intensity is being measured.

<sup>12</sup> More specifically, we define being intensive by establishing whether a given sports industry (core sports, core professional sports or core leisure sports) have an RCA larger than 1. Namely, whether any of these sector classifications exhibit either a share of total employment level or total production added value in a municipality that is larger to the share said sector has at the national level in Mexico.

<sup>13</sup> This analysis was also performed for sports periphery, but as we mentioned previously on this document, sports periphery is a classification that likely picks up economic activities from many different industries that adds significant noise to the interpretation of our regression analysis.

<sup>14</sup> In addition, we performed a specification in which we applied MSA Fixed Effects, but given the low number of observations we obtained, it made more sense to focus our analysis on the full set of municipalities in Mexico.

**Table 2.1. Relationship results of regression analysis between intensity in core sports by employment at the municipal level and municipal-level characteristics**

	(2)
	Intensive in core sports (by employment)
Gini coefficient for inequality at the municipal level	+
(log10) Municipality size by employment	+
(log10) Municipality wage (by effective worker)*	-
Minimum distance (in Km) to airport	-
Minimum distance (in Km) to border	+
Education years, average by municipality	+
Average distance to paved road within municipality	+
Average homicides rate per municipality	-
Municipality average elevation (mt)	+

*\*This variable stands for the average wage paid by establishments by municipality.*

When performing the same exercise as before but measuring intensity through production value instead of employment, our results hold for most relationships with the exception of the average age of establishments in each municipality and a geographic control variable<sup>15</sup>. In addition, the relationship observed around the average distance to a paved road within a municipality might have to do with decisions of where to establish a business, which might take into account how accessible is it for their employees to reach their business. A difference in the coefficient for production value could suggest that high value-generating businesses do not take such variables into account. Nevertheless, one must be cautious in making assumptions around the interpretation behind observed relationships without proper accounting for potential confounding factors behind the relationships we observe on the regression analysis.

<sup>15</sup> This result might suggest that establishments that operate on core recreational sports (such as gyms) are younger than average establishments dedicated to other establishments. This metrics of age were constructed based on historical data from IMSS.

**Table 2.2. Relationship results of regression analysis between intensity in core sports by production at the municipal level and municipal-level characteristics**

	(8)
	Intensive in core sports (by production)
Gini coefficient for inequality at the municipal level	+
(log10) Municipality size by employment	+
(log10) Municipality wage (by effective worker)	-
Minimum distance (in Km) to airport	-
Minimum distance (in Km) to border	+
Education years, average by municipality	+
Average homicides rate per municipality	+
Average age of establishments by municipality	-
Average slope (degrees) by municipality	+

These results fall in line with our previous correlation exercises, which suggested that the sports sector is associated with workers who are more educated on average but earn lower wages (which were also associated with fewer full-time job positions). Therefore, the regression analysis has provided a further robustness check to our initial exploratory analysis of the data we had access to. But also, this exercise allowed us to expand the level of comprehension we had behind what characteristics are associated with a municipalities intensive in sports activities.

In this sense, we found that given the relationships found with municipality geographical components, inequality levels, as well as violence indicators; our research has led to the formulation of new questions. Namely, it is worth exploring at a greater length the channels through which many of these relationships play out. That is, how is inequality playing a role in the intensity of sports might be worth exploring. Similarly, the possibility of a proper identification strategy that could allow us to better infer the causal relationship between intensity in sports and other characteristics of municipalities might provide a valuable contribution to the questions policymakers ask in terms of developing a given sector of the economy.

In other cases, we see relationships between explanatory variables that change, depending on how we measure intensity in the core sports world, as is the case of the average homicides rate per municipality. One could argue that employment is indeed negatively associated with homicides given that places that are more intensive in terms of employment could be deemed as more prosperous and in turn less prone to crime

problems, while the opposite could be true of industrial areas that might be intensive in terms of production. However, as expressed above in the document, one must be careful on the interpretation of such relations.

Specifically, having access to a more nuanced data at the zip code level for crime (as is available in the United States) alongside its evolution over time and through exogenous events that may have materialized in given localities could provide us with a firmer ground to understand what might drive the seemingly contradictory relationships we observe. Similarly, there are also relations which might not have an intuitive story behind the sign and significance of their coefficients on each regression, as is the case for the average age of establishments by municipality. Nevertheless, the case for quality disaggregated data over time holds just as well in these instances.

It is important to mention nonetheless that this study can only bring relationships and associations to our attention, but no causality claims can be made out of this study. That is, we now know some of the characteristics of the municipalities that are competitive in sports activities, however, we cannot yet know whether municipalities closer to an airport are more likely to attract and develop a more significant sports sector or whether an airport is actually built nearby in a municipality because of its intensity in sports in the first place (or simply that both events, intensity and the airport presence, are due to some others unobserved variables).

There are several limitations to this exercise. Among them, we must acknowledge the lack of periodical data in a way that would allow us to analyze this in more detail. As we narrow the scope of our analysis of any dataset, by looking at levels of economic activity for specific industries, in specific locations, the amount of observations we are left with is dramatically reduced. As a result, it becomes more challenging to perform regression analyses at such high levels of disaggregation.

Therefore, we only were able to perform highly aggregated analyses that are far from ideal. This is the reason why having access to quality data, that is both comprehensive of the economy and periodical enough to analyze the evolution of the economy over time is essential to better understand the characteristics of the places that are competitive in a given economic activity. Furthermore, periodical data would better equip us to understand overarching trends that might be unobservable with only one year of data whilst providing us with enough observations to analyzing the intersection of economic activities in particular locations.

For this reason, we restricted this analysis to Mexican municipalities. Many could argue that a state-level or a metropolitan-level analysis might be more accurate when a strong professional sports presence in a municipality is a better indicative of an entire metropolitan area's intensity of sports than just a single municipality's. Given that we have very few observations for specific categories of sports activities, it is challenging to develop a regression analysis where we focused on so few states or metropolitan areas. For this reason, we chose a regression specification where we could study all municipalities in Mexico and yet account for whether each of those municipalities belonged to a metropolitan area or not. Having access to periodical data and a wide array of additional potential explanatory variables could eventually allow us to fully account for variations in

intensity in different sports activities within each municipality<sup>16</sup>.

Similarly, there are arguable many other dimensions of a municipality's profile that are not being accounted for on our explicative variables list, which might suggest that other components (such as cultural, health, or connectedness of aspects of municipalities) might also be playing a role in the intensity of sectors. As a result, a desirable addition to this project would be the expansion of the current list of explanatory variables available so as to account for this need.

## **Section 6. Concluding Thoughts and Potential Avenues for Future Work**

This paper presented a framework through which to study the sports economy. Based on the classification of the sports sector suggested in Russell, Barrios & Andrews (2016), this section presents an estimate of the magnitude, embeddedness in the economy, and strategic value of the sports sector for the Mexican economy.

We found through our analysis that sports activities show strong connections to more than one sector as opposed to peripheral sectors, which are identified by those who hold few connections to the rest of the industries in the economy. In terms of their size, we see that fitness and recreation sports are substantially larger than professional sports. Fitness and recreation sports are above the median size of industries for the economy while professional sports are consistently below average under different definitions of size.

When comparing sports activities between subsectors, we see that fitness and recreation sports are about many small establishments with a large collective contribution while professional sports is about very few large ones with large individual contributions. These measures of size also vary greatly at the state level, with the dispersion being much larger in the case of sports activities. In terms of remuneration, we see that that sports sector's employees earn higher wages than those of the overall employed population. When performing our regression analysis on the intensity of core sports at the municipal level in terms of employment, we found that municipalities that are intensive in core sports activities are also more likely to be unequal, larger in terms of workforce, earn lower salaries on average, but also more educated. Similarly, we found that closeness to an airport is strongly associated with higher intensity in core sports activities. Interestingly, the fact that a municipality belongs to a MSA was not a statistical significant factor.

In conclusion, given the promise but also extensive challenges to an in-depth study of a sector of the economy, it is essential to have access to better and more periodical data that can be standardized with datasets from different countries. Similarly, this exercise made a strong case for a robust classification of the sports economy and provided a better understanding of the relationships we find in the different types of sports activities and what these relationships can imply in each case.

Lastly, there are some exercises available that could further extend the work hereby presented that could add additional dimensions to our understanding of the sports

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<sup>16</sup> By applying MSA fixed effects into our regression specification.

economy. An analysis of co-consumption and input similarity between the sports sector (and within its sub-classifications) and other activities could further enrich the analysis of how this sector relates to the rest of the economy. Even though several challenges remain to a comprehensive study of the sports sector without falling prey to the caveats outlined in Russell, Barrios & Andrews (2016), the recent availability of more detailed data is making possible the development of valuable frameworks to classify and analyze any given sector in an economy with an unprecedented level of detail and rigor. This work is intended as an empirical contribution to the long chain of efforts to further improve the way in which we think of the sports ecosystem of activities and its relationship to the rest of the economy.

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## Appendix A. Detailed presentation of the magnitude of sports-related activities

The following tables present the relevance of each sports-related economic activity in Mexico as a share of total value added, employment, and wages in the Mexican Economy. In addition, the tables identify whether an activity belongs to the core sports or the sports periphery sector, as well as the percentile rank of the activity in terms of its share.

**Table A.1. Share of national added value represented by sports-related economic activities.**

Share(%)	Core	Periphery	Percentile	Economic Activity
0.00011%	1	0	3	Professional athletes
0.00074%	0	1	7	Other civil engineering construction
0.00135%	0	1	10	Independent artists, writers and technicians
0.00169%	0	1	12	Agents and managers for artists, athletes and similar figures
0.00178%	1	0	13	Recreational activities regulatory associations
0.00247%	1	0	15	Amateur clubs or leagues
0.00280%	0	1	17	Supervision of other civil engineering construction works
0.00305%	1	0	18	Bowling centers
0.00407%	0	1	21	Rubber footwear manufacturing
0.00412%	0	1	21	Promoters of performing arts, sports and similar events without facilities
0.00413%	1	0	21	Tourist marinas
0.00531%	0	1	25	Manufacturing of sandals and footwear from other materials
0.00680%	0	1	28	Television programs production
0.00787%	1	0	30	Other recreational services, private sector
0.00941%	1	0	33	Professional associations and organizations
0.01111%	0	1	36	Fabric upper footwear manufacturing
0.01121%	0	1	36	Wholesale trade of sporting goods
0.01295%	1	0	38	Billiard rooms and parlors
0.01355%	1	0	39	Sports schools, private sector
0.01376%	0	1	40	Sporting goods manufacturing
0.01424%	0	1	41	Public relations agencies
0.01455%	0	1	41	Promoters of performing arts, sports & similar events with facilities
0.01943%	0	1	47	Plastic footwear manufacturing
0.02299%	1	0	50	Golf courses
0.02578%	1	0	52	Fitness centers, private sector
0.03192%	0	1	58	Retail trade of sporting goods
0.03181%	1	0	58	Professional sports teams
0.05595%	1	0	69	Sports clubs, private sector



Share(%)	Core	Periphery	Percentile	Economic Activity
0.08433%	0	1	77	Sale of lottery tickets, sports bets and other games of chance tickets.
0.08759%	0	1	78	Cut and sew uniforms manufacturing, mass production
0.12644%	0	1	84	Advertising agencies
0.15696%	0	1	86	Leather upper footwear manufacturing
0.36035%	0	1	95	Commercial and service building construction, except construction supervision

Source: Mexican Economic Census, own calculations.

**Table A.2. Share of national employment represented by sports-related economic activities.**

Share(%)	Core	Periphery	Percentile	Economic Activity
0.00010%	1	0	1	Professional athletes
0.00110%	0	1	4	Other civil engineering construction
0.00240%	0	1	7	Agents and managers for artists, athletes and similar figures
0.00430%	1	0	14	Tourist marinas
0.00630%	0	1	17	Wholesale trade of sporting goods
0.00660%	0	1	18	Supervision of other civil engineering construction works
0.00700%	1	0	18	Recreational activities regulatory associations
0.00800%	0	1	20	Independent artists, writers and technicians
0.00880%	1	0	20	Bowling centers
0.01140%	0	1	24	Promoters of performing arts, sports and similar events without facilities
0.01240%	0	1	26	Television programs production
0.01440%	1	0	29	Professional associations and organizations
0.01780%	0	1	34	Rubber footwear manufacturing
0.01860%	1	0	35	Professional sports teams
0.01950%	1	0	36	Amateur clubs or leagues
0.02800%	0	1	44	Promoters of performing arts, sports and similar events with facilities
0.02840%	1	0	44	Other recreational services, private sector
0.02950%	0	1	45	Manufacturing of sandals and footwear from other materials
0.03050%	0	1	46	Fabric upper footwear manufacturing
0.03380%	0	1	48	Public relations agencies
0.03630%	1	0	50	Golf courses
0.03690%	0	1	51	Sporting goods manufacturing
0.06220%	1	0	64	Billiard rooms and parlors
0.07160%	0	1	68	Plastic footwear manufacturing
0.07540%	0	1	69	Sale of lottery tickets, sports bets and other games of chance tickets.

Share(%)	Core	Periphery	Percentile	Economic Activity
0.08650%	0	1	72	Retail trade of sporting goods
0.09600%	1	0	74	Sports schools, private sector
0.14280%	1	0	82	Fitness centers, private sector
0.14710%	1	0	83	Sports clubs, private sector
0.19910%	0	1	88	Cut and sew uniforms manufacturing, mass production
0.22040%	0	1	89	Advertising agencies
0.41100%	0	1	95	Leather upper footwear manufacturing
0.69900%	0	1	98	Commercial & service building construction, except construction supervision

Source: Mexican Economic Census, own calculations.

**Table A.3. Share of national total wages represented by sports-related economic activities.**

Share(%)	Core	Periphery	Percentile	Economic Activity
0.00030%	1	0	2	Professional athletes
0.00120%	0	1	5	Other civil engineering construction
0.00210%	0	1	9	Independent artists, writers and technicians
0.00230%	0	1	10	Agents and managers for artists, athletes and similar figures
0.00530%	1	0	18	Amateur clubs or leagues
0.00600%	0	1	19	Wholesale trade of sporting goods
0.00660%	0	1	21	Supervision of other civil engineering construction works
0.00660%	0	1	21	Television programs production
0.00650%	0	1	21	Promoters of performing arts, sports and similar events without facilities
0.00650%	1	0	21	Tourist marinas
0.00810%	1	0	24	Bowling centers
0.01000%	0	1	27	Manufacturing of sandals and footwear from other materials
0.01090%	0	1	29	Rubber footwear manufacturing
0.01160%	0	1	30	Promoters of performing arts, sports and similar events with facilities
0.01520%	1	0	35	Recreational activities regulatory associations
0.01610%	1	0	36	Billiard rooms and parlors
0.02390%	0	1	43	Sporting goods manufacturing
0.02350%	1	0	43	Other recreational services, private sector
0.02360%	1	0	43	Professional associations and organizations
0.02610%	0	1	46	Retail trade of sporting goods
0.02690%	1	0	47	Sports schools, private sector
0.02800%	0	1	48	Fabric upper footwear manufacturing
0.04610%	0	1	59	Plastic footwear manufacturing

Share(%)	Core	Periphery	Percentile	Economic Activity
0.04800%	1	0	60	Fitness centers, private sector
0.05100%	0	1	62	Public relations agencies
0.05090%	1	0	62	Golf courses
0.07900%	0	1	72	Sale of lottery tickets, sports bets and other games of chance tickets.
0.08150%	1	0	73	Professional sports teams
0.14040%	1	0	83	Sports clubs, private sector
0.14950%	0	1	84	Cut and sew uniforms manufacturing, mass production
0.23710%	0	1	90	Advertising agencies
0.35910%	0	1	94	Leather upper footwear manufacturing
0.63570%	0	1	97	Commercial & service building construction, except construction supervision

*Source: Mexican Economic Census, own calculations.*

## Appendix B. Analysis in further detail of relationships between Sports Activities and other activities in the Economy:

As it was mentioned previously in this document, different economic activities require different sets of skills and implicit knowledge in order to operate successfully. As a result, we rely on labor flows to better grasp the magnitude to which the skills and know-how required by two economic activities are similar. This section in the appendix presents a detailed account of the ten economic activities that relates the most, in terms of incoming labor flows, to each 6-digit sports activity.

**Figure B.1. Top 10 activities by incoming labor flows from “Sports schools, private sector”**

Source Activity (sports)	Rank	Top 10 Target Activities
Sports schools, private sector	1	Recreational activities regulatory associations.
	2	Schools which combine various education levels, public sector.
	3	Professional athletes.
	4	Fitness and Recreational Sports Center* (713940)
	5	Other outpatient care centers, private sector.
	6	Wholesale trade of metallic waste.
	7	Other distilled beverages manufacturing.
	8	Local courier and messenger services.
	9	Schools which combine various education levels, private sector.
	10	Primary education schools, private sector.

*Source: Mexican Social Security Institute (IMSS), own calculations.*

**Figure B.2. Top 10 activities by incoming labor flows from “Sports schools, public sector”**

Source Activity (sports)	Rank	Top 10 Target Activities
Sports schools, public sector	1	Community emergency services, public sector.
	2	Fitness and Recreational Sports Center* (713940)
	3	Recreational activities regulatory associations.
	4	Wholesale trade of other general purpose machinery and equipment.
	5	Higher education schools, public sector.
	6	Other educational services, private sector.
	7	N/A* (931230)
	8	Food catering services for businesses and institutions.
	9	Industrial machinery and equipment repair and maintenance.
	10	Business administration services.

Source: Mexican Social Security Institute (IMSS), own calculations.

**Figure B.3. Top 10 activities by incoming labor flows from “Professional athletes”**

Source Activity (sports)	Rank	Top 10 Target Activities
Professional athletes	1	Promoters of performing arts, sports and similar events without facilities.
	2	Professional sports teams.
	3	Sports clubs, private sector.
	4	Wholesale trade of magazines and newspapers.
	5	Sports schools, private sector.
	6	Retail trade of naturist products, homeopathic medicines and food supplements.
	7	Amusement and theme parks, public sector.
	8	Water collection, treatment and supply, public sector.
	9	Retail trade of photographic equipment and material.
	10	Food catering services for special events.

Source: Mexican Social Security Institute (IMSS), own calculations.

**Figure B.4. Top 10 activities by incoming labor flows from “Professional Sports Teams”**

Source Activity (sports)	Rank	Top 10 Target Activities
Professional sports teams	1	Bicycle repair and maintenance.
	2	Professional athletes.
	3	General secondary education schools, public sector.
	4	Foreign currency exchange offices.
	5	Recreational activities regulatory associations.
	6	Retail trade of photographic equipment and material.
	7	Fitness and Recreational Sports Center* (713940)
	8	Graphic design.
	9	Wholesale trade of paint.
	10	Synthetic rubbers manufacturing.

Source: Mexican Social Security Institute (IMSS), own calculations.

**Figure B.5. Top 10 activities by incoming labor flows from “Golf Courses”**

Source Activity (sports)	Rank	Top 10 Target Activities
Golf courses	1	Residential care facilities for persons with mental disorder and addictions, private sector.
	2	Barley grain growing.
	3	Manufacturing of paperboard in integrated plants.
	4	Homes and other residential care facilities for the elderly, private sector.
	5	Landscape installing and maintenance services.
	6	Resins of recycled plastics manufacturing.
	7	Attention and day care centers for the elderly and persons with disabilities, private sector.
	8	Other citrus growing.
	9	Highway and bridge management services, and support services.
	10	Resilient and wood floor installation.

Source: Mexican Social Security Institute (IMSS), own calculations.

**Figure B.6. Top 10 activities by incoming labor flows from “Tourist Marinas”**

Source Activity (sports)	Rank	Top 10 Target Activities
Tourist marinas	1	Sightseeing transportation by water.
	2	Water navigation services.
	3	Apiculture.
	4	Other Animal Aquaculture
	5	Cottages, villas and similar facilities.
	6	Coastal transportation, except petroleum and natural gas.
	7	Non-refractory bricks manufacturing.
	8	Electronic data processing, hosting, and other related services.
	9	Furnished apartments and houses with maid services.
	10	Gold mining.

Source: Mexican Social Security Institute (IMSS), own calculations.

**Figure B.7. Top 10 activities by incoming labor flows from “Sports clubs, private sector”**

Source Activity (sports)	Rank	Top 10 Target Activities
Sports clubs, private sector	1	Professional athletes.
	2	Car rental with driver.
	3	Fitness centers, public sector.
	4	Prepared meals freezing.
	5	Sightseeing transportation by water.
	6	Other recreational services, public sector.
	7	Billiard rooms and parlors.
	8	Professional sports teams.
	9	Fitness and Recreational Sports Center* (713940)
	10	Community food services, public sector.

Source: Mexican Social Security Institute (IMSS), own calculations.

**Figure B.8. Top 10 activities by incoming labor flows from “Sports Clubs, Public Sector”**

Source Activity (sports)	Rank	Top 10 Target Activities
Sports clubs, public sector	1	Computer systems design and related services.
	2	Justice administration and security and public order preservation.
	3	Amusement and theme parks, private sector.
	4	Urban and suburban collective passenger transportation by fixed route automobiles.
	5	N/A
	6	N/A
	7	Pre-primary education schools, public sector.
	8	All Other Plastics Product Manufacturing* (326199)
	9	Popular saving banks.
	10	Petroleum refining.

Source: Mexican Social Security Institute (IMSS), own calculations.

**Figure B.9. Top 10 activities by incoming labor flows from “Fitness Centers, public sector”**

Source Activity (sports)	Rank	Top 10 Target Activities
Fitness centers, public sector	1	Ambulance services.
	2	N/A
	3	Sports clubs, private sector.
	4	Private tutor services.
	5	N/A
	6	Other educational services, private sector.
	7	Portfolio Management
	8	Pre-primary education schools, private sector.
	9	Full-Service Restaurants* (722110)
	10	Industrial baking.

Source: Mexican Social Security Institute (IMSS), own calculations.



**Figure B.10. Top 10 activities by incoming labor flows from “Bowling Centers”**

Source Activity (sports)	Rank	Top 10 Target Activities
Bowling centers	1	Regulation and promotion of economic development .
	2	Orange growing.
	3	Manufacturing of basic petrochemicals from natural gas and refined petroleum.
	4	Photographic and video taping services.
	5	Plastic footwear manufacturing.
	6	Avocado growing.
	7	Glass installation and other body repairs for automobiles and trucks.
	8	Rental of tables, chairs, tableware and similar articles.
	9	Candles manufacturing.
	10	Washing and lubricating of automobiles and trucks.

*Source: Mexican Social Security Institute (IMSS), own calculations.*

**Figure B.11. Top 10 activities by incoming labor flows from “Billiard Rooms and Parlors”**

Source Activity (sports)	Rank	Top 10 Target Activities
Billiard rooms and parlors	1	Salt mining.
	2	N/A
	3	Crop dusting or spraying services.
	4	Marble mining.
	5	Wood household goods and utensils manufacturing.
	6	Foreign currency exchange offices.
	7	Other secretarial support and similar services.
	8	Wholesale trade of paint.
	9	Sports clubs, private sector.
	10	Washing and lubricating of automobiles and trucks.

*Source: Mexican Social Security Institute (IMSS), own calculations.*

**Figure B.12. Top 10 activities by incoming labor flows from “Other recreational services, private sector”**

Source Activity (sports)	Rank	Top 10 Target Activities
Other recreational services, private sector	1	Psychiatric and addiction hospitals, public sector.
	2	Amusement arcades.
	3	Cut and sew costumes and typical clothing manufacturing, mass production.
	4	Magazine and other periodical publications publishing.
	5	Promoters of performing arts, sports and similar events without facilities.
	6	Photographic and video taping services.
	7	Sightseeing transportation by water.
	8	Rental of video tapes and discs.
	9	Fitness and Recreational Sports Center* (713940)
	10	Other recreational services, public sector.

Source: Mexican Social Security Institute (IMSS), own calculations.

**Figure B.13. Top 10 activities by incoming labor flows from “Other recreational services, public sector”**

Source Activity (sports)	Rank	Top 10 Target Activities
Other recreational services, public sector	1	Other educational services, public sector.
	2	N/A
	3	Terminal technical middle education schools, private sector.
	4	General rental centers.
	5	Retail trade of orthopedic products.
	6	Public relations agencies.
	7	Guidance and social work services for children and the youth, private sector.
	8	Sports clubs, private sector.
	9	General secondary education schools, private sector.
	10	Other recreational services, private sector.

Source: Mexican Social Security Institute (IMSS), own calculations.

**Figure B.14. Top 10 activities by incoming labor flows from “Professional associations and organizations”**

Source Activity (sports)	Rank	Top 10 Target Activities
Professional associations and organizations	1	Bicycles and tricycles manufacturing.
	2	Rooming and boarding houses.
	3	Agents and managers for artists, athletes and similar figures.
	4	N/A
	5	Livestock veterinary services, public sector.
	6	Community temporary shelters, private sector.
	7	Production of channel programming for cable or satellite television systems.
	8	Credit unions.
	9	Scientific research and development services in social sciences and humanities, public sector.
	10	Other sound recording services.

Source: Mexican Social Security Institute (IMSS), own calculations.

**Figure B.15. Top 10 activities by incoming labor flows from “Recreational activities regulatory associations”**

Source Activity (sports)	Rank	Top 10 Target Activities
Recreational activities regulatory associations	1	Rental of transportation equipment, except road transportation equipment.
	2	Sports schools, private sector.
	3	Sports schools, public sector.
	4	Fitness and Recreational Sports Center* (713940)
	5	Professional sports teams.
	6	Wood trucking, long-distance.
	7	Cottages, villas and similar facilities.
	8	Sightseeing transportation by water.
	9	Amusement and theme parks, public sector.
	10	Management training schools, private sector.

Source: Mexican Social Security Institute (IMSS), own calculations.

## Appendix C. Regression Analysis of the Intensity in Core Sports Sector in Mexico

**Table C.1. List of variables used for regression analysis:**

Gini coefficient for inequality at the municipal level  
(log10) Municipality Size by emp  
(log10) Municipality wage (by effective worker)  
Minimum distance (in Km) to an airport  
Minimum distance (in Km) to a border  
Minimum distance (in Km) to a port  
Minimum distance (in Km) to a locality of more than 100  
Minimum distance (in hrs) to an airport  
Minimum distance (in hrs) to a border  
Minimum distance (in hrs) to a port  
Minimum distance (in hrs) to a locality of more than 100  
% of population in Rural Localities  
Education years, average by municipality  
Average distance to paved road within municipality  
Average homicides rate per municipality  
Average total deaths by municipality  
Average total deaths by execution by municipality  
Average total deaths by confrontations by municipality  
Average total deaths by aggressions by municipality  
Municipality average elevation (mt)  
Metropolitan Statistical Area (MSA)  
Rank of Economic Complexity of Industry  
% Indigenous population by Municipality  
Minimum distance to paved road by municipality  
Max distance to paved road by municipality  
Average distance to paved road by municipality  
Std of distance to paved road by municipality  
Average age of establishments by municipality  
Average age of employees by municipality  
Average slope (degrees) by municipality  
Mean income by municipality (2000 Pop Census)

**Table C.2. Regression analysis between intensity in core sports by employment at the municipal level and municipal-level characteristics**

	(1)	(2)	(3)
	Intensive in core sports (by employment)	Intensive in core sports (by employment)	Intensive in core sports (by employment)
Gini coefficient at the municipal level	0.587***	0.587***	0.778*
(log10) Municipality Size by emp	0.381***	0.380***	0.754**
(log10) Municipality wage (by effective worker)	-0.431***	-0.430***	-0.792***
Minimum distance (in Km) to airport	-0.001***	-0.001***	-0.00015
Minimum distance (in Km) to border	0.0002***	0.0002***	0.00171*
Education years, average by municipality	0.0281***	0.0282***	0.0455***
Avg distance to paved road within municipality	0.0483***	0.0474***	0.140**
Average homicides rate per municipality	-0.0003***	-0.0003***	-0.0004
Municipality average elevation (mt)	0.00006***	0.00006***	-0.0001
Metropolitan Statistical Area (MSA)		-0.00522	0
Constant	1.258***	1.255***	0.856
N	3539	3539	1202
r <sup>2</sup>	0.107	0.107	0.266
municipality FE	NO	NO	YES

*Note: Specification (2) adds "MSA" as an explanatory variable to specification (1) while specification (3) incorporates MSA fixed effects to specification (2).*

**Table C.3. Regression analysis between intensity in core sports by production at the municipal level and municipal-level characteristics**

	(1)	(2)	(3)
	Intensive in core sports (by production)	Intensive in core sports (by production)	Intensive in core sports (by production)
Gini coefficient at the municipal level	0.537**	0.537**	
(log10) Municipality Size by emp	0.972***	0.972***	1.519***
(log10) Municipality wage (by effective worker)	-0.905***	-0.905***	-1.271***
Minimum distance (in Km) to airport	-0.0005**	-0.0005**	0.000514
Minimum distance (in Km) to border	0.0002***	0.0002***	0.00203**
Education years, average by municipality	0.0236***	0.0236***	0.0543***
Avg distance to paved road within municipality	-0.0226*	-0.022	
Average homicides rate per municipality	0.000247***	0.00025***	-0.000887**
Municipality average elevation (mt)			
Metropolitan Statistical Area (MSA)		0.00387	0
Rank of Economic Complexity of Industry	-0.0000006	-0.0000006	-0.000004**
% Indigeneous population by Municipality			
Min distance to paved road within municipality			
Average age of establishments by municipality	-0.05***	-0.05***	
Average age of employees by municipality			
Average slope (degrees) by municipality	0.03***	0.03***	
Constant	2.341***	2.337***	1.464*
N	3526	3526	1296
r <sup>2</sup>	0.0688	0.0688	0.229
municipality FE	NO	NO	YES

*Note: Specification (2) adds "MSA" as an explanatory variable to specification (1) while specification (3) incorporates MSA fixed effects to specification (2).*