

Investigating the global productivity effects of highly skilled labour migration: how immigrant athletes impact Olympic medal counts

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Labour migration is a significant factor in today's global economy, as more people live and work outside their country of birth than ever before. Elite athletes are among a select group of workers who can seek employment on a global market level and who offer data to assess how migration affects productivity. Similar to the concept of 'brain drains and brain gains', the migration of athletes also has policy implications. For example, there have been documented accounts of countries openly 'recruiting' foreign athletes to help increase their Olympic medal counts. Although IOC officials have voiced concerns about such practices, they do not collect information tracking migration of Olympians (e.g. birthplaces, timing and relocation motives) or its potential effects on medal counts. This study represents the first known work to investigate labour migration patterns and productivity in the context of the Summer Olympics and has found preliminary evidence of migration's effect in the four Summer Games of the twenty-first century. Among the key findings, percentage of medal winners who are immigrants is significantly higher than the current percentage of the world's international migrant population. Results of hierarchical linear regression models predicting medal totals suggest that having immigrant athletes is one of the strongest indicators of medal totals for countries in each of the four Games. These findings highlight the challenges migration presents to current IOC policy.

Keywords: brain drain; Olympic governance; immigration policy; hierarchical linear regression; logistic regression

Introduction

The transient nature of labour forces has become progressively more commonplace in today's global economy. With more people living outside their country of birth than ever before, the increasing scope and frequency of labour migration presents complex opportunities and challenges for affected nations and people, which have brought about concomitant interest of researchers across various disciplines (Doyle 2004, Taylor 2005, Asis and Piper 2008, Bandyopadhyay and Wall 2008). The transnational movement of skilled labour, in particular, increased more than eightfold from 1960 to 1990, and countries have subsequently struggled to balance immigration policies designed to reap the benefits brought by an influx of skilled migrants, while simultaneously dealing with the loss of indigenous talent (Spence 2002, Kanbur and Rapoport 2005, Donaghey and Teague 2006, Oettl and Agrawal 2008). As a consequence, 'brain gains' (an increasing level of human capital), 'brain drains' (a net loss of human capital) and 'brain exchanges' (a flow of human capital resulting in no net loss or gain) take place across borders throughout the world and affect the involved countries' resources and productivity (Straubhaar 2000). However, the Global Commission on International Migration (GCIM 2005) notes that

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while labour migration is ubiquitous, relatively few types and motivations for labour migration can be considered global. Because of their unique skill sets, athletes and entertainers are among the minority of labour forces (along with information technology specialists, senior academics, health professionals and teachers) who can seek employment on a global market level, while the majority of people have more limited opportunities based on national markets (GCIM 2005). As a result, Asis and Piper (2008) argue that few studies have examined the impact of migration on a global level. They note that most migration studies are conducted at either the origin or destination country but rarely as interacting units or from a region-wide perspective.

Because of the global nature of the sports entertainment industry and the omnipresence of elite athletes, Kahn (2000) and Torgler (2009) assert that the sports industry offers a medium through which to study skilled labour migration and provides a virtual laboratory to test implications of labour market theories. There exists a global market for athletes, who have many of the same motivations for migration as other labour forces. Sport represents one of the biggest industries in the world, and the availability of statistics on the performance of individual athletes and relatively straightforward measures of productivity help to facilitate development of models explaining and predicting worker productivity. One of the largest and most international sports business venues is the Olympic Games. The Summer Olympics in London in 2012 operated with a budget of more than 8 billion GBP (BBC 2012). The National Broadcasting Company (NBC) paid a record \$2.2 billion for the American broadcast rights to the 2010 and 2012 Olympics, 5500 times more than what the television rights were first sold for at the 1960 Olympics (McMillan 1991, Serjeant 2010). As will be illustrated, athletes who have switched nationalities and competed for other countries can be considered a migrating labour force. The policy to deal with this form of capital mobility has been inconsistent as governments and non-governmental organizations attempt to balance the benefits and challenges athlete immigration poses in this area of the sports industry. Like labour migration in other sectors, the relocation of Olympic athletes has the potential to provide competitive advantages to some while putting others at a disadvantage, and it is difficult, arguably impossible, to regulate fairly (Carlson 2004, NBC Sports 2004). The Olympics represent possibly the most global context for understanding sport labour migration by virtue of the fact that more countries participate than in any other sporting event in the world. Yet, to date, few studies exist in this area. Consequently, the current research builds on the growing literature on labour migration and productivity by investigating the global flow of a particular group of highly skilled workers (Olympic athletes) across international borders to assess the effects of human capital mobility on productivity (medals) in one of the largest and most competitive sectors of the sports entertainment industry.

The productivity of the athlete labour force in the Olympic Games can be evidenced in a variety of ways. Just by being part of the competition, the athletes provide compelling television content, which helps increase advertising and sponsorship revenues. Winning medals can help garner worldwide attention for the nations that they represent. Athletes of foreign origin can contribute to the medal totals of their new countries and to sought-after material (e.g. advertising revenue, donations, heightened public attendance and awareness of sport) and symbolic effects (e.g. national pride, international prestige) that are purported to accompany winning Olympic medals (Delgado 2003, Moosa and Smith 2004, van Hilvoorde *et al.* 2010). As a corollary, the nation that the winning immigrant athlete is originally from is often unacknowledged and unaccounted for in the medal standings, akin to the 'brain drain' found in other sectors – what Wharton (2004) termed 'brawn drain' – whereby some countries lose their valued, natural athletic talent to others. The symbolic

benefits of winning a medal can be elusive and are difficult to quantify, but seem to be desired, given the amount of money countries allocate to achieving Olympic success and winning medals (Vinokur 1988, Koller 2008, van Hilvoorde *et al.* 2010). For instance, in 2006, UK Sport estimated that the cost per year to train a single British Olympic athlete for the 2012 Summer Games (with no guarantee of medal success) would be 83,000 GBP plus an additional 70,000 GBP per year if the athlete were to have potential to win a medal. Thus, the medals that Great Britain anticipated to win in 2012 would cost at least 10 million GBP (Jenkins 2006). Migration can also provide benefits to the individual athletes, and from their perspective, winning medals can open doors to personal and commercial opportunities (Zuckerman and Hauptly 2008). Unlike other highly skilled professions, however, the physical demands of competitive sports at elite levels mean that athletes generally have a more limited window of opportunity to maximize the benefits of their talents; moreover, the Olympics offer its competitors a chance to ‘produce’ only once every 4 years.

The importance placed on winning medals has sparked economic studies that have developed production functions and efficiency analyses that show how economic, non-sporting variables, such as population size and gross domestic product per capita, correlate with medal distribution (Johnson and Ali 2004, Moosa and Smith 2004, Rathke and Woitek 2008). While medal studies have looked at a country’s internal characteristics such as population, GDP per capita and government type, medal literature is extended in this study to account for the contribution of external human capital in the form of labour migration (in other words, the input of foreign labour) to determine whether favouring of foreign labour in the Olympics parallels trends in other sectors of industry, such as in medicine, academics and technology (Straubhaar 2000). International Olympic Committee (IOC) president Jacques Rogge noted in 2004 that he disapproves of ‘flexible citizenship’ (Ong 1999) and using citizenship as a negotiated commodity (Carter 2011). ‘From a moral point of view, we should avoid this transfer market in athletes’, he said. ‘What we don’t like is athletes being lured by large incentives by other countries and giving them a passport when they arrive at the airport’ (Rogge, in Carlson 2004, p. 4). However, the IOC does not collect or have the information to track the migration of athletes (such as birthplaces and timing and motivations for migration) and hence no way to monitor labour migration patterns and effects. Labour migration within the Olympics has received little critical evaluation. The availability of data and statistics to answer research questions remains a challenge to understanding migration issues and formulating policies that address the ramifications of migration (Asis and Piper 2008). Thus, the current study investigates: (1) athletic talent flows across borders as an example of skilled labour migration and capital mobility (Oettl and Agrawal 2008); (2) the global productivity effects of elite immigrant athletes in a global sports competition (Milton-Smith 2002, Asis and Piper 2008, van Hilvoorde *et al.* 2010); and (3) whether the presence of foreign-born talent offers organizations (i.e. national Olympic teams) a competitive advantage in this realm.

Literature review

The current study focuses on the Olympics, as it provides a global context for examining highly skilled labour migration. The Olympics illustrate how gains and losses of productivity can be affected by the migration of elite athletes (van Hilvoorde *et al.* 2010). The research will first be framed by a review of the relevant labour migration literature,

followed by a discussion on sport labour migration in general and how this issue relates to the Olympics in particular.

Labour migration

The movement of people, referred to by Appadurai (1990) as ‘ethnoscapes’, and their external effects represent a form of capital mobility as the contemporary global economy facilitates the flow of people across borders with greater ease than at any time in history. In 2005, an estimated 200 million people lived outside their country of birth, an increase of 25 million from 2000 figures and more than ever before. Approximately, 1 in 35 people, or 2.9% of the world’s population, were international migrants in 2005 (GCIM 2005). From 1990 to 2000, international migration explained 56% of the population growth in the developed world (including 89% in Europe) compared with 3% in the developing world (GCIM 2005). At one time, skilled workers may have been limited to local resources and opportunities. Now, their influence has a potential to project far beyond their native borders and regions. For example, Doyle (2004) illustrates how a Nigerian computer engineer can extend his influence to Sweden because of the ease of travel and communication and the financial and technological interdependence that are products of contemporary globalization. Labour migration and its effects have received significant research interest among social scientists since the 1960s; in particular, Hewlett (2002) notes that scholars across various disciplines such as business, economics and sociology have focused on exploring the determinants and consequences of labour migration. Early research emphasized motivations for migration, and more recent studies have increasingly addressed migration’s effects (Hewlett 2002). While there are certain types of involuntary migration (e.g. refugees and asylum seekers), voluntary migration is a selective process with migrants choosing the optimal destination countries and destination countries screening for the optimal migrants (Kanbur and Rapoport 2005). Better opportunities, rational individual choice and utility maximization – often caused by wage disparities, unemployment rates, differentials in life expectancy and education gaps – motivate voluntary labour migration (Hewlett 2002, Doyle 2004, GCIM 2005).

With regard to the study of migration’s effects, Oettl and Agrawal (2008) measured the productivity of skilled migrants using patent citations connected with the flow of inventors and knowledge across borders. They examined the data set compiled by the United States Patent and Trademark Office and looked for identical inventor names with patents registered using addresses in different countries. Countries with a net gain of inventors were labelled ‘importers’ and countries with a net loss of inventors were labelled ‘exporters’. They found, over a 20-year period (1980–2000), a 1.2% frequency of patent citations attributed to immigrant inventors. Countries varied substantially in their inflow and outflow of inventors. Of the 26 countries in their sample, the United States, Japan, Germany and Great Britain accounted for more than half of the inflows of inventors and also more than three-quarters of the outflows of inventors. The United States, with more ‘imported’ inventors than ‘exported’ was classified as a ‘net importer’, while Japan and Germany were ‘net exporters’ and Great Britain showed a balanced level. However, lack of available data to track migration prevented Oettl and Agrawal (2008) from knowing motivations for migration or exactly when migration occurred; thus, they offer conservative conclusions and call for more research about productivity effects of labour migration on a global level. Others have also cited data limitations as the biggest challenge to modelling labour migration patterns and effects (Asis and Piper 2008).

On a local level, a specific analysis of intraregional movement by workers in Swedish labour markets found that higher levels of labour mobility contribute to greater knowledge diffusion, productivity and efficiency (Thulin 2009). Mobility facilitates exposure of workers to other workers and resources and leads to better matches between employees and employers (Thulin 2009). Quality-selective immigration policies have contributed to increased levels of highly skilled migration over the past 20 years, which, in turn, positively affect productivity, according to International Labour Organization (ILO) statistics (Kanbur and Rapoport 2005).

Consequently, many have argued that the optimal immigration level gains from migration outweigh the costs (Bandyopadhyay and Wall 2008, Thulin 2009), and that attracting skilled labour has a positive effect on a country's bottom line (Straubhaar 2000, Spencer 2002). The New Growth Theory (Straubhaar 2000) proffers a positive evaluation of immigration in the context of the host country, based on the contributions of imported human capital (both quantifiable and externalities) outweighing assimilation costs. In Great Britain, Home Office research concluded that migrants contribute 2.5 billion GBP more to the public purse each year than they consume in public services and welfare benefits (Spencer 2002). Groeneveld (2009) advocates the co-governance model, as countries have been shown to benefit using others' resources.

Labour migration in sports entertainment industry

The sports industry offers researchers a unique opportunity to investigate labour market theories, given the availability of individual performance statistics for workers, relatively well-defined metrics of productivity and comparison (win, score) and clear outcomes (Kahn 2000, Munasinghe *et al.* 2001, Moskowitz and Wertheim 2011). In addition, sport represents one of the largest and most globally ubiquitous businesses in the world. Torgler (2009, p. 333) argues that sporting events can be viewed and studied as 'economic (miniature) environments'. Economic concepts such as opportunity costs, prices and property rights are observable in sporting contexts. An advantage of investigating economic theories within sports is that sport offers controlled environments where participants operate under similar rules and conditions and are motivated by general economic principles such as incentives and constraints. Sport provides a wealth of reliable data with low variable errors and where the metrics of productivity are relatively clear (Munasinghe *et al.* 2001, Torgler 2009). Munasinghe *et al.* (2001) argues that, although some might object to sport as a central economic activity, it is, at its core, a human endeavour in the same way that writing software is. While it is not always clear who is 'better' at writing software, sports records are clearer about what 'better' means, how productivity can be compared, and whether records are being broken faster (Munasinghe *et al.* 2001). Kahn (2000) found this to be the case when examining labour migration theories.

Athletes comprise one of the few global labour forces cited by the GCIM (2005). Carter (2011) points out that professional sport is the only industry in which the labour force can be legally bought and sold. National governments, sports leagues and teams seek to ensure their individual best interests in light of the challenges and opportunities that migration of athletes poses (Carter 2011). Athlete migration is analogous to the export of raw materials, because the athletic talent from one country can be utilized by another country (Poli 2006). Professional sports leagues routinely employ an immigrant work force, such as European players in the National Hockey League (NHL), Hispanic and Japanese players in Major League Baseball (MLB) and African players in the English Premier League (EPL) and other European soccer leagues (McCormick 2004, Carter

2011). Many states promote the highly skilled labour migration of athletes in comparison with mass migration of unskilled workers (Carter 2011).

To this end, a body of ‘sport labour migration research’ – a term from the title of a theoretical paper by Maguire (2004) – has been carried out in various international sporting contexts such as soccer, cricket and handball (Stead and Maguire 1998, Poli 2006, Agergaard 2008). In light of the direction of labour migration literature on other sectors, the next step is for these studies to model the productivity effects of player movement (Hewlett 2002). Sport labour migration research has focused on postulating motivations for their migration, such as financial, personal or talent development (Maguire 1996, Magee and Sugden 2002). It has also explored the cultural significance of global sports celebrities such as Michael Jordan and David Beckham (Smart 2005, Carter 2011). However, one of the few exceptions in this area is research in the field of economics that has modelled intra-league migration within MLB, where data on player movement and productivity are readily available (Cymrot and Dunlevy 1987, Cymrot *et al.* 2001). These studies illustrate how migration by ‘free agents’ is motivated by expected earnings gains. However, this research focuses on intra-league (and not international) movement of athletes between teams. The relative availability of archival data in professional baseball makes it easier to track intra-league labour movement (via records of transactions between teams and players) and subsequent productivity metrics (e.g. player statistics), as opposed to obtaining and pairing similar data related to global migration. As for some studies that have attempted to quantify migration in international sport (inter-league as opposed to intra-league), Poli (2006) examined the number of players of African origin competing in European soccer leagues during the 2002–2003 season. Similarly, Agergaard (2008) tallied the number of foreign players in the Danish Women’s Handball League. The above research begins to detail the global labour market of athletes. However, these studies lack a truly global dimension and instead focus on specific countries and regions. Few, if any, sport labour migration studies have attempted to model migration and its effects on productivity on a global level.

Global productivity in the Olympics

Perhaps the most global example of the sports business industry is the Olympics, in which more countries participate than any other athletic venue. The fact that the 2012 Summer Olympics featured competitors from a record 205 countries or territories (a larger collection than the United Nations) makes the Summer Olympics arguably the most global business enterprise in the world. The IOC represents one of the largest and most powerful sport business organizations in the world. The ‘Olympic mystique’ has become highly sought after by countries looking to host the Olympics and cash in on Olympic success, and by corporations and sponsors seeking to partner with the Olympic aura (Barney *et al.* 2002). In the 1970s, Lord Killanin, president of the IOC from 1972 to 1980, recognized that commercial revenue is the ‘glue’ that would maintain and grow the Olympic movement, in contrast to his predecessor’s bemoaning the infusion of commercial motivations into Olympic affairs (Barney *et al.* 2002, p. 275).

Today, many countries devote substantial resources to the pursuit of Olympic medals (or, more precisely, to the previously mentioned corollaries that accompany winning a medal). The importance placed on winning medals has sparked economic studies that have developed production functions and efficiency analyses that show how economic, non-sporting variables, such as population size, GDP per capita and form of government, correlate with medal distribution (Johnson and Ali 2004, Moosa and Smith 2004, Rathke

and Woitek 2008). These studies seek to determine the economic and political determinants that allow some nations to be more productive in terms of medals won than other countries. Johnson and Ali (2004) examined countries' participation and medal totals after World War II in connection with economic and political determinants they believed would be related to participation and productivity: GDP per capita, population size, whether a nation hosts or is in proximity to the site of the Games, political regime and climate. Regression analyses by Johnson and Ali (2004) suggest that larger, high-income nations have an advantage in terms of participation and winning medals. One in three competitors at the 2000 Summer Games and one in two at the 2002 Winter Games came from countries ranked in the top 10% of GDP. Nations hosting or near the site of an Olympics were found to have a competitive advantage. Single-party or communist political systems were more productive than democracies or republics. At each Summer or Winter Games since 1952, there has been an average of 9 to 13 competitors per medal. Less than half of the countries that participate in the Olympics actually win medals. They estimate that each additional medal won is equated with a \$1760 increase in GDP per capita, with additional gold medals estimated at a \$4750 increase in GDP per capita (Johnson and Ali 2004). The variables they use to predict medal counts had a total explanatory power of $R^2 = 0.47$. Rathke and Woitek (2008) also find that GDP and population are related to medals won, but that population is a significant predictor only for relatively rich nations. The emphasis and resources placed on winning Olympic medals seem to contrast with the Olympic creed of modern Olympic founder Baron Pierre de Coubertin,

The most important thing in the Olympic Games is not to win but to take part, just as the most important thing in life is not the triumph, but the struggle. The essential thing is not to have conquered but to have fought well. (Mallon and Buchanan 2006, p. 210)

Milton-Smith (2002) argues that the modern Olympics have always operated as a business and that even the ancient Greek Olympics utilized a professional labour force of athletes. Similar to professional sports leagues that ubiquitously feature an immigrant work force, migration has become a feature of the Olympics as it has in professional sports leagues mentioned earlier.

Although professional sports teams can choose who belongs to their team based on the players they sign, the Olympic 'teams' (i.e. countries) are constructed based on the nationality (as defined by citizenship) of their players. The formation of Olympic teams can produce tensions between the IOC, as the international NGO that unifies the countries that compete in the Olympics and the individual countries, and National Olympic Committees (NOCs) that seek to retain sovereignty over the affairs of their country (Carter 2011). In terms of IOC policy, athletes can represent a country of which they are a citizen; yet, citizenship is ultimately determined by the countries themselves. Prior to 1920, no citizenship requirement existed in the Olympic Charter. Increasingly, citizenship processes are streamlined for athletes from whom a country can benefit from their skills (Thibault 2009). Olympic athletes sometimes compete for countries for which they have no connection prior to obtaining citizenship (Carter 2011). Along with visa programmes favouring other types of highly skilled workers, a selection bias exists towards attracting particularly highly skilled foreign labour (Kanbur and Rapoport 2005).

To illustrate the contradictory nature of IOC policy, on one hand, the Olympic Charter states, 'The Olympic Games are competitions between athletes in individual or team events and not between countries' (IOC, Olympic Charter, Chapter 1, Rule 6, 2007a). On

the other hand, the Olympic Charter mandates, ‘Any competitor in the Olympic Games must be a national of the country of the NOC [National Olympic Committee] which is entering such competitor’ (IOC, Olympic Charter, Chapter 5, Rule 42, 2007b). In light of the former concern, the Olympic Solidarity programme of the Association of National Olympic Committees and the IOC has sought to promote the collective development of sports programmes in all countries. In light of the latter concern, the competitive nature of the Olympics and the medal standings used as a benchmark by countries for evaluating their investment in elite sport funding fragment countries and pit their individual interests against the collective development (van Hilvoorde *et al.* 2010).

In their survey of the Olympics’ effects on citizens’ national pride in the Netherlands, van Hilvoorde *et al.* (2010) suggested (but did not measure) that the externality of Olympic medals won by athletes of foreign origin contributes to the medal totals of the immigrants’ new countries. The immigrant country benefits in the medal tables, while the emigrant medal winner’s country of origin cannot effectively take advantage of the recognition that accompanies that Olympic success. Medal studies have yet to look at whether external human capital in the form of migration levels (in other words, the input of foreign labour) is related to medal productivity.

The favouring of foreign labour in the Olympics parallels trends in other sectors of industry, such as in medicine, academics and technology (Straubhaar 2000). On one hand, countries can import talent to achieve a competitive advantage. On the other hand, domestic development becomes affected with less of an incentive to train native talent. For instance, this has led to a debate about migration policy for Table Tennis Canada in response to Canada and many other country’s fast-tracking Chinese table tennis players for citizenship to compete for a new country in Olympic and major international competition (Shimo 2008). After initially engaging in the importation of Chinese table tennis talent at the expense of indigenous talent, Canada’s governing body for table tennis favoured eligibility restrictions in order to foster domestic sport development. The International Table Tennis Federation intervened in 2008 and ruled that adults over the age of 21 could not change citizenship and compete for a new country in certain international competitions (Shimo 2008). Unlike the other global market professions cited by the GCIM in 2005 (information technology specialists, senior academics, health professionals and teachers), who can have longer careers and more opportunities for productivity and job security, Olympic athletes have a relatively small window of opportunity with the chance for Olympic success occurring only once every 4 years. The fact that birthplaces and migration data on Olympic athletes are not readily available hints at the challenges of tracking a phenomenon that has become an important issue for the Olympics in the twenty-first century. Asis and Piper (2008) note that limitations in the availability of data often confront labour migration researchers; yet, it is a vital tool for formulating a sound labour migration policy and for evaluating the ramifications of migration policy and advocacy issues (which begs the question as to why a powerful NGO, such as the IOC, does not maintain these records).

Research questions

Based on the preceding review of the literature, the current research investigates migration by a highly skilled labour force (elite athletes), which has been argued to be afforded the greatest degree of worldwide mobility as a function of their very unique talents (GCIM 2005). Similar to Oetl and Agrawal (2008), archival data are employed to trace the capital mobility of a particular skill across borders and related effects on productivity. Given the

availability of individual performance records kept in the sports entertainment industry and how they can be used to develop and test economic models and theories because of well-defined measures of productivity and comparison (Kahn 2000, Munasinghe *et al.* 2001, Torgler 2009, Moskowitz and Wertheim 2011), this business context presents a unique research opportunity to examine labour migration from a more global perspective, as called for by Asis and Piper (2008). Like Johnson and Ali (2004) and Moosa and Smith (2004), a non-sporting, economic variable's effect on productivity is analysed within the Olympic context.

This study assesses productivity changes and competitive advantages associated with foreign-born labour in a highly competitive, multi-billion dollar global enterprise, given the efforts by many countries to attract such talent to reap the ancillary benefits of their productivity (Johnson and Ali 2004, Rathke and Woitek 2008).

Research Question 1: Which regions of the world have experienced the greatest inflow of foreign-born Olympic medal winners since 2000?

Research Question 2: Which regions of the world have experienced the greatest outflow of foreign-born Olympic medal winners since 2000?

Research Question 3: In light of the world's international migrant population of 2.9% (GCIM 2005), what is the total size of the immigrant medal-winning athlete labour force in the Summer Olympics in: (1) 2000; (2) 2004; (3) 2008; and (4) 2012?

Research Question 4: What are the global productivity effects (Olympic medals) of highly skilled foreign-born labour (non-native Olympic athletes) in the Summer Olympics in: (1) 2000; (2) 2004; (3) 2008; and (4) 2012?

Research Question 5: After controlling for other variables that have been shown to be related to medal productivity for countries in the Olympics (e.g. population, GDP per capita), what role does labour migration play in: (a) 2000; (b) 2004; (c) 2008; and (d) 2012?

Answers to these questions will add to the academic literature on highly skilled labour migration phenomena and on medal productivity. The current study also has important applied implications, as this is the first work to quantify labour migration effects that are relevant to the world's largest sport-business organization (IOC), thereby addressing policy-related concerns raised by its president. As such, the study examines the issues of citizenship, immigration and assimilation that are relevant to arguably the most influential global sport federation, its constituencies (NOCs), other international and national sport federations, and national governmental policies for individual countries around the world.

Method

Data source

In order to assess the global productivity effects of a highly skilled migrating labour force in the twenty-first century, the sample chosen was from the Summer Games in 2000, 2004, 2008 and 2012. Each twenty-first century Summer Olympics has included more than 10,000 participants from at least 200 countries or territories. They are larger in scope and more global than the Winter Olympics, which included approximately 2500 competitors from 80 countries or territories in the 2002, 2006 and 2010 Games. Approximately 1800 athletes from 80 countries won medals (as individuals or as part of teams) at each of

the past four Summer Games. However, no single database provides readily available information that accounts for any migration that has occurred by these competitors. A new database was constructed because the IOC does not keep track of athletes' birthplaces. Given the need to examine each athlete individually and the desire to assess immigrant athlete productivity, this research focused on which medal winners were born in countries different from the one for which they competed.

Sample construction

The current study used athletes' countries of birth and countries for which they medal to measure migration effects in the Olympics. There are several ways to define athletes' nationalities. By the IOC's definition in its Olympic Charter, the countries for which athletes compete and medal represent the countries for which they are citizens and thus define their nationality (regardless of whether those athletes have any other connection with those countries). To assess whether migration has occurred to country of competition, an athlete's country of birth represents an initial (at least physical) assessment of from where that athlete came. Carter (2011) calls classifying citizenship a 'thorny issue.' Citizenship is the connection an individual has with a sovereign body, and there are often clashing issues of who is sovereign in the Olympics – the governing body, the states or the athletes themselves. Some determine citizenship based on birthplace (*jus soli*), others on ancestry (*jus sanguinis*) (Carter 2011). These metrics are initial starting points for determining the possible scope of migration in the Olympics.

In order to construct a data set of immigrant medal-winning Olympians, each country's medal-winning athletes were examined individually. In 2000, 1785 athletes from 80 countries won medals (either as individuals or as part of a team). In 2004, 1840 athletes from 76 countries medalled. In 2008, there were 1874 medallists from 87 countries. In 2012, 1770 medallists represented 85 countries.¹ Medals won by athletes born in the country they represented were classified as 'native medals'. Medals won by athletes born in a different country than the one for whom they competed were coded as 'non-native medals'. Similar to Oettl and Agrawal (2008), countries with a gain of Olympic medal winners were labelled as 'importers', and countries with a loss of medal winners were labelled as 'exporters'. Both inventors and athletes are among the few truly global labour forces cited by the GCIM (2005). Both are highly skilled. However, no citizenship requirement exists for immigrant inventors to be productive in their new country, as is the case in the Olympics. Olympic athletes also have relatively shorter careers, given the physical demands of competing in elite sports.

The IOC does not keep track of athletes' birthplaces in its official records.² Instead, the IOC notes that each NOC is responsible for keeping track of its athletes' birthplaces. Consequently, without contacting each individual NOC, no single 'official' source exists listing the birthplace of *all* Olympic athletes, and there is no comprehensive way of tracking the athletes that win individual or team medals for a country different from the one in which they were born. Instead, this study utilized what Johnson and Ali (2004) characterize as 'secondary sources', as opposed to official sources of the IOC. Data limitations have often been cited as challenges to ascertaining global productivity effects in labour migration studies (Asis and Piper 2008). Constructing a data set of non-native medal winners required searching individually through the 7269 medallists at the 2000, 2004, 2008 and 2012 Games. The independent Olympic database website, www.sports-reference.com/olympics, included

a list of all medallists with links to biographical information where most of the athletes' birthplaces for this study were obtained. If no birthplace was listed, the medal tables on websites of the individual organizing committees (www.athens2004.com, www.beijing2008.cn and www.london2012.com) sometimes provided biographical information for medal winners that included birthplaces as provided by NOCs. When the above sources were incomplete, individual NOC websites were consulted, along with media reports about specific athletes. However, NOCs do not make information about athlete origin readily available to be analysed. A small number of athletes' birthplaces could not be obtained.³ These medals were treated as 'native' medals, following Oetl and Agrawal's (2008) conservative approach of only accounting for immigrant productivity that could be verified. Although this introduces the risk of type II errors (meaning some immigrant medals may have been missed),⁴ the sample serves as a conservative estimate of productivity of foreign-born medal winners. Nevertheless, the percentage of these medals was small and is not expected to bias the results.

Oetl and Agrawal (2008) determined patent citations attributed to immigrant inventors using the data set compiled by the United States Patent and Trademark Office. They pointed out the possibility of making endogenous interpretations that labour mobility directly accounts for productivity effects. This is because available data could not account for dates or motivations of migration. In addition to the absence of a single database with the necessary information to track migration of Olympic athletes, no data set offers information on when an athlete's move occurred from country of birth to country represented in the Olympics (with the exception of a handful of anecdotal media reports). Unlike the economic studies of intra-league migration in baseball, where leagues can offer a wealth of uniform data to examine, similar databases that would allow one to measure the reason and timing for moves do not exist in this sports industry context. The reason, timing and nature of an athlete's move affect the big picture of modelling labour migration and quantifying migration patterns. With voluntary migration being a selective process (Kanbur and Rapoport 2005), there are a variety of motivations that draw migrant Olympians away from their country of birth to another country, whether the attraction is financial or personal or related directly to a country's athletic recruiting or indirectly to a country's attractiveness for immigrants in general. The destination country features an appeal that the country of origin did not possess. Given that the athlete's new country could attract such raw talent, they ultimately benefited, while the original country did or could not. Consequently, it could be argued that, in an exploratory first study, any measurement other than birthplace will introduce some degree of academic subjectivity. When athletes develop their talent can also be a subjective rationale. In addition, the IOC does not distinguish among motivations for migration in the Olympic Charter and treats all immigrants and dual nationals the same, regardless of motivation (IOC, Olympic Charter, Chapter 5, Rule 42, 2007b). These results are interpreted as a conservative starting point for estimating the global migration of highly skilled athletes.

Unit of analysis

After examining each medal winner from the 2000, 2004, 2008 and 2012 Summer Olympics, the total number of non-native medallists represented the size of the migrating labour force, and the total number of medals they won accounted for their productivity (Poli 2006, Agergaard 2008). The economic studies that predicted Olympic medal totals considered variables such as population size, GDP per capita, whether a nation hosts or is in proximity to the site of the Games, political regime and climate (Johnson and Ali

2004). These economic and demographic variables were also controlled for in this study. In hierarchical regression analyses designed to test the role labour migration plays in the Olympics, a first model for each year followed Johnson and Ali's (2004) model for ascertaining demographic and economic variables that are related to medal productivity. Economic statistics were obtained from the World Bank, except in the case of Chinese Taipei, which is not recognized by the World Bank.⁵ No valid GDP per capita figures could be found for North Korea. Political systems were ascertained according to the classification by the United States Central Intelligence Agency. Whether a country was a neighbour of the Olympic host country was determined if it was in the same United Nations Statistics Division geographical subregion. While Johnson and Ali (2004) accounted for a country's climate, they were motivated to do so by the Winter Olympics (where naturally colder regions might have a competitive advantage) but not by the Summer Olympics. They included climate in their Summer Olympic analyses for consistency, but considered the variable not worthy of incorporating into conclusions about the Summer Games. Then, in the second level of the regression analyses in this study, classifying whether a country is an 'importer' allowed for assessment of labour migration's contribution to countries' medal totals in regression analyses after controlling for other variables that have been shown to be related to medal productivity (Johnson and Ali 2004, Oettl and Agrawal 2008).

Results

Migration patterns by continent

Looking first at migration patterns, Tables 1–4 show the movement of immigrant medal-winning athletes by continent at each Olympic Games since 2000 and help answer Research Questions 1 and 2 about how countries in certain regions have experienced inflows and outflows of Olympic medal-winning athletes. Countries are classified by continent, according to the United Nations Statistics Division. Regions vary considerably in both their inflow and outflow of immigrant medal winners. European countries account as a destination for most of the athletes born in a different country, and many medal-winning athletes migrated inter-continentially within Europe. (Migration between countries within the same continent is shown in bold in Tables 1–4.)

Table 1. The international migration of medal-winning athletes by continent, 2000.

2000 Origin continent	Destination continent						Total
	Africa	Asia	Europe	Northern America	Oceania	Latin America and the Caribbean	
Africa	1	0	4	1	3	0	9
Asia	0	4	15	0	2	0	21
Europe	0	4	40	10	5	1	60
Northern America	0	0	4	0	0	0	4
Oceania	0	0	0	0	4	0	4
Latin America and the Caribbean	0	0	0	0	1	1	2
TOTAL	1	8	63	11	15	2	100

Table 2. The international migration of medal-winning athletes by continent, 2004.

Origin continent	Destination continent						Total
	Africa	Asia	Europe	Northern America	Oceania	Latin America and the Caribbean	
Africa	0	0	7	0	2	0	9
Asia	0	7	24	0	1	0	32
Europe	0	5	47	5	3	2	62
Northern America	0	0	0	1	1	1	3
Oceania	0	0	2	0	1	0	3
Latin America and the Caribbean	0	0	2	5	0	0	7
TOTAL	0	12	82	11	8	3	116

Table 3. The international migration of medal-winning athletes by continent, 2008.

Origin continent	Destination continent						Total
	Africa	Asia	Europe	Northern America	Oceania	Latin America and the Caribbean	
Africa	0	2	6	0	4	0	12
Asia	1	7	11	0	0	0	19
Europe	1	7	30	7	3	0	48
Northern America	0	0	5	1	0	0	6
Oceania	0	0	0	0	1	0	1
Latin America and the Caribbean	0	1	2	3	0	0	6
TOTAL	2	17	54	11	8	0	92

Table 4. The international migration of medal-winning athletes by continent, 2012.

Origin continent	Destination continent						Total
	Africa	Asia	Europe	Northern America	Oceania	Latin America and the Caribbean	
Africa	1	1	10	0	2	0	14
Asia	0	6	15	0	0	0	21
Europe	0	12	38	5	4	0	59
Northern America	0	0	5	6	0	3	14
Oceania	0	0	1	0	1	0	2
Latin America and the Caribbean	0	0	4	5	0	1	10
TOTAL	1	19	73	16	7	4	120

Global productivity effects

In order to answer Research Question 3 about the global level of migration of Olympic medal winners, Table 5 shows the overall size of the foreign-born Olympic medal-winning labour force along with the percentage of total medal winners for which they accounted. In 2000, 100 athletes won individual medals or were on a medal-winning team for a country different from the one in which they were born. There were 115 such athletes in 2004, 92 in 2008 and 120 in 2012. Foreign-born athletes have won medals in more than 75% of the Olympic sports (at least 26 different ones) at each Summer Olympics since 2000. The most frequent sports that featured non-native medallists are individual sports that offer several events, and consequently opportunities, to medal, such as athletics, swimming and weightlifting. These sports are also relatively accessible worldwide with low equipment, facilities or climate requirements.

When comparing the percentage of immigrant medal winners with the general world's migrant population of 2.9% (GCIM 2005), results of binomial tests for 2000, 2004, 2008 and 2012 (shown in Table 5) indicate that the percentage of medal winners who are immigrants is statistically significantly higher than the percentage of the world's international migrant population: (1) 2000 ($z = 6.73, p < 0.001$); (2) 2004 ($z = 8.63, p < 0.001$); (3) 2008 ($z = 5.12, p < 0.001$); and (4) 2012 ($z = 9.73, p < 0.001$).

To answer Research Question 4 about the global productivity effects (Olympic medals) of highly skilled foreign-born labour (non-native Olympic athletes) in the twenty-first century, Table 6 indicates that for each of the past four Summer Games, approximately 100 medals (one out of every 10) were won either by athletes competing for a country different from the one in which they were born or by teams that included athletes born in a different country. Note that in some cases, single athletes won multiple medals, while in other cases, multiple athletes competed on the same team to win a single

Table 5. Immigrant medal-winning athlete labour force in the Olympics.

Year	Total medal-winning athletes	Immigrant medal-winning athletes	Per cent
2000	1785	100	5.6 ^a
2004	1840	116	6.3 ^a
2008	1874	92	4.9 ^a
2012	1770	120	6.8 ^a

Note: ^aDenotes proportions that are statistically significantly ($p < 0.001$) different from the world's international migrant population of 2.9% (GCIM 2005).

Table 6. The productivity effects of immigrant Olympic medal winners.

Year	Total medals	Immigrant medals	Per cent
2000	927	98	10.6 ^a
2004	929	103	11.1 ^a
2008	958	91	9.5 ^a
2012	962	103	10.7 ^a

Note: ^aDenotes proportions that are statistically significantly ($p < 0.001$) different from the frequency of patent citations attributed to immigrant inventors of 1.2% (Oettl and Agrawal 2008).

medal. Table 6 also shows the proportion of total medals that were products of labour migration (approximately 10% for each Summer Games since 2000).

Rather than comparing this proportion to 0 and assuming no foreign-born productivity to the contrary, the one other study that measured skilled labour productivity – the 1.2% of patent citations attributed to immigrant inventors (Oetl and Agrawal 2008) – is called upon as a measure of comparison. Results of binomial tests for 2000, 2004, 2008 and 2012 (shown in Table 6) indicate that the percentage of medals won by non-native Olympic athletes is statistically significantly higher: (1) 2000 ($z = 26.06, p < 0.001$); (2) 2004 ($z = 27.53, p < 0.001$); (3) 2008 ($z = 23.44, p < 0.001$); and (4) 2012 ($z = 27.08, p < 0.001$). By mathematical extension, one could actually assume that the rate of foreign-born productivity could be as high as 8.0% and still find that the proportion of non-native medals is statistically significantly higher ($p < 0.05$) for each of the past four Summer Olympics.

Labour migration's impact on total medals

A model is offered for ascertaining labour migration's impact on medal totals to help address Research Question 5 about labour migration's relationship with total medals won in light of other variables that have been shown to be related to medal productivity. Table 7 shows hierarchical linear regressions of medal-winning countries for 2000 ($N = 78$), 2004 ($N = 72$), 2008 ($N = 85$) and 2012 ($N = 83$). In the first model, the 'traditional' predictors of total medals are also related to total medals won by countries in 2000, 2004, 2008 and 2012. In particular, the oft-cited variables of population and GDP per capita are related to productivity for countries that medalled.

The second level of the linear regressions for medal totals for 2000, 2004, 2008 and 2012 incorporates a labour migration variable classifying whether a medal-winning nation was an 'importer' for that particular year (Oetl and Agrawal 2008). The binary variable accounts for whether a medal-winning country won medals with immigrant talent or whether it did not. Medal-winning countries also involved in labour migration show statistically significant beta values positively related to total number of medals (Table 7). Medal-winning nations that featured productivity from a foreign-born labour force won an average of 12.02 more medals in 2000, an average of 14.71 more medals in 2004, an average of 12.61 more medals in 2008, and an average of 10.02 more medals in 2012 than countries whose medals were won exclusively by native-born athletes: (1) 2000 ($b = 12.02, t(78) = 3.22, p = 0.002$); (2) 2004 ($b = 14.71, t(72) = 3.43, p = 0.001$); (3) 2008 ($b = 12.61, t(85) = 3.51, p = 0.001$); (4) 2012 ($b = 10.02, t(83) = 2.93, p = 0.004$). The beta-value of the labour migration variable is comparable to the population variable as one of the highest explanatory variables in the models (Table 7). Adding the labour migration variable also adds statistically significant R^2 explanatory power to the models (Table 7). The value of total R^2 is 0.38 for the 2000 medal analysis model, 0.34 for 2004, 0.46 for 2008, and 0.45 for 2012.

When including the variable that accounts for labour migration, GDP is no longer a statistically significant explanatory variable for 2000, 2004 and 2008. However a post hoc logistic regression tests whether the probability of a medal-winning country's also being an 'importer' is related to the economic variables found in the medal literature. This post hoc logistic regression shows that the probability of a medal-winning country's also being an 'importer' is slightly increased at a statistically significant level by increased GDP per capita for these years. Logistic regressions for 2000, 2004 and 2008 used the dichotomous labour migration variable as the dependent variable and the economic and demographic variables for predicting medals as independent variables. GDP per capita was the only statistically significant predictor: 2000 ($b = 0.06, Wald = 6.08, p = 0.01$); 2004 ($b = 0.04, Wald = 5.87,$

Table 7. Productivity effects of medal-winning countries by year.

Variable	2000		(N = 78)		2004		(N = 72)		2008		(N = 85)		2012		(N = 83)	
	Model 1 β	Model 2 β														
Population (millions)	0.33***	0.33***	0.37**	0.39**	0.29*	0.29**	0.29*	0.29**	0.44***	0.46***	0.44***	0.46***	0.44***	0.46***	0.44***	0.46***
GDP per capita (thousands)	0.28**	0.18	0.31**	0.20	0.29**	0.29**	0.17	0.26*	0.33**	0.26*	0.33**	0.26*	0.33**	0.26*	0.33**	0.26*
Republic/Democracy	(omitted)															
Monarchy	-0.13	-0.11	(no cases)	(no cases)	-0.06	(no cases)	-0.09	(no cases)	-0.18	(no cases)						
Single-party	0.12	0.12	0.04	0.00	0.11	0.00	0.07	0.10	0.09	0.10	0.09	0.10	0.09	0.10	0.09	0.10
Military	(no cases)	(no cases)	(no cases)	(no cases)	-0.02	(no cases)	-0.01	(no cases)								
Other political system	-0.04	-0.05	-0.07	-0.06	-0.02	-0.06	-0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Host nation	0.27**	0.23*	0.01	-0.04	0.27	-0.04	0.31*	0.25**	0.27**	0.25**	0.27**	0.25**	0.27**	0.25**	0.27**	0.25**
Neighbour nation	-0.04	-0.01	-0.02	-0.12	0.07	-0.12	0.05	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18
Labour migration		0.32**		0.38***		0.38***		0.32***		0.32***		0.32***		0.32***		0.26**
Total R^2	0.29	0.38	0.22	0.34	0.37	0.34	0.46	0.45	0.39	0.45	0.39	0.45	0.39	0.45	0.39	0.45
Change in R^2		0.09**		0.12***		0.12***		0.09***		0.09***		0.09***		0.09***		0.06**

Notes: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Model 1: replication of other studies predicting medal totals (Johnson and Ali 2004, Rathke and Woitek 2008). Model 2: add 'Labour Migration' variable classifying whether a medal-winning nation is an 'Importer' (Oetli and Agrawal 2008). Bold variables indicate significant variables.

$p = 0.02$); 2008 ($b = 0.04$, Wald = 8.70, $p = 0.003$). This suggests a possible mediating effect, whereby GDP per capita relates to labour migration, and labour migration relates to medals won.

Implications, limitations and future directions

The current study examined the global productivity effects resulting from highly skilled labour migration in the context of immigrant medal winners at the Summer Olympics since 2000. The sports entertainment industry provides a unique venue to respond to calls to study labour migration on a global level because athletes represent a globally ubiquitous and a particularly mobile labour force (GCIM 2005). The sports industry also presents a unique context in which to develop and investigate economic theories and models given the relative availability of performance statistics, clear metrics and controlled environments (Kahn 2000, Munasinghe *et al.* 2001, Torgler 2009, Moskowitz and Wertheim 2011). This research is the first to show labour migration's presence and influence in one of the world's largest sports business venues.

Scholarly implications

Highly skilled labour migration productivity

Similar to how Oettl and Agrawal (2008) modelled knowledge flows, the findings in this study begin to quantify 'brawn drains', 'brawn gains' and 'brawn exchanges' (Wharton 2004). Most previous studies on labour migration in the sports entertainment industry have not been able to model migration patterns or productivity. Tables 1–4 show how some continents experience a net gain of immigrant medal winners, while others experience a net loss. When comparing the total frequency of Summer Olympic immigrant medal winners (see Table 5) with the world's international migrant population of 2.9% in 2005 (GCIM 2005), the binomial test results indicate that non-native medal winners occurred at a statistically significantly higher rate at the 2000, 2004, 2008 and 2012 Summer Olympics. The migrating labour force of athletes in the current study is shown to be higher than the overall percentage of international migrants. The greater frequency of this particular form of highly skilled labour migration seems to be in line with what would be expected from the immigration policies and visa programmes in many countries that favour skilled labour migration (Kanbur and Rapoport 2005, Taylor 2005).

This study then determines that the productivity related to athletic talent flows across borders at each of the past four Summer Olympics has resulted in approximately 100 medals (one out of every 10) won either by athletes competing for a country different from the one in which they were born or by teams that included athletes born in a different country (see Table 6). These findings begin to elucidate on a global level the notion that van Hilvoorde *et al.* (2010) put forth, that Olympic medals won by athletes of foreign origin contribute to the effects of the medal totals of the immigrants' new countries. Through athlete labour migration, an Olympic medal awarded to one country can be the result of what Poli (2006) argues is analogous to the by-product of raw materials of another country. In this way, one country achieves a competitive advantage based on another's resources. However, in this case, the country of origin generally receives no consideration (monetary or symbolic) for its native talent. Immigrant Olympians are shown to be highly productive if compared to the 1.2% of patent citations attributed to

immigrant inventors (Oettl and Agrawal 2008). Yet, more research is needed in order to be able to evaluate productivity effects across different industry sectors definitively.

Hence, this study has found preliminary evidence of talent flows and resultant productivity caused by labour mobility in one of the largest and most global sports business venues, the Summer Olympics. Similar to the example of the Nigerian computer engineer working in Sweden, illustrated by Doyle (2004), results suggest that Olympic athletes, in the twenty-first century, can be productive for a country different from the one in which they are born. As such, the Olympic athlete labour force can serve as a platform to analyse other skilled migrating labour forces, such as academics, technology specialists and doctors, in the same way that sport lends itself to modelling other economic phenomena (Kahn 2000, Munasinghe *et al.* 2001).

Migration's impact on medal totals

After controlling for other variables that have been found to be related to medal productivity for countries in the Olympics, countries that featured non-native medal winners won more medals on average in 2000, 2004, 2008 and 2012 than countries whose medals were won exclusively by native-born athletes (see Table 7), hence showing labour migration's potential impact on overall productivity. This study first replicated the major findings of existing medal literature, the relationship between medal totals and population and GDP per capita (Johnson and Ali 2004, Rathke and Woitek 2008). While other medal studies have looked at country's internal characteristics such as population, GDP, and government type, results here suggest how the medal literature could be extended to account for the contribution of external human capital in the form of labour migration. Operationalized as it was here, labour migration had an effect comparable to population size. Labour migration also mediated the effect of GDP per capita. Countries with higher GDP levels displayed greater probability of attracting productive foreign talent, in line with how in other business venues richer countries are considered to be more attractive to highly skilled labour (GCIM 2005).

Applied implications

Policy implications

This study represents the first-known work to investigate labour migration patterns and productivity in the context of the Summer Olympics. Assessing labour migration's contribution in the Summer Games can begin to inform rational policy-making for the world's largest sports organization, the IOC, whose president has raised concerns about the presence of labour migration in the Olympics. The results suggest that if the IOC is truly interested in understanding and regulating labour migration in the Olympics, the organization should collect data to track the phenomenon and measure its effects. At a minimum, collecting data for athletes relating to their birthplaces would allow the IOC to trace basic labour migration patterns and totals. Tracking when athletes migrate and their motivations for migration would further allow the IOC to assess whether athletes winning a medal for a country different from the one in which they were born migrated as fully developed talent or whether they developed their talent in their new country. However, the IOC does not do this, and its policy to deal with labour migration has often proved ineffective. On the contrary, the IOC has benefited from labour migration's presence in the Games in terms of the compelling competition these athletes provide. The difference between the rhetoric and actions of the IOC calls into question the organization's true stance on labour migration. Other

professional sports leagues such as NHL hockey and NBA basketball in North America have openly embraced and promoted their foreign-born workforce. However, perhaps because the Olympics are still divided along national lines, the IOC has struggled to balance the multinational composition of the teams that compete and the fact that the teams and athletes still represent a single national identity in competition. While a return to the IOC policy prior to 1920 when no citizenship requirement existed in the Olympic Charter would likely not address this tension, perhaps the Olympic Charter could be updated to embrace the multinational composition of the teams that compete. Similar to how boxing announcers will introduce a world champion as ‘fighting out of Miami, Florida, by way of Port-au-Prince, Haiti’, the Olympics’ promotion of from where athletes came (possibly using birthplace as a first attempt at acknowledgement of origin) in addition to for whom they currently compete would share the credit of who wins medals.

Without cooperation, labour migration brings out competing interests among labour forces that seek to maximize benefits and capitalize on their talent, international organizations that generally attempt to regulate migration, and national policy that often aims to attract optimal talent (Donaghey and Teague 2006, Groeneveld 2009). The IOC, as an international NGO, clashes with national governments and national NGOs, in the form of NOCs, with regard to immigration policy and defining citizenship criteria. Athletes try to navigate the regulations to seek the best personal and athletic opportunities. The competing interests are counter to the co-governance model advocated by Groeneveld (2009). Rules for many European soccer leagues limited the number of foreign players that teams could sign before the Bosman ruling established the European Union policy in 1995 that citizens of one European Union country did not require a visa to work in another European Union country (Carter 2011). European athletes can move freely within the European Union, regardless of whether they are citizens of the country in which they desire to play (McCormick 2004). Hence, at least within the European Union, the policy of free movement of workers mirrors the goals teams and players have of creating the best fit. This is not the case in the Olympics, where the IOC has citizenship requirements in place, but countries looking to attract optimal talent can circumvent them with policies that fast-track citizenship for elite athletes (McCormick 2004).

Results suggest that countries with higher GDP levels displayed greater probability of attracting these desired elite athletes. The immigration of a country’s most talented athletes represents a challenge to the goals of collective sport development in all countries promoted by the Olympic Solidarity programme. While Olympic Solidarity currently focuses on sport development, partnering with other NGOs that focus on country development could enable Olympic Solidarity to better achieve its mission. For instance, the creation of a school that complements the creation of a sports academy could affect the overall growth of a country in a way that enables the country to keep its best athletic talent. This would allow sport in that country to grow more, since it has a better chance of retaining and utilizing its best athletic talent rather than seeing it leave to another country. The Olympics illustrate some of the policy, cultural and social consequences, and tensions of migration, which are less explored in migration literature (Asis and Piper 2008).

Olympic medal productivity

The positive contribution labour migration has made in the Summer Games since 2000 has the potential to be influential as countries invest millions of dollars in Olympic success. In the context of labour migration in general, Straubhaar (2000, p. 17) poses an interesting question in relation to a country’s health care:

As far as human capital accumulation generates some positive spillover effects for an economy, a strategic decision has to be taken by the policy makers: Should they produce their brain gains by themselves and invest in the accumulation of human capital by publicly subsidized schooling and research activities? Or should an economy 'free ride' and 'import' human capital that has been produced outside the country (and that has been financed by others!)?

In the specific context of the Summer Olympics, is it possible to 'buy' Olympic success in the same way that professional teams can purchase the best talent as opposed to developing the talent on their own (like the New York Yankees' signing other teams' best pitchers rather than developing players within their own minor league farm system)? In other words, do immigrant medal winners have a significant effect on the overall success that also includes the 90% of native (non-immigrant) medal winners? Could the Summer Olympics become a *de facto* professional sports league (an extension of the professionalization qualities Milton-Smith [2002] argues the Olympics already exhibit) with countries playing the role of teams? There seems to be some momentum in this direction. However, it is important to note that for a country to increase its Summer Olympic medal total, it is not sufficient to simply import any athletes from other countries, but rather it must import athletes of a calibre who can actually win a medal. Similarly, when Straubhaar (2000) poses his question regarding countries seeking to improve their medical care, it is not sufficient to import any medical student but rather doctors who have the ability to affect a country's medical practices. The importation must result in productivity for the new country to benefit (Spencer 2002). Obviously, many factors go into a country's medal total, but nonetheless, a relationship seems to exist in the twenty-first century between 'importing' Olympic success and increasing overall medal totals.

Nations have been able to take advantage of the various motivations of migration that draw immigrant Olympians away from their country of birth to another country. Whether the destination country offers money in exchange for athletic success, better athletic training, more opportunities to compete or the chance to create a better life outside of sports, the destination country features an appeal that the country of origin did not possess. Given that the athlete's new country could attract such talent, they ultimately benefited, while the original country did or could not. Many countries have policies in place to attract elite athletes to their country (similar to attracting other highly skilled professions), and nations devote substantial resources to training athletes and pursuing Olympic success. Results here suggest that all motivations of migration should be considered, not just those related to direct recruitment of athletes, when analysing the productivity effects of labour migration.

However, despite the benefits 'brawn gains' have had for some countries' medal productivity in the Olympics, the practice of featuring non-native medal winners could lead to a reliance on foreign talent, as is the case in other business sectors, such as academics, medicine and technology. This may not be conducive to long-term growth of a country's Olympic sports infrastructure, as was the case with Table Tennis Canada, where the majority of table tennis players representing Canada in major competitions were born in China (Shimo 2008). Many major international table tennis competitions became competitions among Chinese table tennis players competing for different countries. In response, Table Tennis Canada chose to self-regulate to foster domestic development of the sport.

Limitations and future directions

The current study has attempted to measure the global productivity effects of highly skilled labour migration by examining one of the few truly global labour forces (athletes) within the context of possibly the most international sports industry venue (the Summer Olympics). However, the nature of the data must be considered when attempting to draw firm conclusions about labour migration in this context. In terms of method, given certain data limitations, which is often the case in labour migration studies (Donaghey and Teague 2006, Asis and Piper 2008), this research has offered a preliminary and conservative metric (country of birth) to better understand the worldwide effects of labour migration on productivity in the sport industry. There are additional determinants of nationality that could be considered while assessing changes of nationality and immigration patterns. In terms of assessing productivity, like Oettl and Agrawal's (2008) measure for the output of migrants in the context of patent citations, one assumes an interconnected relationship between labour migration and subsequent productivity because of the lack of data to account for timing and motivations of migration. That is, these results are interpreted as deriving from a causal relationship, whereby labour flows directly account for productivity gains and losses. Oettl and Agrawal (2008) were similarly unable to account for migration timing and motivations. An athlete's new country does play a role in training the athlete to win a medal, although the immigrant athlete still embodies what Poli (2006) analogizes as the raw material of the original country. The reason, timing and nature of an athlete's move affect the big picture of modelling labour migration. A variety of motivations can draw migrant Olympians away from their country of birth to another country, and timing affects whether a destination country 'imported' productive talent or raw talent that developed in the new country. Yet, even the attraction of raw talent benefits the new country in a way from which the original country did or could not benefit. Assessing when athletes develop their talent can also be a subjective exercise. The IOC does not consider the timing of migration or distinguish among motivations for migration in the Olympic Charter. The IOC treats all immigrants and dual nationals the same (IOC, Olympic Charter, Chapter 5, Rule 42, 2007b). Also in terms of policy, given that the IOC does not track this data for the Olympics and that a data set had to be collected and constructed, country of birth serves as a base starting point for scholarship in this area. This study needed to utilize 'secondary sources' (Johnson and Ali 2004) as opposed to being able to rely exclusively on official IOC sources, as some other studies that have examined medal totals were able to (Johnson and Ali 2004, Shibli *et al.* 2008).

Yet, the initial findings that labour migration has an effect on productivity in this context begin to provide an empirical understanding for what academics (van Hilvoorde *et al.* 2010) and the IOC have put forward as an issue but have yet to quantify to date. Migrating athletes have become an influential labour force in the Summer Olympics, and labour mobility has become a key contributor to countries' productivity. Future studies should seek to develop a data set that accounts for timing and distinguishes motivations for migration when assessing labour migration's effects on productivity. This would require cooperation among scholars, the IOC, NOCs and athletes across many different countries. Future evaluations could delve beyond assessing the affect of the mere presence of migration (operationalized as it was in this preliminary study) and assess different proportionalities of reliance on foreign-born talent. Future analyses could extend to other Olympic years to provide historical perspective of highly skilled labour migration productivity effects. Research could also study migration patterns among all Olympics athletes (not just medal winners), although at the moment, this will require examining more than 10,000 athletes from each Games individually. Other sports

industry venues could be considered as well in order to achieve a broader understanding of labour migration's influence on the sports entertainment industry and one of the most globally ubiquitous cultural and business institutions. Some work has been done in this area in American professional baseball. Yet, few sports industry venues are truly global in terms of productivity. Professional leagues generally fit within a national/regional framework (e.g. NHL in North America, La Liga soccer in Spain) as opposed to global world cup competitions in soccer and rugby.

Labour migration has strong effects on productivity in global venues both inside and outside of sport. Contemporary global financial, technological, social and cultural inter-connectivity has allowed workers to access and influence opportunities and resources beyond their borders (Doyle 2004, Kanbur and Rapoport 2005). More people now live outside their country of birth than at any time in history, and can have significant and measurable effects and influence on productivity in their new country.

Notes

1. The total number of medals and medallists were considered immediately after the conclusion of each Olympics. Consequently, they do not reflect subsequent, albeit rare, decisions by the IOC to strip a medal from an athlete or country for doping.
2. Personal E-Mails to IOC Information Centre. 29 October 2008 & 18 August 2010.
3. Out of the 927 total medals in 2000, 30 could not be classified as 'immigrant' or 'native'. Out of 929 total medals in 2004, 11 could not be classified as 'immigrant' or 'native'. Out of 958 total medals in 2008, 19 could not be classified as 'immigrant' or 'native'. Consulting multiple databases did lead to the classification of all 962 medals in 2012.
4. This study has corrected an error in logic in Oettl and Agrawal (2008), who labelled such instances of not recognizing immigrant labour as type I errors.
5. Population and GDP figures were culled for the year the Olympics took place, except 2011 figures were used in 2012 calculations due to the availability of statistics at the time of writing and submission. The most recent GDP figures from Bahrain were from 2010, Cuba's were 2008, Iran's were 2009, and Puerto Rico's were 2010. Chinese Taipei figures are from the IMF.

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