

THE OLYMPICS AND ECONOMICS 2016



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Introduction: Modelling Medal Success in Rio

Even economists like to have a little summer fun, at least every four years. In the quadrennial Olympics and Economics report that follows, we explore the link between a country's economic, political and institutional traits and its medal success, and we update our ever-popular medal predictions model to forecast country medal counts at the Rio Games. We also explore the economic benefits (if any) of hosting the Olympics—a question that's top of mind with the prolonged contraction in Brazil.

Before we (and the Games) begin, a few fun findings from our analysis:

- **Hosting is gold.** Our model predicts a 30% boost to Brazil's overall medal tally relative to 2012 and a greater than 50% boost to gold alone—bringing their total to a record 22.
- **Just not for the economy.** The ~US\$10bn spent on infrastructure and logistics is too small to stimulate Brazil's US\$1.8 trillion economy.
- **Or the guy who hosted last time.** Expect the UK to lose 10% of its 2012 medal tally at the Rio Games, but still end third in the overall medals table.
- **The key to standing on the podium is sitting down.** If you're the UK, that is. Jokes aside, statistics show the country dominates in rowing, cycling and other seated sports.
- **There's an indoor/outdoor factor.** The UK and Brazil are among the best outdoor sportsmen, while many Asian countries fare better inside.
- **Starting something doesn't mean you'll finish well.** Greece, the birthplace of the Olympics, has poor sporting performance relative to what its economic indicators suggest it could achieve.
- **It's not a two-man race.** The US and China dominate in total medals, but not in every sport. Whom to watch: Italian fencers, Korean archers and Brazilian volleyballers.

Now without further ado, we bring you our main event: the 2016 Olympics and Economics analysis and medal count predictions for Rio. We hope you enjoy reading.



Forecasting Olympic Success, Economist Style

Four years on from that golden summer of 2012 in London it is time for the summer Olympics again, this time in the magical city of Rio de Janeiro. Ahead of the London Games, we undertook a simple exercise to see if we could use macroeconomic variables and statistical relationships to predict success at the Olympics, mostly to add to the enjoyment of the event. Looking back, however, the predictions for medal tallies were more accurate than we could ever have imagined, with the perfect prediction for the total medals (65) for the UK, and picking 10 out of the top 11 countries in the gold medal tables and all the top 11 in the total medal tables correctly being the standout highlights.¹

We would not be good economists (or econometricians) if we did not acknowledge the role of beginners' luck or randomness here, typical in small samples. And without an in-depth knowledge of elite athletes, recent performance metrics, and event details, it would be surprising if broad econometric exercises based on macroeconomic relationships weren't only a very rough guide to predicting Olympic success. Still, the predictive success of our last effort suggests that at least at the level of a country it may be possible to identify the ingredients of winning. With that in mind, but mostly because sporting events are often more enjoyable with some "skin in the game", we are making another effort at predicting Olympic medals.

Our model features the quality of growth environments, population, previous success, and 'host effects'

As a reminder, our medal predictions below are based on a panel regression model with time effects, where the explanatory variables are our proprietary Growth Environment Score (GES), the size of the population, lagged medal attainment, a dummy variable for the host (in this case Brazil) and a dummy variable for the previous host (in this case the UK). All variables are statistically significant at a 10% level.²

Our Growth Environment Score is a proprietary broad measure of growth conditions across countries which we have aggregated annually since 1996. They are designed to capture important features of the economic, political and institutional environment that affect productivity performance and growth across countries, and we use these scores to guide our thinking about countries' long-term potential. Their inclusion in the model reflects the simple insight that **a country is more likely to produce world class athletes in a world class environment**; and while that is hard to measure in a sporting context, we think our GES scores provide a useful and holistic measure of a high quality environment that can be related to sporting success in addition to economic success.

¹ The medal predictions in *Gold goes to where growth environment is best – using our GES to predict Olympic medals*, July 2012 also holds up well in more rigorous comparisons (<http://www.topendsports.com/events/summer/medal-tally/predicted-analysis-2012.htm>).

² Our calculations, forecasts and exhibits exclude Cuba, North Korea and Puerto Rico due to absence of data on GES scores.



There are two main differences compared to the model we used in 2012. First, there is typically a significant boost to medal attainment that comes from hosting the Olympic Games – according to our model estimates a roughly 50% boost in terms of gold medals and a 20% boost to the total medal tally. Previously we had modelled this in absolute units of medals, whereas now we uprate the host tally (in this case Brazil) by a percentage increment relative to the previous Games. As Exhibit 2 shows, the UK gained 50% more golds in 2012 relative to the previous Games in 2008. Second, some of our most significant forecast misses in our previous prediction exercise came in countries that were recent Olympic hosts and where we forecast a much stronger performance than eventually achieved. In other words, *what the host effect giveth, it also taketh away*. For example, Australia's total medal tally has been sliding since the outstanding performance at the Sydney Games of 2004 (with 58 medals), and similarly China, with 88 total medals at London 2012 underperformed our prediction of 98 total medals relative to the 100 achieved in the Beijing 2008 Games. Our estimates suggest that previous hosts (in this case the UK) lose roughly 10% of their overall medal tally and 15% of their gold medal tally at the next Games.

In general, the model explains roughly 90% of the variation in medal attainment over the past 5 Olympic Games and is better at predicting total medals relative to gold medals – unsurprising given that the difference between winning a gold (versus silver or bronze) comes down to one-hundredth or one-thousandth of a second. The predictive performance of the model for the 2012 Games can be seen in Exhibit 1. The 45 degree line represents a perfect forecast and the fact that most points (representing total medal attainment by country) are close to that line suggests a high degree of forecast accuracy.

One final caveat about the estimation and then we can dive into the medal predictions. The ongoing controversy about Russia's participation in the Rio Olympics is especially hard for our modelling approach to incorporate. Moreover, since Russia typically is among the top 5 medal winners, this can have significant knock-on effect on the rest of the predictions in a way that the non-participation of a smaller country would not. Based on the information available at the time of going to print – that Russia is unlikely to participate in Athletic events and only partially in a range of other Olympic sports – we subtract the share of medals that Russia won in these specific competitions in the London 2012 Games from its 2016 prediction, and redistribute those medals to the rest of the countries in line with their 2012 Athletics medal achievements. We recognise the crudeness of this approach, which is likely to affect the accuracy of the final medal predictions, but it is the most straightforward adjustment under the current circumstances.

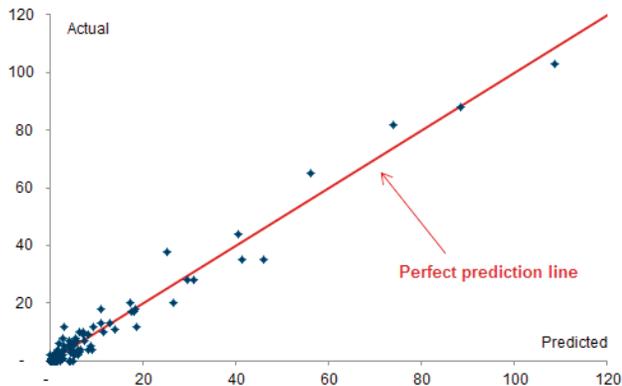


Exhibit 3 presents our predictions for gold medals and Total medals for 2016. They reveal that in general, gold does go to where the growth environment is best – countries with better GES scores and higher populations tend to get the most medals. In terms of changes relative to 2012, three things stand out.

- First, showcasing the host effect, we expect Brazil to get 22 medals in total – its best achievement at the Summer Games ever – and 5 gold medals – equalling its tally at the 2004 Athens Olympics.
- Second, the biggest drops in predicted medal attainment occur in Russia – for the reasons discussed above – and in the UK – as the host effect starts to fade.
- Third, we expect to see a small amount of democratisation of the Olympic league table, with a number of smaller countries improving their performance relative to 2012 at the expense of the traditional Olympic heavyweights who dominate medal attainment at the top of the table.

Exhibit 1: Our econometric model did a good job in predicting total medal outcomes in 2012

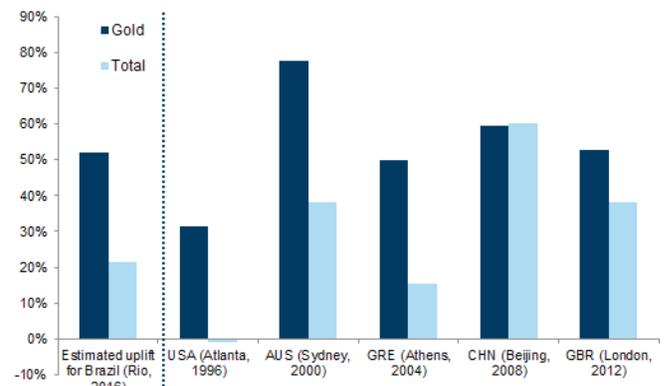
Dots represent countries’ actual 2012 medal count against the model prediction



Source: Sports Reference, Goldman Sachs Global Investment Research

Exhibit 2: A significant and measurable “host effect” at Olympic Games should benefit Brazil at Rio 2016

Percentage increase in the medal count of host countries relative to the prior Olympic Games



Source: Sports Reference, Goldman Sachs Global Investment Research



Exhibit 3: 2016 Olympics medal count prediction

Forecasts and exhibits exclude Cuba, North Korea and Puerto Rico due to absence of data on GES scores.

		Gold Forecast	Change since 2012	Total Forecast	Change since 2012	Population (mln)	GES Score
1	United States	45	-1	106	3	324	6.9
2	China	36	-2	89	1	1381	6.1
3	United Kingdom	23	-6	59	-6	66	6.5
4	Russia	14	-10	58	-24	146	5.6
5	South Korea	13	0	28	0	51	8.1
6	Germany	12	1	46	2	83	7.2
7	France	11	0	36	1	65	6.6
8	Italy	8	0	28	0	61	5.6
9	Hungary	8	0	18	0	10	6.4
10	Japan	7	0	39	1	127	7.0
11	Australia	7	0	35	0	24	7.5
12	Kazakhstan	7	0	13	0	18	5.6
13	Ukraine	6	0	21	1	45	4.9
14	Netherlands	6	0	20	0	17	7.6
15	New Zealand	6	0	13	0	5	7.5
16	Brazil	5	2	22	5	206	5.4
17	Jamaica	5	1	14	2	3	5.2
18	Iran	4	0	13	1	80	5.2
19	Czech Republic	4	0	11	1	11	6.9
20	Ethiopia	4	1	9	2	91	3.7
21	Spain	3	0	18	1	46	6.0
22	South Africa	3	0	7	1	56	5.3
23	Kenya	3	1	14	3	45	4.1
24	Croatia	3	0	6	0	4	5.7
25	Turkey	3	1	7	2	79	5.5
26	Poland	3	1	11	1	38	6.1
27	Switzerland	2	0	5	1	8	7.5
28	Romania	2	0	10	1	20	5.7
29	Norway	2	0	5	1	5	7.7
30	Denmark	2	0	9	0	6	7.5
31	Belarus	2	0	12	0	9	6.0
32	Azerbaijan	2	0	10	0	9	5.5
33	Lithuania	2	0	5	0	3	6.4
34	Mexico	2	1	8	1	129	5.2
35	Canada	2	1	19	1	36	7.2
36	Colombia	1	0	9	1	49	5.3
37	Algeria	1	0	2	1	41	5.5
38	Argentina	1	0	5	1	44	5.4
39	Sweden	1	0	9	1	10	7.4
40	Uzbekistan	1	0	4	1	31	5.3
41	Dominican Republic	1	0	3	1	10	5.2
42	Venezuela	1	0	2	1	31	4.4
43	Uganda	1	0	2	1	41	3.5
44	Tunisia	1	0	4	1	11	5.4
45	Ireland	1	0	5	0	5	6.5
46	Serbia	1	0	4	0	7	5.4
47	Georgia	1	0	7	0	4	5.8
48	Slovenia	1	0	4	0	2	6.5
49	Latvia	1	0	2	0	2	6.3
50	India	1	1	8	2	1310	4.5

Source: Sports Reference, Haver Analytics, Goldman Sachs Global Investment Research



Sporting dominance – which are the countries to beat at each Olympic sport?

Our predictions for medal attainment at the Rio 2016 Olympics are based on a top down approach using a parsimonious model. But even if such a model cannot predict success at the level of each sport, it is still interesting to know which countries are the best at each Olympic sport.

To address this question, we construct a dominance score for each sport and country using historical data on medal attainment. We do this calculation in three steps: first, we calculate a medal attainment per country per sport per year index by assigning three points to every gold medal, two points to every silver medal and one point to bronze; second, we calculate a decaying moving average of this index (with the highest weight given to the most recent (London) Games, and rapidly decreasing weights thereafter)³; finally, we express the dominance index as a percentage of total medal scores for each sport, so that we can compare the index across sports with different number of events. The value of the index ranges between 0% (a country did not receive any medal in a particular sport over the last 5 Olympic Games) to 100% (a country received all medals in the particular sport).

The resulting table of sporting dominance is presented in Exhibit 4. A few interesting observations stand out.

- **China is very dominant in the sports that it dominates.** China has some of the highest dominance scores across all the sports. In other words, it has the largest margin of leadership in the sports it is best at: for example, China boasts 69% domination in table tennis, 57% in badminton and 52% in diving.
- **US dominates sports with the largest medal hauls on offer.** Unsurprisingly, the US and China dominate the dominance table, but there is an important difference. While US dominance is not as overwhelming as Chinese dominance, it is focused on sports with the most events and medals on offer, namely swimming and athletics.
- **Beware of Italian Fencers, Korean Archers and Brazilian Volleyballers.** It is not just the Olympic giants (China and the US) that dominate all the sports. With a dominance score of 44%, South Korean archers have been the team to beat for several Olympic Games (South Korea also dominates taekwondo but by a much smaller margin). Similarly, Italian fencers – excuse the bad pun – have been at the cutting edge of the sport for many Games. And host Brazil has been dominating the volleyball competition over the last couple of Olympic Games.
- **Jokes apart, the UK does in fact dominate sports that involve sitting down.** It is often said in jest that the UK is only good at sports that involve sitting down, but our dominance scores show that there is firm statistical basis for this claim. It is dominant in rowing, cycling, sailing and second most dominant in equestrianism behind Germany.

³ Medal attainment at the 2012 games are given a 0.5 weight; subsequent games are weighted 0.3 (for 2008), 0.1 (for 2004), 0.05 (for 2000), and 0.05 (for 1996).



Exhibit 4: Country dominance score by Olympic sport

Scores represent countries' medal attainment as a proportion of total, with greater weights on recent Games and gold. See text for details.

	Top score	Top country	Second best score	Second best country
Triathlon	17%	AUS	14%	GBR
Volleyball	27%	BRA	18%	RUS
Badminton	57%	CHN	13%	KOR
Diving	52%	CHN	13%	RUS
Gymnastics	25%	CHN	18%	USA
Shooting	17%	CHN	11%	USA
Table Tennis	69%	CHN	10%	KOR
Trampoline	50%	CHN	26%	CAN
Weightlifting	25%	CHN	13%	RUS
Cycling	25%	GBR	10%	FRA
Rowing	17%	GBR	10%	AUS
Sailing	19%	GBR	14%	AUS
Canoeing	18%	GER	13%	HUN
Equestrianism	27%	GER	20%	GBR
Fencing	22%	ITA	10%	FRA
Judo	17%	JPN	9%	FRA
Archery	44%	KOR	15%	CHN
Taekwondo	15%	KOR	10%	CHN
Modern Pentathlon	22%	LTU	16%	GBR
Hockey	35%	NED	23%	GER
Handball	20%	NOR	20%	FRA
Boxing	12%	RUS	10%	GBR
Rhythmic Gymnastics	59%	RUS	22%	BLR
Synchronised Swimming	49%	RUS	23%	ESP
Wrestling	19%	RUS	10%	JPN
Athletics	19%	USA	13%	RUS
Basketball	48%	USA	13%	ESP
Beach Volleyball	43%	USA	28%	BRA
Football	25%	USA	18%	BRA
Swimming	33%	USA	13%	AUS
Tennis	27%	USA	13%	RUS
Water Polo	22%	USA	14%	ITA

Source: Sports Reference, Goldman Sachs Global Investment Research



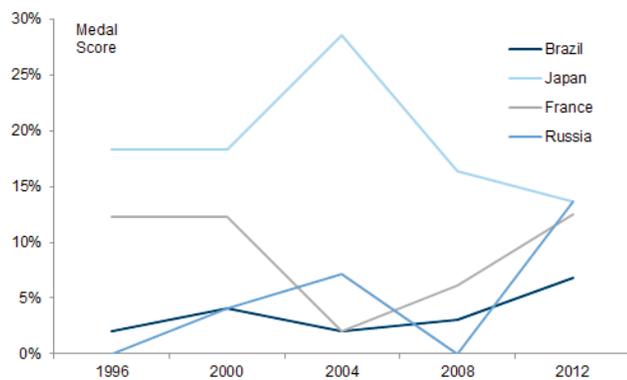
Catching up, forging ahead, neck and neck, and falling behind

The process by which countries experience income growth, catch-up with the technological frontier or fall behind is one of the central issues that economists try to address. One of the seminal articles about this was published almost exactly 30 years ago in the summer of 1986, titled “Catching Up, Forging Ahead, and Falling Behind” in the Journal of Economic History.⁴ While the author was interested in countries catching up or forging ahead in income and productivity terms, the same process is also ongoing across Olympic sports. Below we highlight four examples of this:

- **Catching up in judo:** While Japan has been the dominant country in terms of medal attainment in judo, this dominance has faded markedly over the past two Olympic Games. A group of countries have been eating away at its dominance, including France, Russia and also hosts Brazil. Will the ‘host effect’ help Brazil leapfrog the other two?
- **Forging ahead in swimming:** The dominance of the US in swimming competitions has grown stronger over the past two Games, in particular at the expense of Australia. Chinese swimming has been getting consistently better in the last few competitions, but it is still significantly behind the US in terms of medal attainment. With some of the largest medal hauls available in swimming, if the US continues to forge ahead, it will only strengthen its hold at the top of the overall medals table in Rio 2016.

Exhibit 5: Catching up in judo

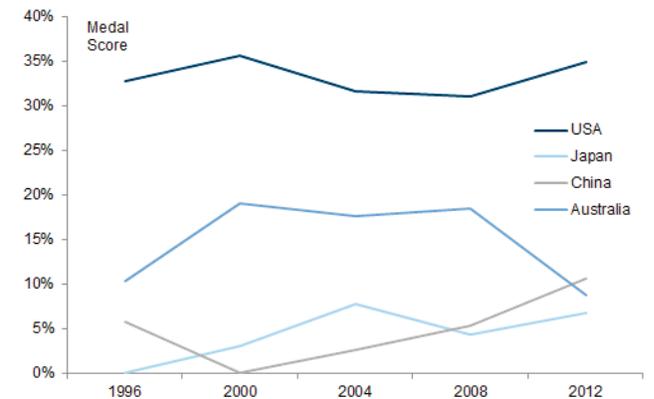
Scores represent countries’ medal attainment as a proportion of total, with greater weights on gold.



Source: Sports Reference, Goldman Sachs Global Investment Research

Exhibit 6: Forging ahead in swimming

Scores represent countries’ medal attainment as a proportion of total, with greater weights on gold.



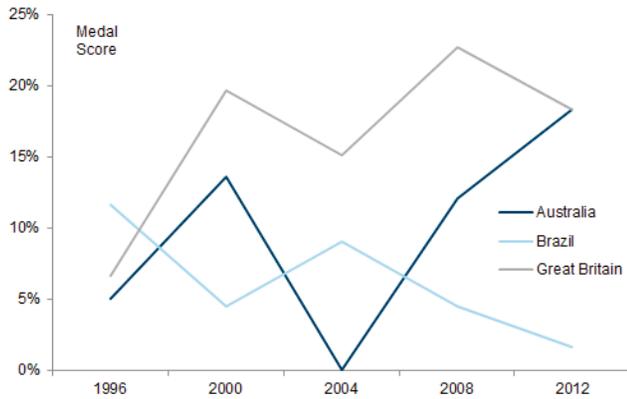
Source: Sports Reference, Goldman Sachs Global Investment Research

⁴ Abramovitz Moses, *Journal of Economic History*, June 1986.



Exhibit 7: Neck and neck in sailing

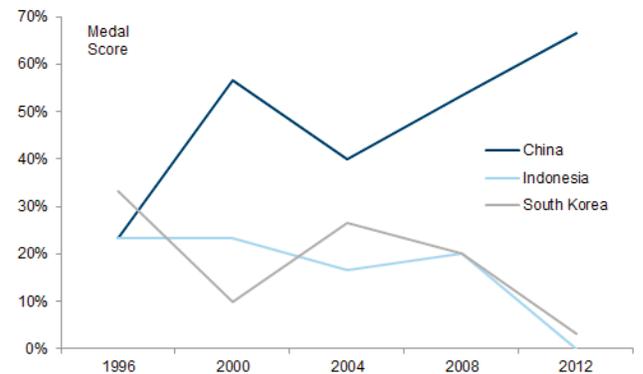
Scores represent countries' medal attainment as a proportion of total, with greater weights on gold.



Source: Sports Reference, Goldman Sachs Global Investment Research

Exhibit 8: Falling behind in badminton

Scores represent countries' medal attainment as a proportion of total, with greater weights on gold.



Source: Sports Reference, Goldman Sachs Global Investment Research

- **Neck and neck in sailing:** Great Britain and Australia are two sailing heavyweights and were locked neck and neck in terms of sailing medals achievement at the last Olympic Games. It will be exciting to see if one of them manages to edge in front of the other in Rio 2016. Brazil has also been a formidable competitor here in the past, and while the 'host effect' manifests itself in many different ways, knowledge of local wind and sea conditions may be a vital advantage.
- **Falling behind in badminton:** The Chinese contingent are likely to dominate badminton at Rio 2016, but in part that is because strong competitors from previous Olympic Games – Indonesia and South Korea – have fallen meaningfully behind. London 2012 saw their worst performance in the past five Games, and it will be interesting to see if they can start reversing this at Rio 2016.

Let the Games begin!

Kamakshya Trivedi and Mark Ozerov



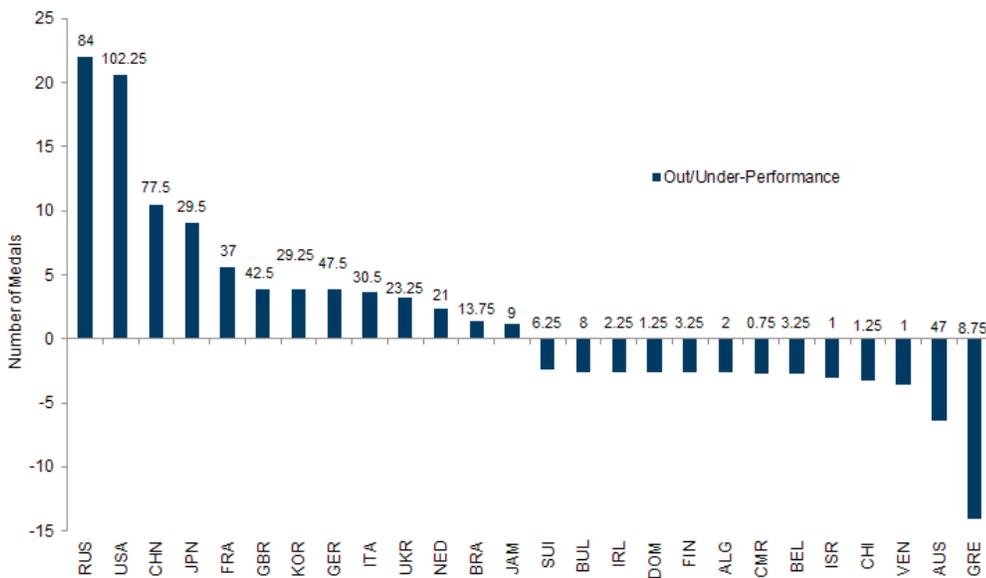
The Top Olympian: An Economist's Pick

Just like people, some countries are more 'sporty' than others. To qualify this statement, we look at the share of Olympic medals (over the total contested) won by each country participating in the Games between 1980 and 2012. We then measure the relative performance of countries controlling for how populous, rich (income per capita), and 'efficiently run' they are. Efficiency here is defined via a series of economic, political and institutional traits captured by our proprietary Growth Environment Scores (GES). We also account for a 'host country' effect.

The accompanying chart ranks the 10 top and the 10 bottom countries in all sports disciplines once the controls mentioned above are applied. Columns are labelled with the average number of medals won by the country between 2000 and 2012. Countries which have conquered less than three medals over the past 4 summer Olympics have been excluded. As can be seen, among all countries taking part in the Olympics, US, China and Russia appear to be punching above their weight, especially over the past 4 editions of the Games. By contrast, Greece, Australia, Venezuela, in particular, have a poor sporting performance in relation to what economic indicators say they could achieve.

Exhibit 9: China, Russia, US Punch Above Their (Macro) Weight

Country out/underperformance relative to predicted medal count (2000-12 average)



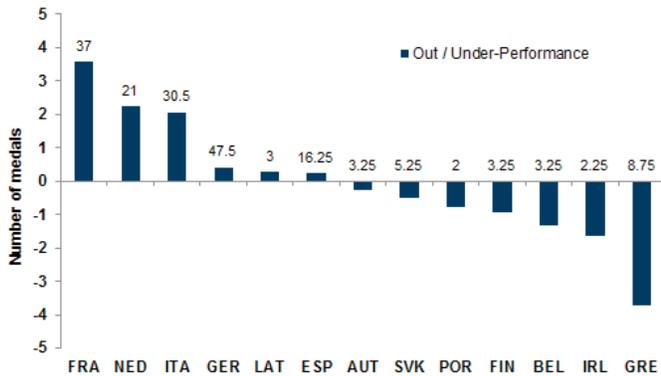
Source: Sports Reference, Haver Analytics, Goldman Sachs Global Investment Research

We then look at top and bottom performers among the Euro area countries. Being a more homogeneous bunch (given their shared institutions), this may enhance the statistical quality of the results. Among this group of countries, controlling for their population, income and broader efficiency, the top country in terms of physical sporting prowess is France, followed by Netherlands and Italy. Greece – birthplace of the Olympics – is instead lagging behind.



Exhibit 10: France, Netherlands and Italy the More Sporty Among EMU Countries

Country out/underperformance relative to predicted medal count (2000-12 average)



Source: Sports Reference, Haver Analytics, Goldman Sachs Global Investment Research

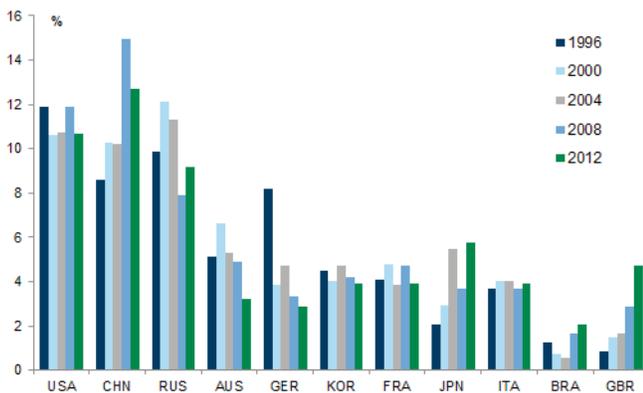
Olympic athletes: Indoor or outdoor types?

Some countries are more successful than others at indoor disciplines, while some excel in open air activities. To track this, we count the number of medals each country has won in indoor sports as share of total medal count in indoor sports for all countries since the 1996 Olympic Games.

In this context, some countries are more 'specialized' in indoor disciplines. We look at the medal count in indoor disciplines as share of total medals won by each country. As can be seen in the chart below, in China, Japan and Korea athletes seem to perform better in indoor sports than outdoor ones. By contrast, the most outdoor sportsmen appear to be those of the UK, Brazil and Germany.

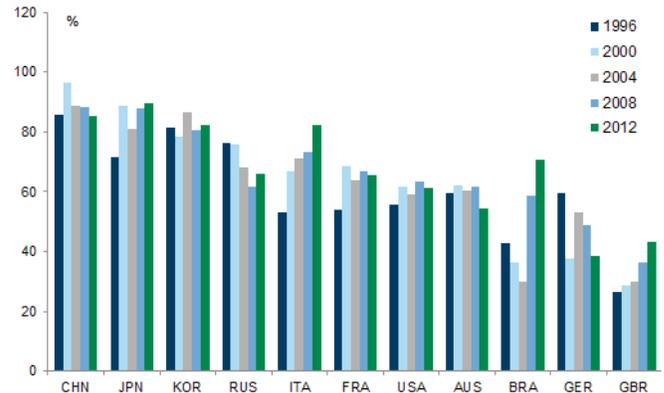
Some countries are better fighters: in boxing, wrestling, judo and taekwondo, most medals are won by Asian countries. Japan appears to be a specialist: on average 51% of its medals are in these four Olympic disciplines.

Exhibit 11: Country medals in indoor sports as a percentage of total medals in indoor sports (1996-2012)



Source: Sports Reference, Goldman Sachs Global Investment Research

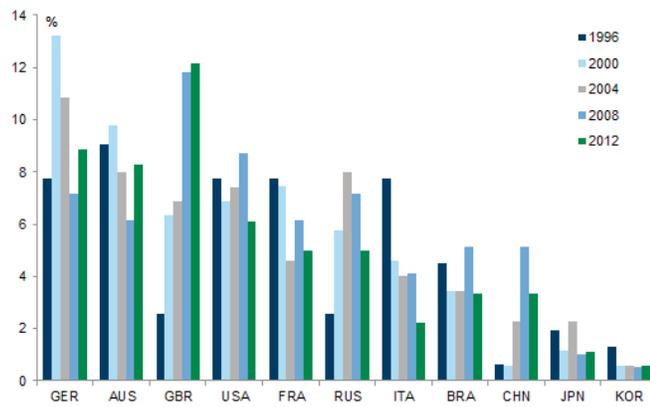
Exhibit 12: Country medals in indoor sports as a percentage of total country medals (1996-2012)



Source: Sports Reference, Goldman Sachs Global Investment Research

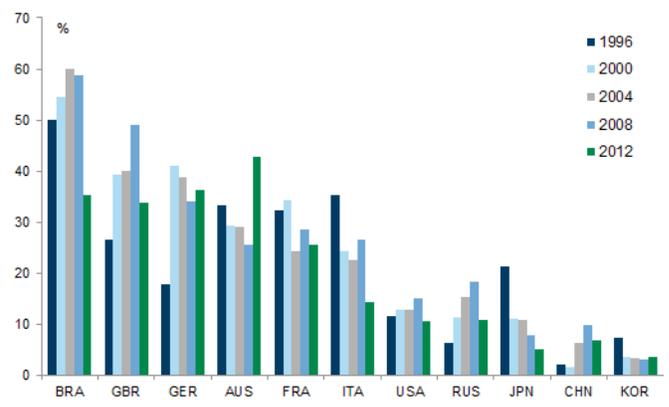


Exhibit 13: Country medals in team sports as a percentage of total medals in team sports (1996-2012)



Source: Sports Reference, Goldman Sachs Global Investment Research

Exhibit 14: Country medals in team sports as a percentage of total country medals (1996-2012)



Source: Sports Reference, Goldman Sachs Global Investment Research

Team-oriented or individualist athletes?

Some countries fare better at team sports than others. In relation to the total medal count in team sports, Germany excels, followed by Australia and Great Britain. At the other extreme are the large Asian countries like China, Japan and South Korea.

Brazil's medal count, however, has historically been dominated by team sports, representing more than 50% of its medals in the last 5 Olympic Games. At the other end remain the Asian countries where individual performance appears to prevail.

Francesco Garzarelli and Lorenzo Incononato⁵.

⁵ Lorenzo Incononato is an intern in the Global Macro Markets team.



Brazil: Hoping for the Olympic Spirit to Lift the Animal Spirits of the Brazilian Economy

"The important thing in life is not the triumph but the struggle, the essential thing is not to have conquered but to have fought well."

Pierre de Frédy, Baron de Coubertin (Jan 1863 – Sept 1937); French educator, historian, and founder of the International Olympic Committee.

The glamour of Rio awaits visitors and athletes

The Rio 2016 Summer Olympic and Paralympic Games will be held in Rio de Janeiro, Brazil. This is the first time a South American country will host the Olympics, and the first time in a Latin American country since Mexico City in 1968. From Aug 5-21 (Sept 7-18 for the Paralympic Games) more than 10,000 athletes from 206 delegations will celebrate the spirit of the Olympics and compete at the highest level in 42 different sport disciplines.

Rio de Janeiro is the second largest city in Brazil (with a population of just over 6mn) and the most popular tourist destination in South America. Rio is known for its striking natural setting in the Guanabara Bay, sandy beaches, carnival celebrations, a diverse musical heritage and, of course, its passion for soccer and beach volleyball. Rio became a World Heritage Site in July 2012: the first city to receive this title from UNESCO in the Natural Landscape category.

At the 2012 London Olympics, Brazil collected 17 medals (three of which were gold). Brazil has excelled in volleyball in Olympic competition: its women's team won gold and the men's team silver in London, as well as silver (men) and bronze (women) in beach volleyball. Brazil is one of the top 10 world economies in US Dollar-denominated GDP terms (PPP-adjusted), and the fifth largest country in terms of land mass and population, but finished only in 22nd place (behind Spain) in the total medal count in London. As has been the experience in other hosting nations, Brazil hopes to benefit in 2016 from the home Olympic dividend and collect a number of medals that is more in line with its relative economic weight in the world.

Investment related to the Games too small to lift a large economy

The Olympics are always a time of hope and good feelings. It is a unique opportunity to celebrate cultural diversity and friendly athletic competition. But these are not the happiest of times in Brazil as the economy is going through one of the longest and deepest economic contractions in recorded history, the unemployment rate has surged to double digits, and federal and local governments are grappling with deteriorating public finances.

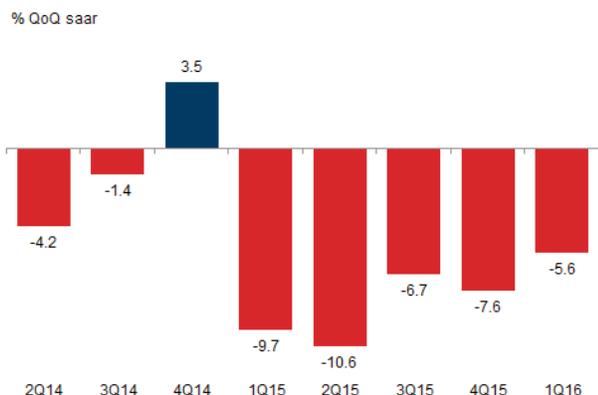
Hosting the 2014 FIFA Soccer World Cup and the upcoming 2016 Summer Olympic/Paralympic Games increased private and public investment in infrastructure and related logistics. Investment related to the Games can be divided in three main buckets. The first is the (operating) cost to actually run the event. This is estimated, according to official sources, at under R\$8bn (US\$2.4bn) and will be 100% sourced/funded by the private sector, including sponsors. The second bucket



includes investment/expenses related to sports facilities and other projects that would not have been undertaken if Rio had not hosted the event. These investments are officially estimated to exceed R\$7bn (US\$2.1bn), of which roughly 60% will be funded by the private sector. The third bucket includes projects that either anticipate or increase federal, state and municipal investments in infrastructure and public policy programs (e.g., expansion of subway lines). The goal is to increase the number of people benefitted by the Games. Many of these investments have been funded through public-private partnerships (PPPs) and are estimated by government sources to reach approximately R\$25bn (US\$7.6bn) with roughly 40% of the cost funded by private sector sources.

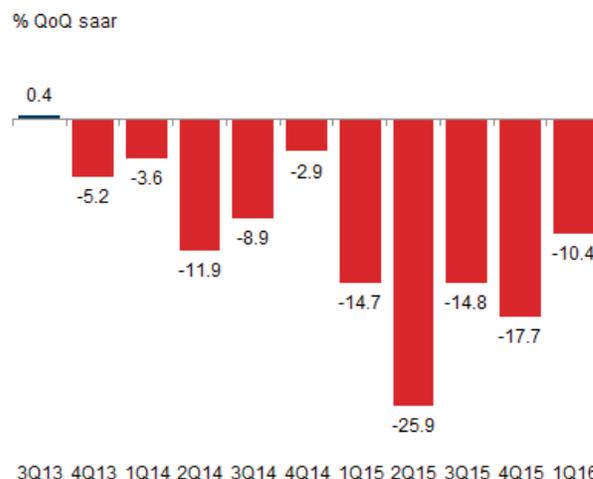
Overall, we believe the World Cup and Olympics related investment was just too small to generate a significant economic dividend/impulse given the sheer size of the economy (\approx US\$1.8 trillion). Furthermore, due to a number of large macroeconomic imbalances that have grown and permeated the economy and the severe drop in confidence indicators, total investment spending has actually been contracting uninterrupted for 2.5 years. Gross Fixed Investment has now declined for ten consecutive quarters (at a significantly high average rate of -11.6% qoq sa, annualized). Overall, gross fixed investment retrenched by a cumulative 27.0% between 4Q2013 and 1Q2016, and is now at the same level as 2Q2009.

Exhibit 15: Severe Domestic Demand Retrenchment



Source: Haver Analytics, Goldman Sachs Global Investment Research

Exhibit 16: Deep and Prolonged Contraction of Gross Fixed Investment



Source: Haver Analytics, Goldman Sachs Global Investment Research

Not the happiest of economic times

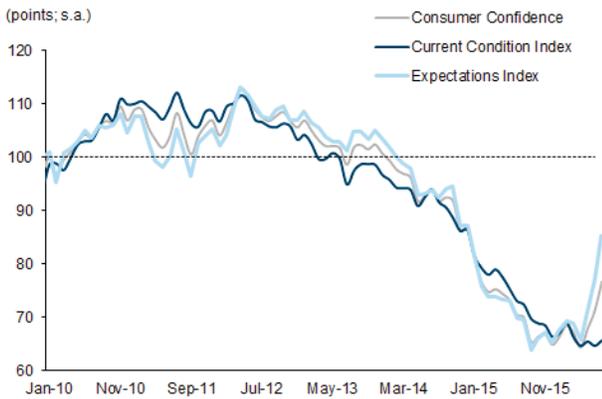
Brazil went from strong single-digit growth as recently as five years ago to a deep 2-year economic recession that brought the GDP level to that of 4Q2010 with a cumulative decline in per capital real GDP of 9.0%. The sharp deterioration in economic performance reflects a combination of domestic and external factors. The external backdrop turned less friendly: commodity prices declined, which resulted in a deterioration in Brazil’s terms of trade, and global liquidity conditions became more exigent. But the main driver of the sharp deterioration in the economy was the heterodox/interventionist domestic policy mix, which ended up creating a number of large imbalances. Expansionary fiscal and credit policies led to a meaningful decline



in the savings rate of the economy and a deterioration in both the current account and the fiscal balances. Rather than accelerating growth, the policy response ended up incubating and accommodating inflationary pressures, and hurting the investment outlook. This raised concerns about the policy approach, hurting consumer and business sentiment, and deeply depressing the animal spirits in the economy.

Brazil is currently going through the early stages of a complex political transition (which would need to be confirmed, or reversed, by a final Senate floor impeachment vote likely in late August/early September). Given the economic performance of recent years and unsettled political backdrop, markets have invested a significant amount of hope in this transition, sustained by the expectation that it could lead to a macro policy regime-shift, and a more stable and cooperative political equilibrium. Part of the Brazilian financial markets' positive performance in recent months was admittedly driven by expectations that a new administration could: (1) be more inclined to embrace the measures and structural reforms needed to rebalance the economy and address the rapidly deteriorating fiscal picture, and (2) prove capable of co-opting Congress and building the necessary political consensus to move forward with the critically needed fiscal and structural reform agenda.

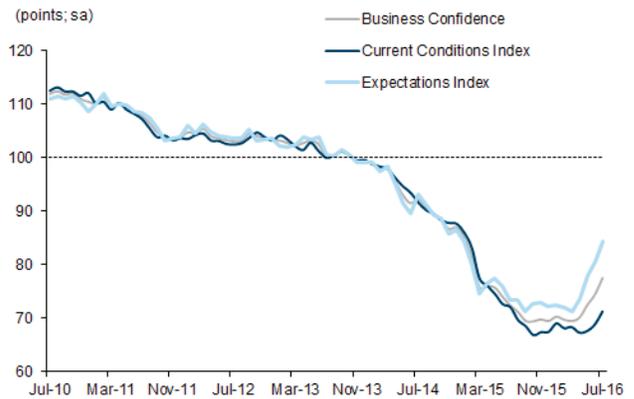
Exhibit 17: Weak but Firming Consumer Confidence



Source: FGV

Exhibit 18: Business Confidence Rebounding from Record Lows

Note: Equal-weighted aggregate of retail, services, construction and industrial confidence indices.



Source: FGV

Note: Equal-weighted aggregate of retail, services, construction and industrial confidence indices.

There are now budding signs that the recessionary forces that have gripped the economy are easing at the margin. Consumer and business confidence indicators seem to have turned the corner and have started to improve in recent months, albeit modestly and from extremely depressed levels. This could be a prelude to the end of the recession and better days ahead, particularly if the recovery in sentiment is supported and hauled up by tangible measures to deepen the needed fiscal adjustment and rebalance the economy. In all, as the country welcomes thousands of athletes and visitors and cheers the local favorites, it silently hopes that the soaring Olympic spirit will also help lift the animal spirits of the Brazilian economy and bring it back to the podium reserved for the top performers.

Alberto Ramos



Disclosure Appendix

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We, Francesco Garzarelli, Kamakshya Trivedi, Alberto Ramos and Mark Ozerov, hereby certify that all of the views expressed in this report accurately reflect our personal views, which have not been influenced by considerations of the firm's business or client relationships.

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