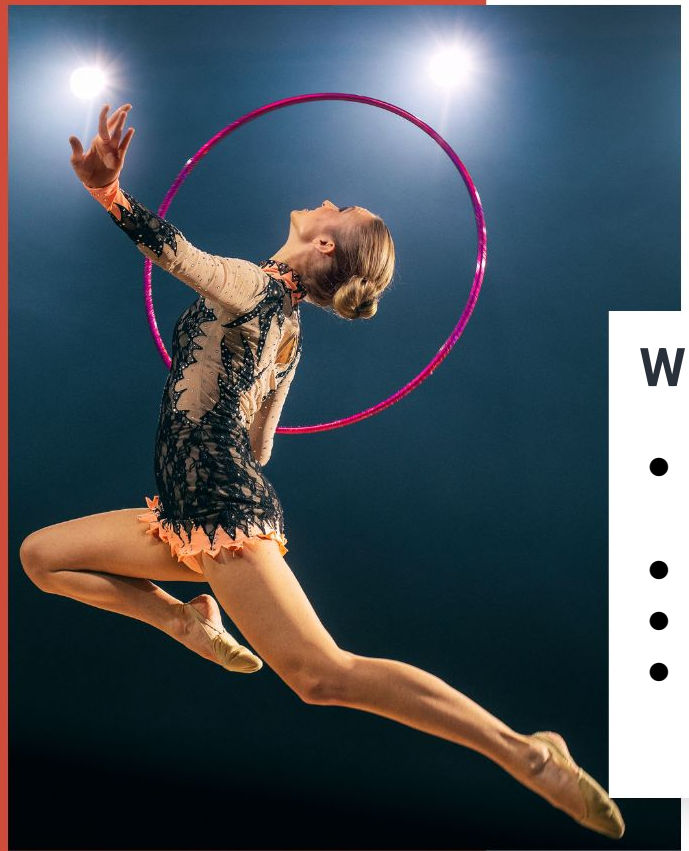
# DOES HOSTING THE OLYMPICS PROVIDE HOME ADVANTAGE IN GYMNASTICS?

PROJECT - TEAM 5

# BACKGROUND



The Olympics is one of the world's largest sporting events, and gymnastics.
Gymnastics relies heavily on subjective judging, creating potential opportunities for bias.
This project examines whether host nations gain a measurable competitive advantage in Olympic gymnastics using 124 years of data.

## WHY GYMNASTICS?

- Scoring depends on human judges → greater potential for national bias
- Long historical data (1896–2020)
- Rich data across nations, genders, and ages.
- Ideal sport to study home advantage phenomenon

# QUESTION 1:

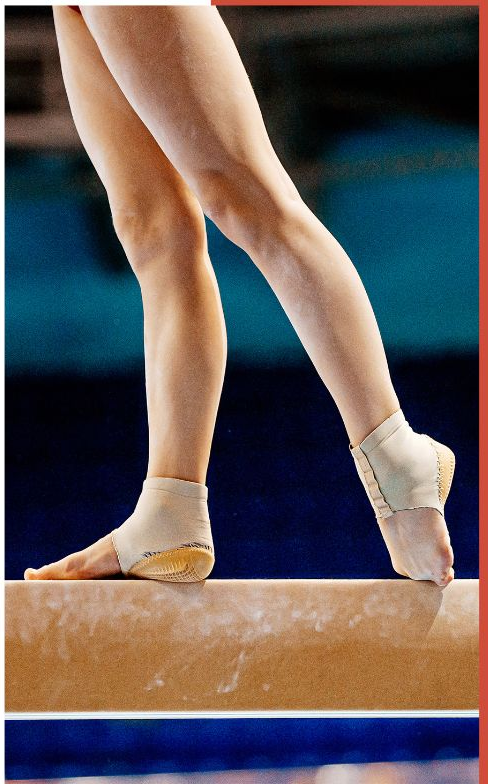
## DOES HOSTING PROVIDE HOME ADVANTAGE?

**1. Host nations win significantly more medals**

Compare medal-winning rates between host and non-host countries.

**2. Average Percentage Increase for Host Countries**

Compare each host country’s hosting-year performance with its own historical baseline.



Host countries: **16.04%** (361 medals / 2250 performances)

• Non-host countries: **8.03%** (2112 medals / 26,304 performances)

• Difference: **8.02 percentage points**

➡ Chi-square results show this difference is **highly significant** ($\chi^2 = 167.316$, $p < 2e{-}16$), confirming host nations win significantly more medals.

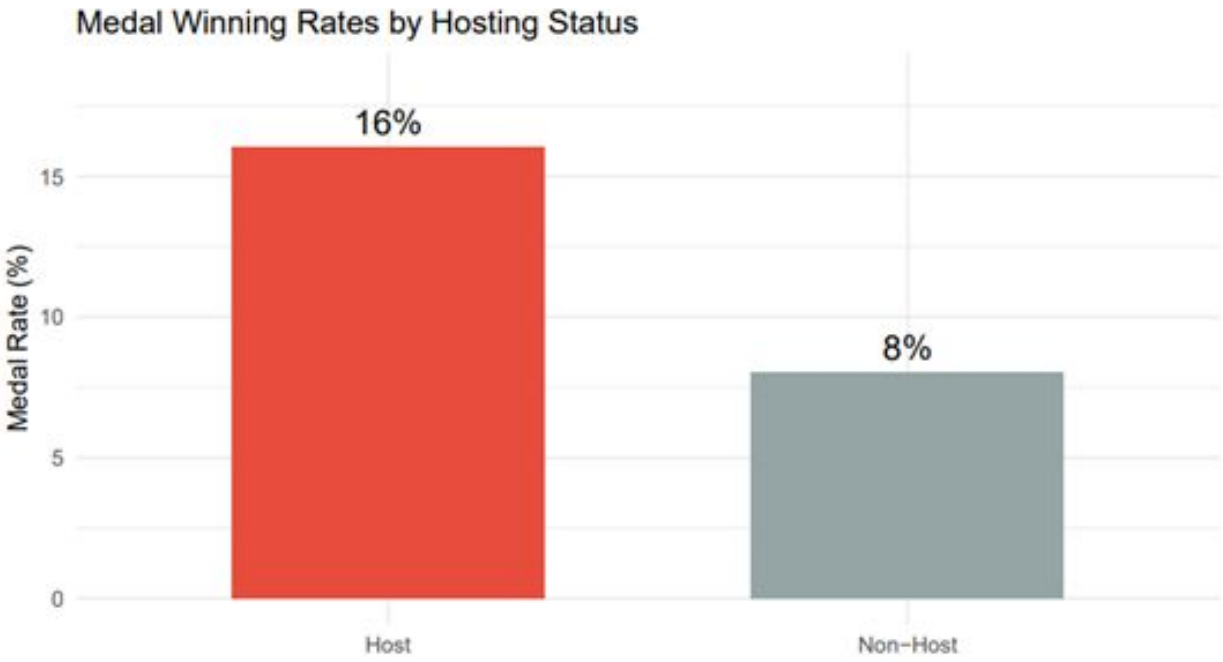



Figure 1: Medal Rates: Host vs Non-Host Countries

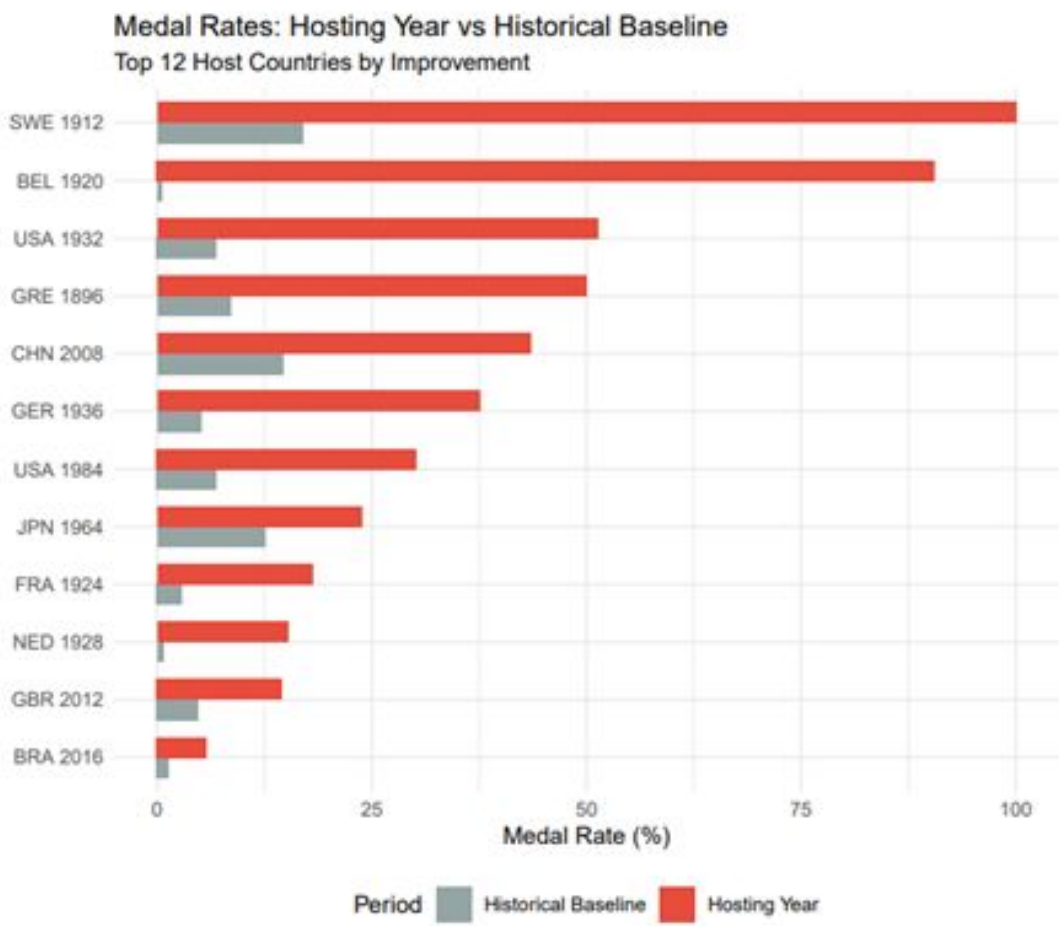



Figure 2: Hosting Year vs Historical Baseline Performance

# T-TEST

**H0:** Host and Non-host countries have the same medal-winning rate

**Ha:** Host and Non-host countries have different medal-winning rates

# PAIRED T-TEST RESULT

**T = 2.892**
**df = 28**
**p-value = 0.00732**

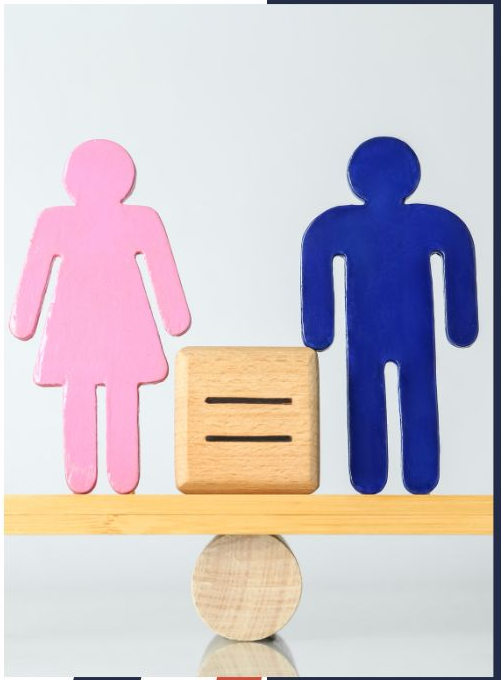
95% CI for improvement: **3.85% to 22.55%**
Average baseline: **7.27%**
Average hosting year: **20.47%**
Improvement: **+13.2** percentage points

**Since $p < 0.05$,**

**We reject $H_0$ and conclude host nations perform significantly better during hosting years.**

# QUESTION 2:

## GENDER DIFFERENCES IN HOME ADVANTAGE



**1. Gender Differences in Medal Rates**

Compare male and female gymnasts to determine who benefits more from hosting.

**2. Gender Gap Over Time**

Examine how home-advantage effects for men vs. women have shifted across Olympic eras.

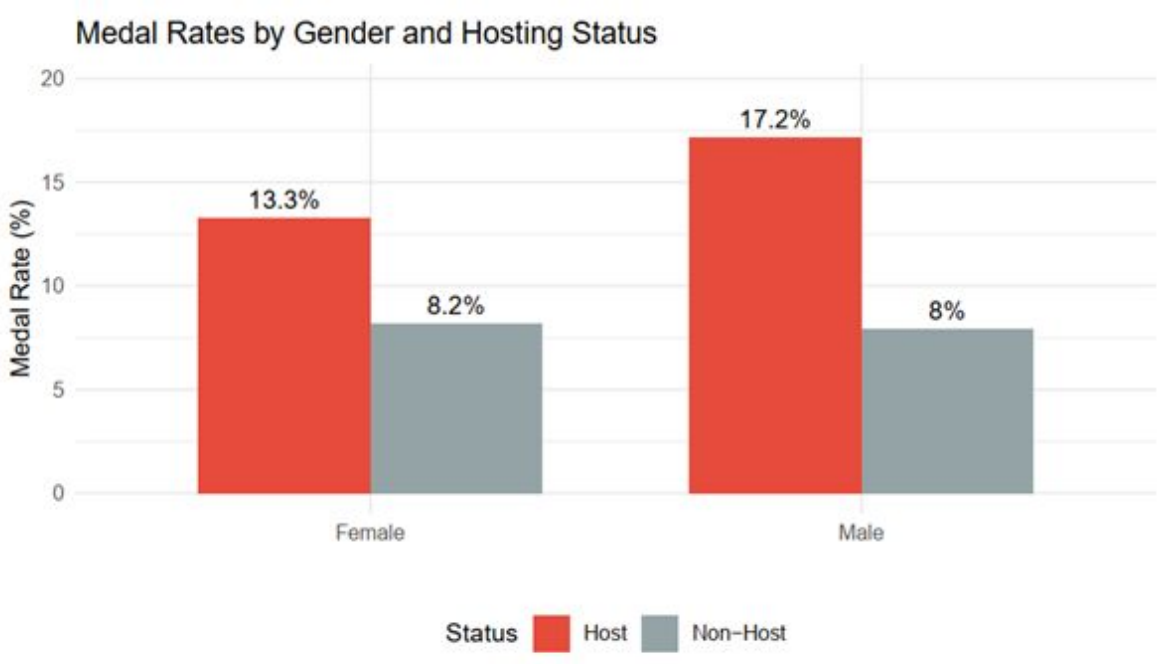



Figure 3: Medal Rates by Gender and Hosting Status

**Male Gymnasts**

- Host: **17.17%**
- Non-host: **7.95%**
- Difference: **+9.22** percentage points

**Female Gymnasts**

- Host: **13.30%**
- Non-host: **8.16%**
- Difference: **+5.14** percentage points

**➡ Male gymnasts show a stronger home-advantage effect.**

# CHI-SQUARE TEST

**Male Gymnasts**

- $\chi^2 = 153.609$, df = 1
- p-value < 2e−16
- 95% CI: 7.29% to 11.15%

➡ **Highly significant**

**Female Gymnasts**

- $\chi^2 = 20.18$, df = 1
- p-value = 7.05e−06
- 95% CI: 2.40% to 7.88%

➡ **Significant**

Both genders show significant home-advantage effects, but **male advantages are nearly double those of females**.

**Early Era**

**1896–1948**

- Female: **34.07** pp
- Male: **1.18** pp

**Females had far stronger home advantage**

**Mid Era**

**1952–1988**

- Female: **3.86** pp
- Male: **11.3** pp

**Shift: males gained more advantage**

**Modern Era**

**1992–2020**

- Female: **2.76** pp
- Male: **8.88** pp

**Males show consistently larger advantage**

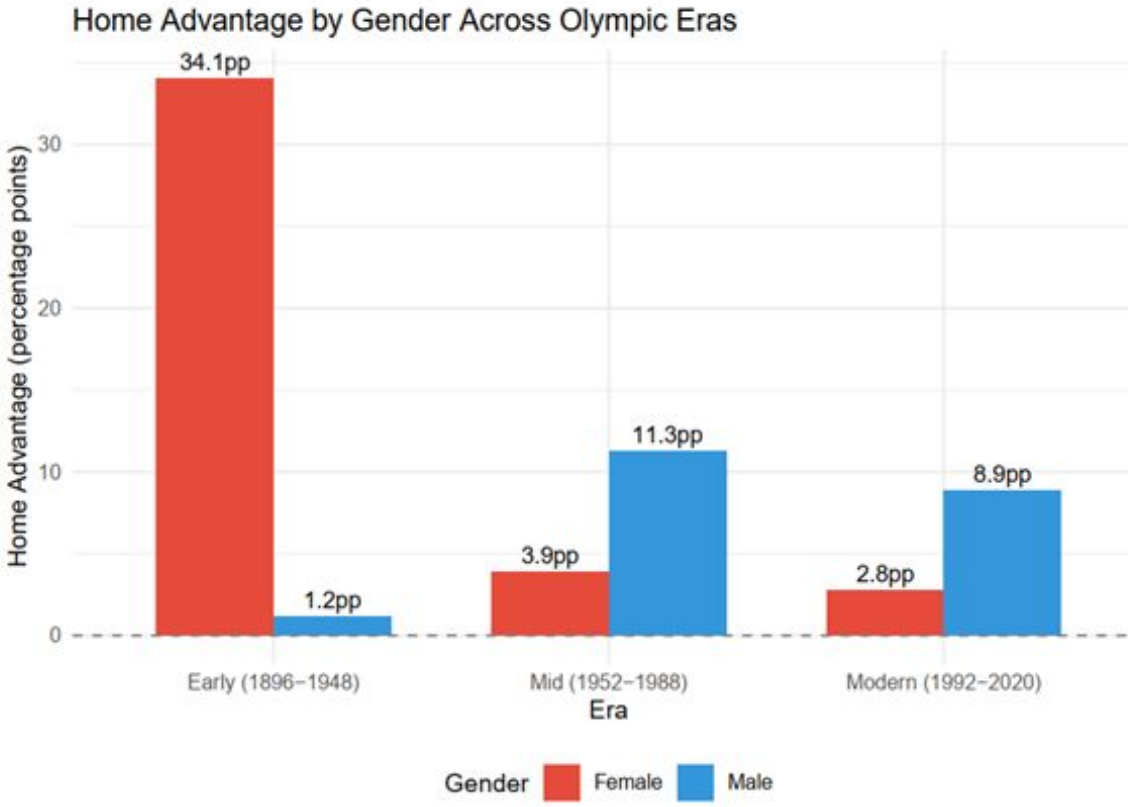



Figure 4: Gender Home Advantage Trends Over Time

# QUESTION 3:

## COUNTRY FACTORS

**1. Do Smaller Countries Experience Larger Increases?**

Compare medal improvements across large, medium, and small countries.

**2. Do First-Time Hosts Gain a Bigger Boost?**

Compare hosting-year improvement between first-time and repeat hosts.

**3. Do Host Nations Field More Gymnasts?**

Evaluate whether hosts send larger teams, potentially increasing medal opportunities.

**Average improvement by country size:**

- Small countries: **17.14** pp (n = 15)
- Large countries: **12.06** pp (n = 9)
- Medium countries: **3.66** pp (n = 4)

**Small countries show the largest improvement.**

**Chi-square test**

- $\chi^2$ = **1.934**
- df = **2**
- p = **0.38**

**Not significant**

➡ **Improvement varies but not statistically confirmed.**

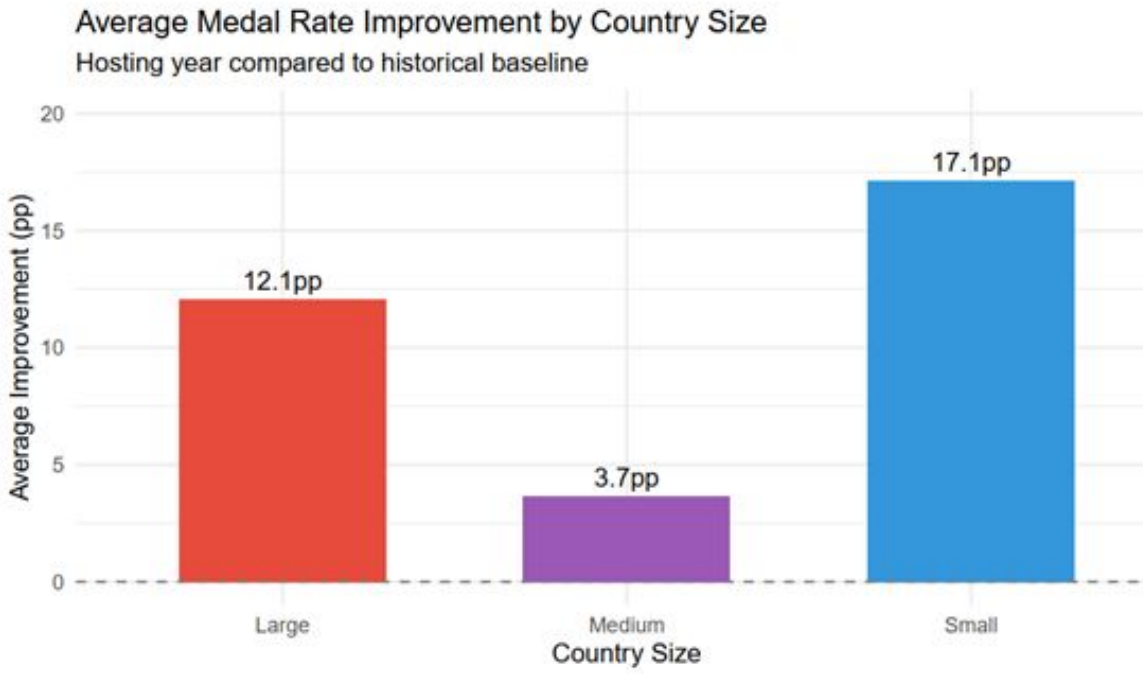



Figure 5: Home Advantage by Country Size

**Average improvement:**

- First-time hosts: **16.53** pp (n = 18)
- Repeat hosts: **8.27** pp (n = 10)

**T-TEST — FIRST-TIME VS REPEAT HOSTS**

- t = **0.981**
- p = **0.336**

**No significant difference**

**➡ Although first-time hosts show numerically larger boosts, the difference is not statistically significant.**

**Average number of gymnasts per country:**

- Host countries: **23.5** gymnasts
- Non-host countries: **7.2** gymnasts

Difference: **+16.3** more gymnasts for host nations

**T-TEST - HOST VS NON-HOST PARTICIPATION**

- t = **−3.328**
- p = **0.00245**

**HIGHLY SIGNIFICANT**

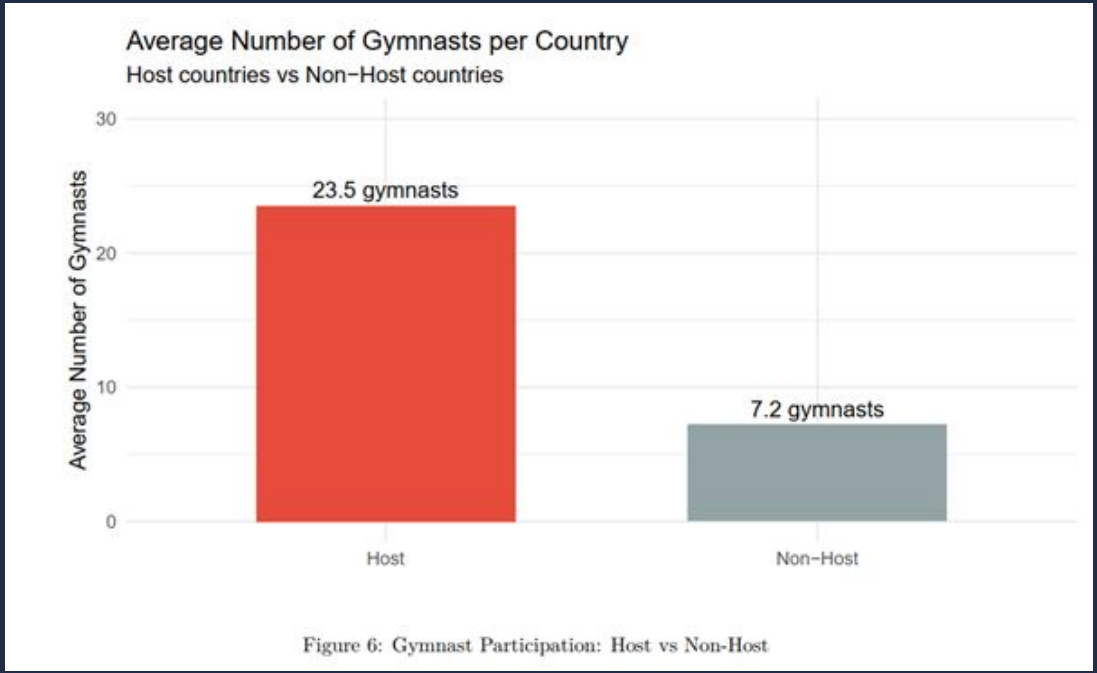



Figure 6: Gymnast Participation: Host vs Non-Host

**➡ Host countries field much larger teams, which may increase medal opportunities.**

# QUESTION 4:

## ECONOMIC & DEMOGRAPHIC

**1. GDP per capita & home advantage**

Examine whether richer countries gain larger improvements when hosting.

**2. Working-age population share & home advantage**

Test whether countries with more working-age citizens perform better when hosting.

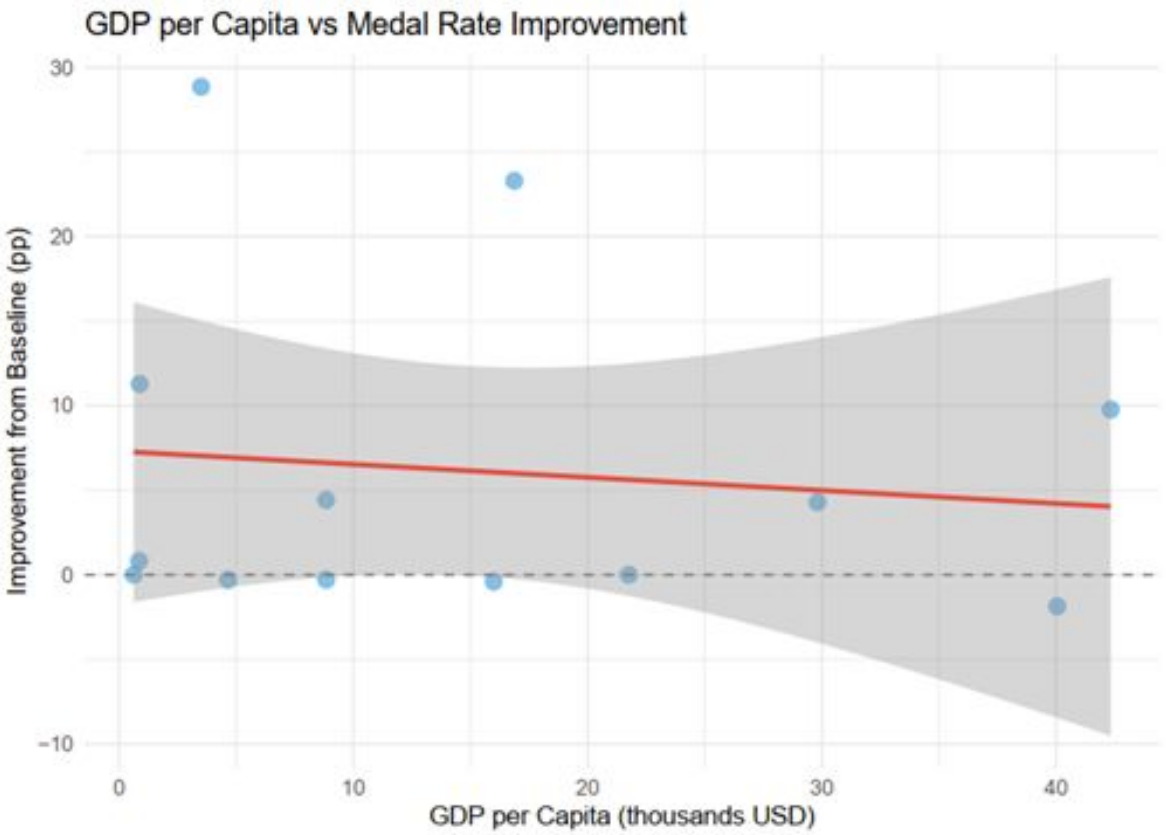



Figure 7: GDP per Capita vs Home Advantage

**GDP per capita vs medal rate improvement**

- Correlation coefficient: **−0.115**
- P-value: **0.708**

**No significant relationship**

➡ **Wealth does not predict whether a country gains higher medal improvements when hosting.**

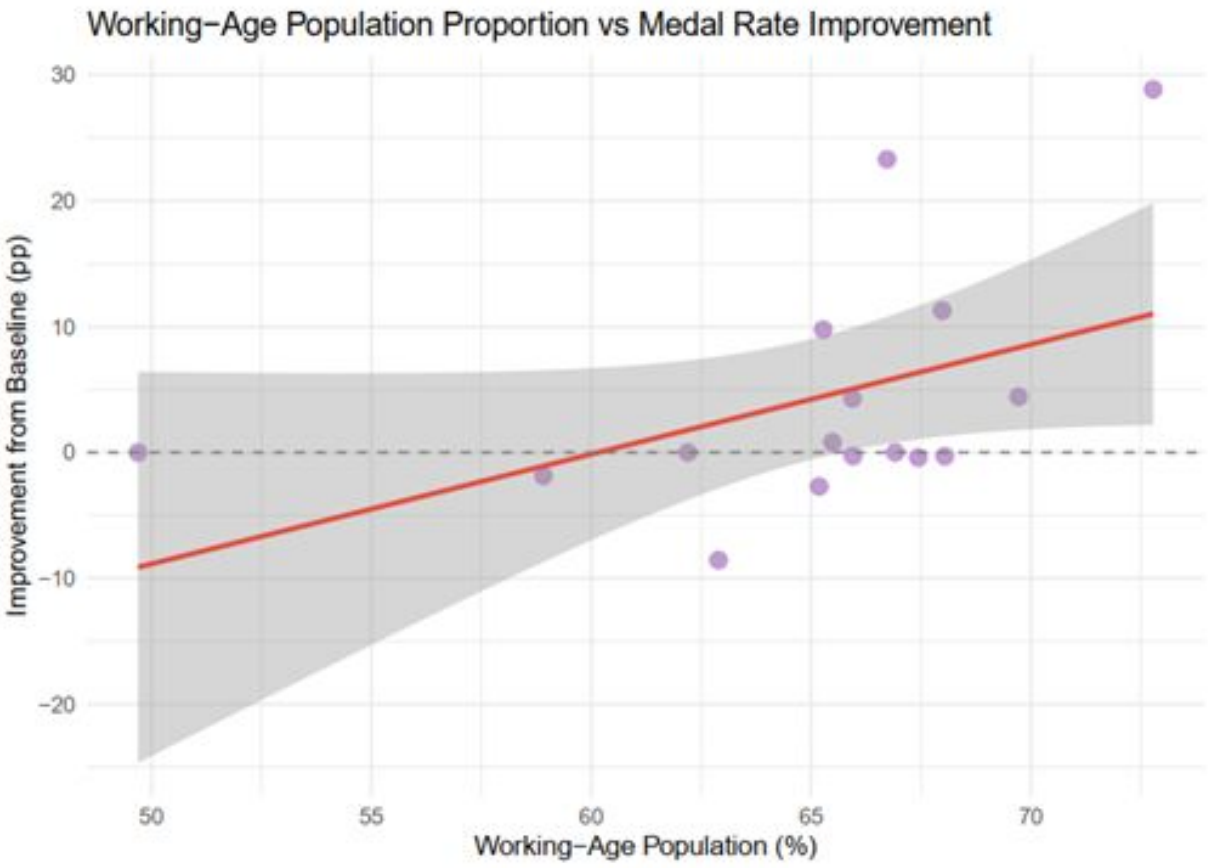



Figure 8: Working-Age Population vs Home Advantage

**Working-age population (%) vs improvement**

- Correlation coefficient: **0.461**
- P-value: **0.072**

**Not statistically significant (but trending positive)**

**➡ Countries with larger working-age populations show some positive trend, but it is not statistically significant.**

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