



# Civilization Diplomacy Analysis

## 0. Methodology

### 1. Hypothesis Verification and Validation

H1: Rapid tech growth accelerates military power, increasing war initiation risk.

H2: Economic desperation increases war probability to acquire resources.

H4: Cultural similarity promotes diplomacy and trade, reducing conflicts.

H5: Civilizations with higher initial friendliness and cultural development are likelier to establish enduring trade networks, leading to long-term stability and growth.

H6: Repeated victories decrease friendliness and increase aggressiveness, potentially triggering a cycle of escalating conflicts that can destabilize even well-resourced civilizations.

### 2. Scenarios

Juggernaut

Wolf

Thunderdome

Friendzone

### 3. Individual Simulations

### 4. Additional findings

Population Cap:

Resource Cap:

### 5. Possible pivots

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## **Executive Summary**

This analysis uses an agent-based simulation to evaluate the dynamics of diplomacy behavior under varying technological, cultural, and environmental pressures. Results mostly support proposed hypotheses. The findings not only validate theoretical claims with empirical data but also open new pathways for exploring diplomatic evolution, trade dynamics, and systemic stability under pressure.

## **0. Methodology**

Hypothesis are verified using the configuration of 15 civilization randomly located on the grid of  $30 \times 30$  and values from value table (Definitions, Civilization Diplomacy document) and 1000 runs.

Graphs are taking mostly as means per civilization.

Besides multiple runs, individual runs were explored and documented.

## 1. Hypothesis Verification and Validation

Hypothesis are verified using the configuration of 15 civilization randomly located on the grid of  $30 \times 30$  and values from value table (Definitions, Civilization Diplomacy document) and 1000 runs.

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### H1: Rapid tech growth accelerates military power, increasing war initiation risk.

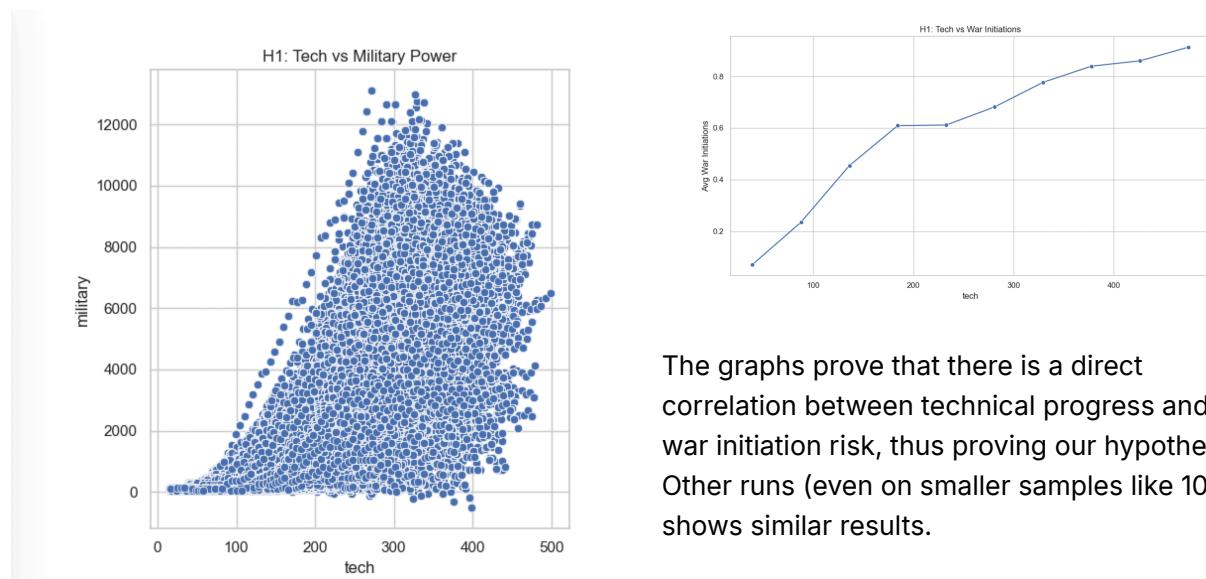
**Example:** Germany before World War II

- Between 1933–1939, Nazi Germany rapidly rearmed and adopted innovative military technologies and doctrines. This was also paired with overall world technological development. The growth of military-industrial capacity fueled aggressive foreign policy.

**Supporting Data:**

- SIPRI (Stockholm International Peace Research Institute) and World Bank data show a correlation between **military R&D expenditure** and militarization indices.
  - World bank R&D: <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS>
  - Military spendings: <https://milex.sipri.org/sipri>

**Simulation Results:**



The graphs prove that there is a direct correlation between technical progress and war initiation risk, thus proving our hypotheses. Other runs (even on smaller samples like 10) shows similar results.

## H2: Economic desperation increases war probability to acquire resources.

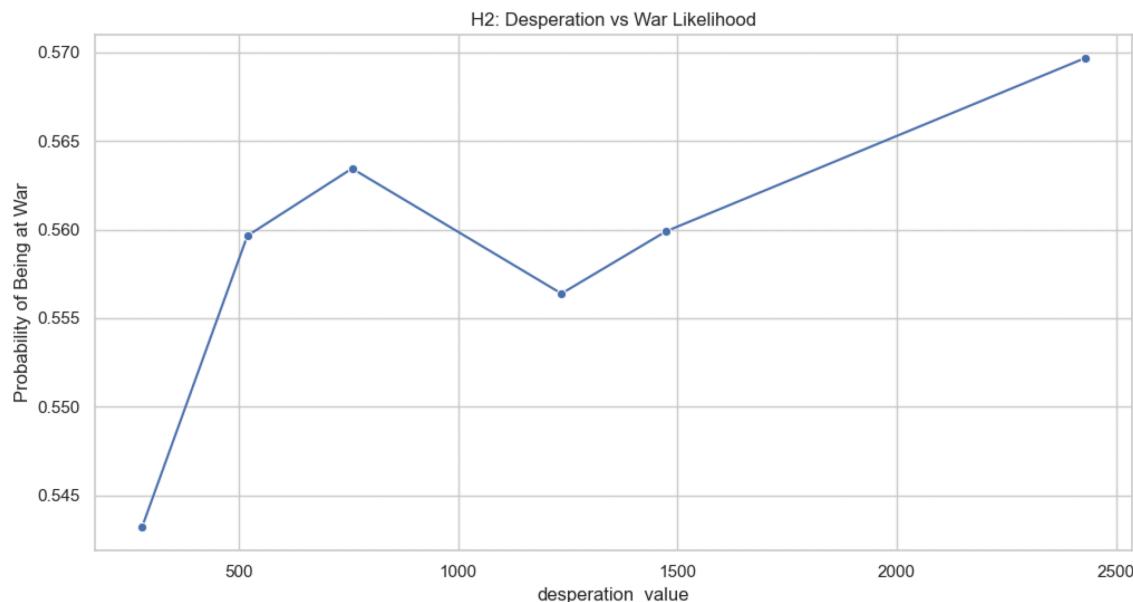
**Example:** Imperial Japan and the Second Sino-Japanese War (1937–1945)

- Japan's economic dependence on imported oil, rubber, and metals led to military incursions into China and Southeast Asia as well as leads to Pearl Harbor due to United States oil embargo.

### Supporting Data:

- Studies in international relations (e.g., Michael Klare, *Resource Wars*) highlight how resource scarcity and economic strain are precursors to conflict.
  - <https://digital-commons.usnwc.edu/nwc-review/vol57/iss1/24/>

### Simulation Results:



Resource desperation is a heavy factor for the war likelihood for the civilization.

## H3: Population pressure acts as a catalyst for conflict when civilizations cannot expand territorially.

**Example:** Rwanda Genocide (1994)

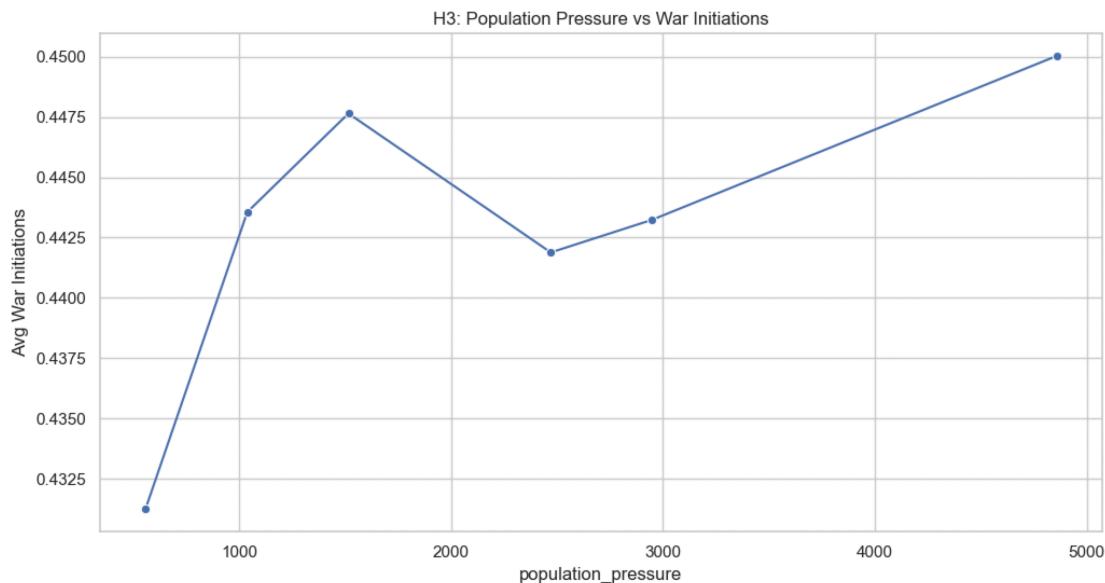
- Rwanda had one of the highest population densities in Africa, combined with land scarcity.
- Resulted in social tension and ultimately mass violence.

### Supporting Data:

- UN studies link **high population growth + land scarcity** with increased probability of ethnic conflict and resource wars.
  - <https://www.prb.org/resources/environmental-scarcity-and-the-outbreak-of-conflict/>

- Paul Collier's research on civil war identifies population pressure as a risk factor.
  - <https://archive.globalpolicy.org/security/issues/diamond/wb.htm>

#### **Simulation Results:**



Other runs provided similar results and show that population pressure directly correlates with the war initiation risk.

#### **H4: Cultural similarity promotes diplomacy and trade, reducing conflicts.**

##### **Example: European Union**

- Shared cultural, political, and economic values have led to the **lowest intra-European war rates** since WWII.

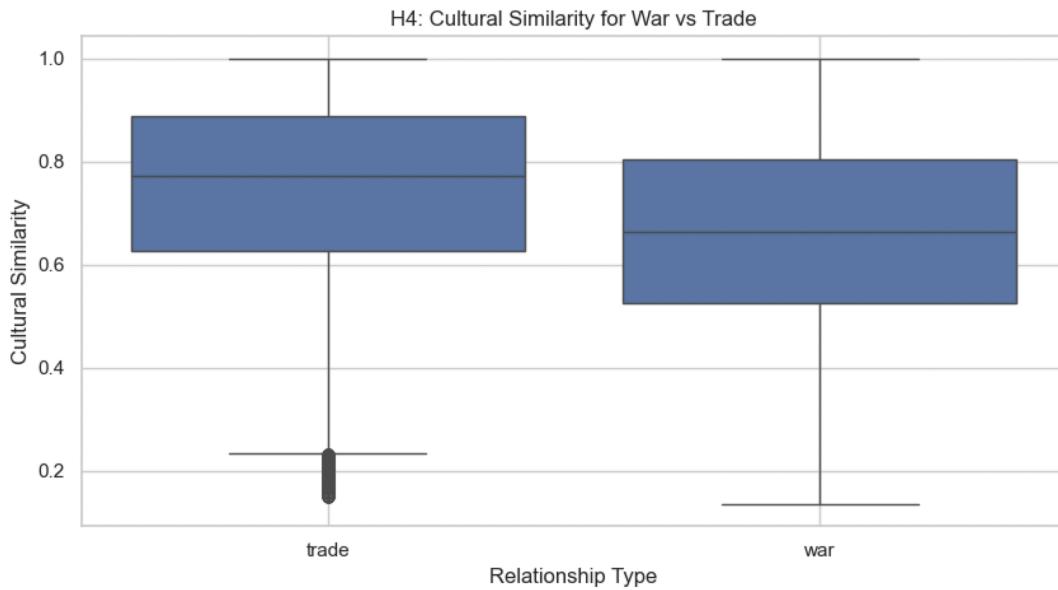
##### **Example: Nordic Cooperation (Denmark, Sweden, Norway, Finland)**

- Culturally aligned countries engage in cross-border trade and social integration.

#### **Supporting Data:**

- Studies show trade volumes are significantly higher among culturally similar nations (e.g., Guiso et al., *Cultural Biases in Economic Exchange*, 2009).
  - [https://econpapers.repec.org/article/oupqjecon/v\\_3a124\\_3ay\\_3a2009\\_3ai\\_3a3\\_3ap\\_3a1095-1131.htm](https://econpapers.repec.org/article/oupqjecon/v_3a124_3ay_3a2009_3ai_3a3_3ap_3a1095-1131.htm)

#### **Simulation Results:**



Indeed, civilizations who have more cultural similarity, tended to engage in trade, not war.

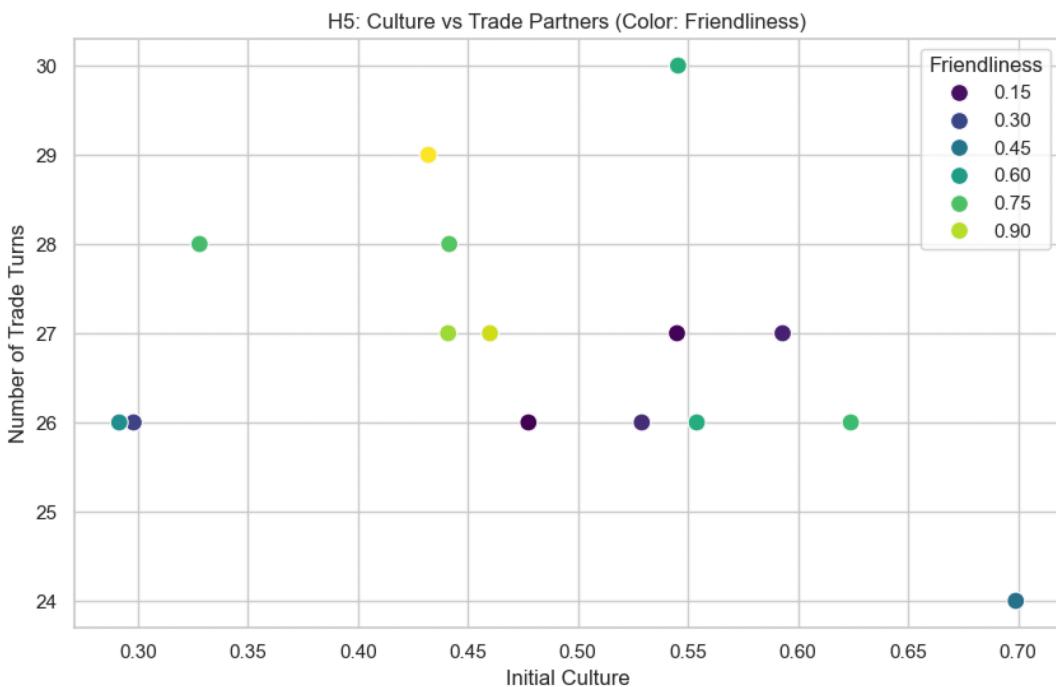
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**H5: Civilizations with higher initial friendliness and cultural development are likelier to establish enduring trade networks, leading to long-term stability and growth.**

**Example:** ASEAN (*Association of Southeast Asian Nations*)

- Countries like Singapore, Malaysia, and Indonesia — with strong early post-colonial diplomatic posture and internal development — created lasting trade agreements and reduced regional conflict.

**Simulation Results:**



The values are not always directly correlated due to some civilizations not surviving after the initial stage (data points are taken at the initial stage) or the fact that war decision is also pressured with resource deficit and population density.

## H6: Repeated victories decrease friendliness and increase aggressiveness, potentially triggering a cycle of escalating conflicts that can destabilize even well-resourced civilizations.

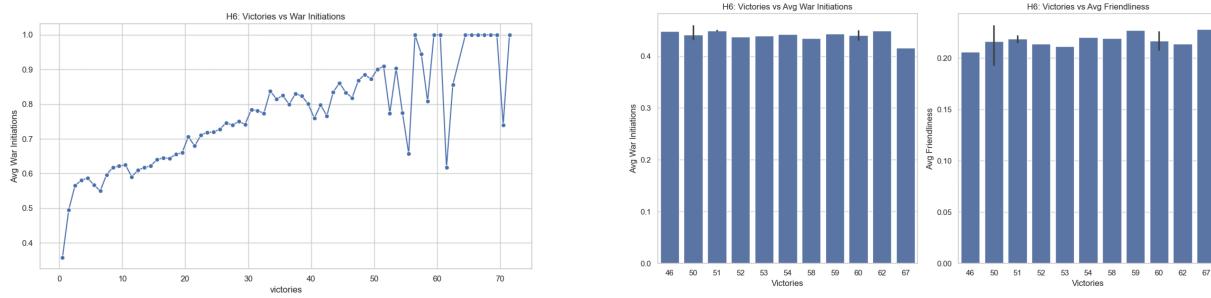
**Example:** Napoleonic France

- Early European victories increased France's military ambitions, leading to widespread war and eventual overextension and collapse (1812–1815).

**Supporting Data:**

- [https://adambrown.info/p/notes/snyder\\_myths\\_of\\_empire](https://adambrown.info/p/notes/snyder_myths_of_empire)
  - Explores expansion as result of imperialist drive after victories.

**Simulation Results:**



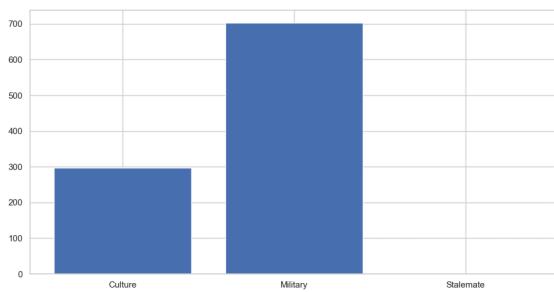
First graph shows the correlation grouped by initiation probability and number of victories, however, on the mean civilization level, it can be not always true due to civilization already being aggressive (thus, number of victories doesn't matter) or civilization being passive due to having excess of resources with no population pressure.

## 2. Scenarios

### Juggernaut

This scenario aimed to see, how often will the most advanced (from the start) civilization win. Here are the results of 1000 simulations:

**Civilization 0 won 582 out of 1000 simulations.**

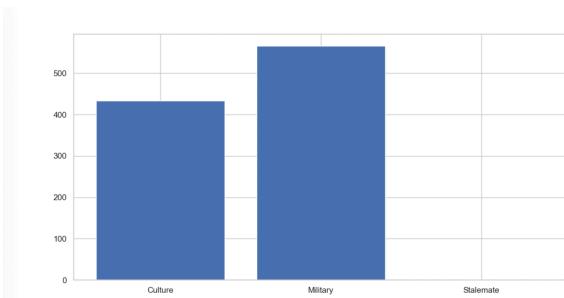


This means that even extremely advanced civilization can be defeated and the increase in military wins suggest that going to war with everyone from the start did not always end well for the *juggernaut* but boosted those who were able to defeat it.

### Wolf

This scenario aimed to see how often will the psychopath civilization win if it goes to war with everyone on turn 1. Here are the results of 1000 simulations:

**Civilization 0 won 88 out of 1000 simulations.**

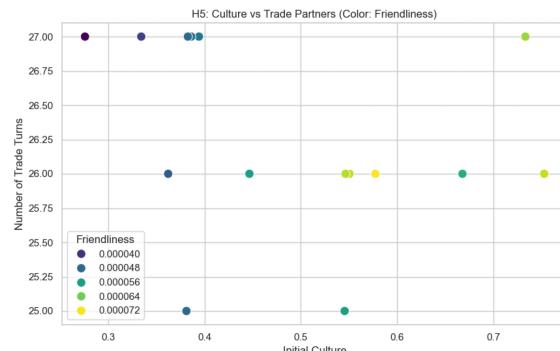
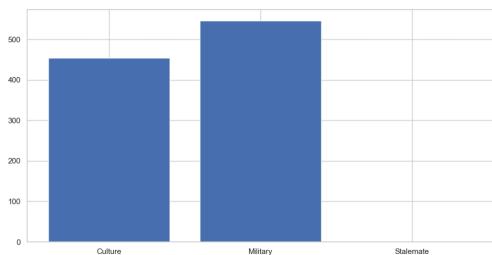


Such low number shows that without resource boost like in previous case, aggressive tactic even less effective, even against friendly civilizations.

## Thunderdome

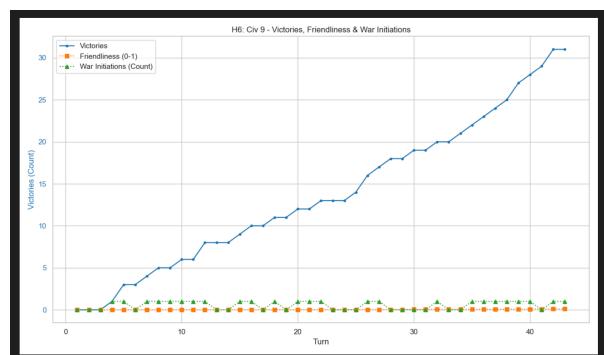
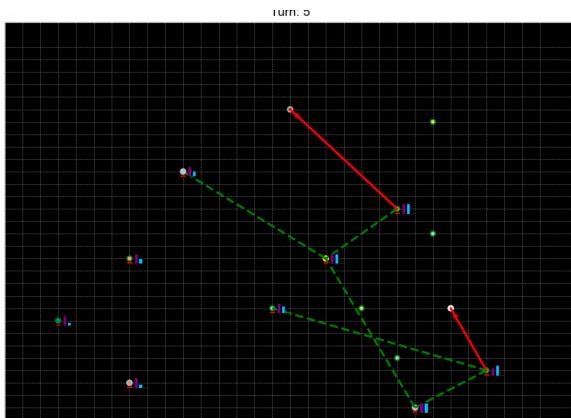
This scenario aimed to explore cases where civilizations are all aggressive from the start.

Here are the results:



Graphs other than H5 stayed relatively the same

The interpretation of these results can vary, on the individual cases it is seen that despite being unfriendly, even at the early stages, civilizations still choose to cooperate:

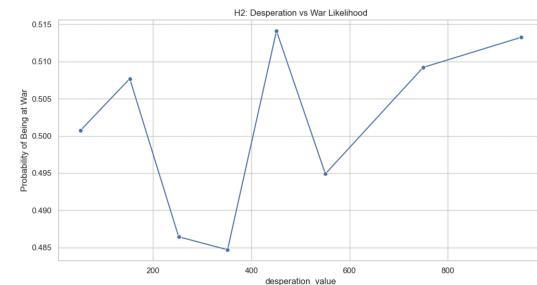
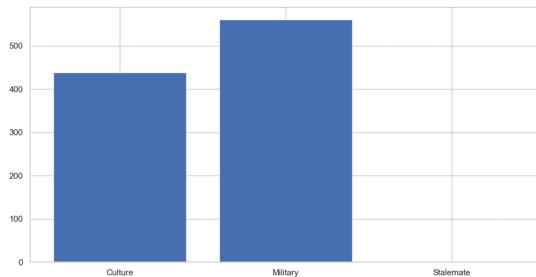


Civ 9 achieved cultural victory.

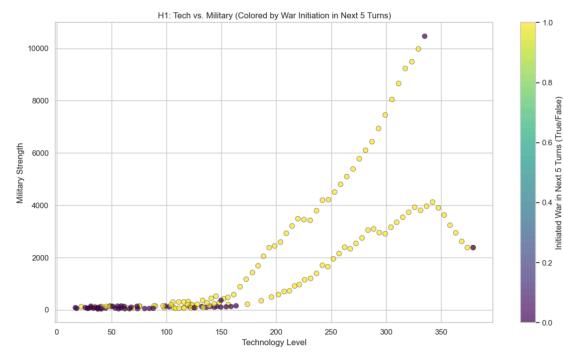
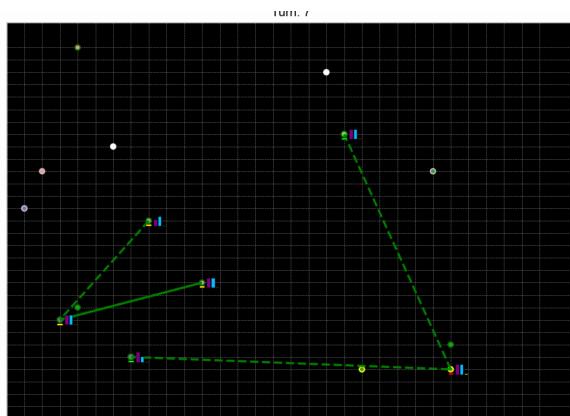
And despite having initial friendliness of 0, numerous victories, civ 9 still didn't initiate all wars and achieved cultural victory over military one.

## Friendzone

This scenario aims to explore the opposite of the thunderdome. Here are the results:

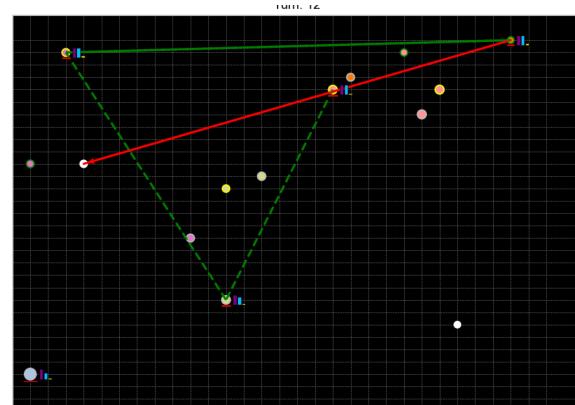
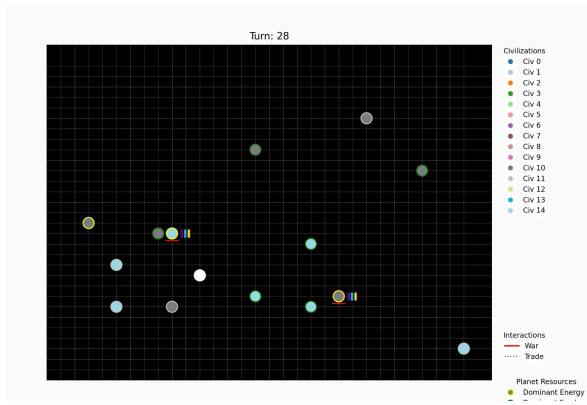


The proportion of victories still stays the same. Initial friendliness didn't have affect on the amount of military wins.

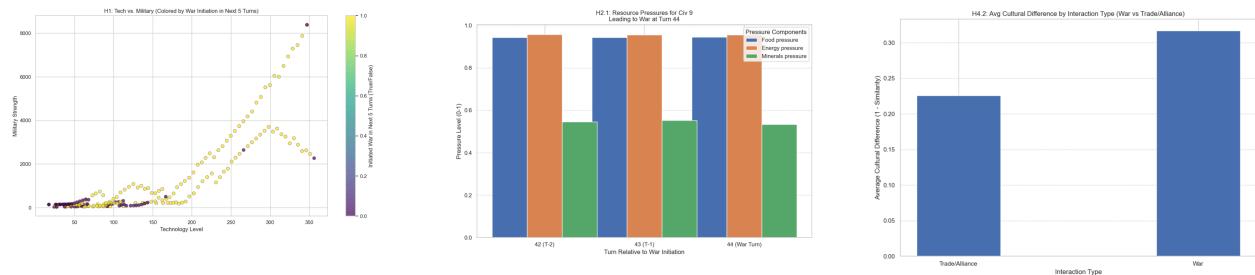


Despite having initial friendliness, wars still appear

## 3. Individual Simulations



Exploring individual simulations, we may see similar trends that we've noticed with our hypotheses: tech increases military, pressures are the key factors of war and similar culture tend to trade with each other. Even though sometimes those statements may slightly vary.

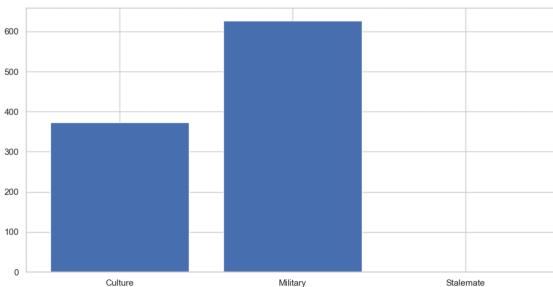


## 4. Additional findings

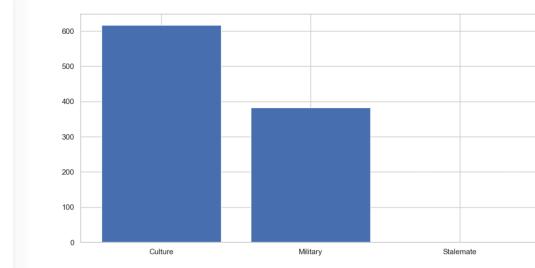
### Population Cap:

**Changing parameter of planet population cap affects the cultural/military distribution: the less cap, the more gap between those types of victories (in favor of military):**

Cap = [100, 300]:



Cap = [3000, 5000]:

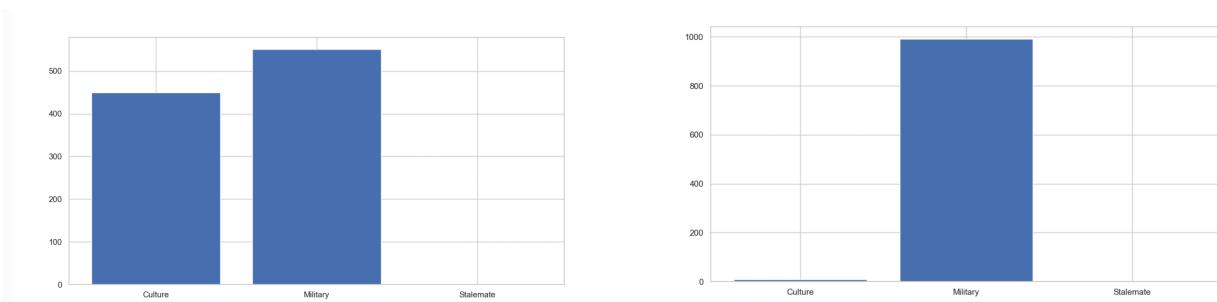


### Resource Cap:

**Statement above is true for resource range as well:**

Range = [100, 500]:

Range = [10, 50]:



## 5. Possible pivots

- Exploring how probability of war changes depending on the overall population in the model
- Cultural diffusion over time
- Aggressive neighbor proximity - investigate how clustering affects probability of war and overall friendliness
- Adding “empty” planets with resources
- Adding energy tax for travels