

# Are You tired of rising inflation?



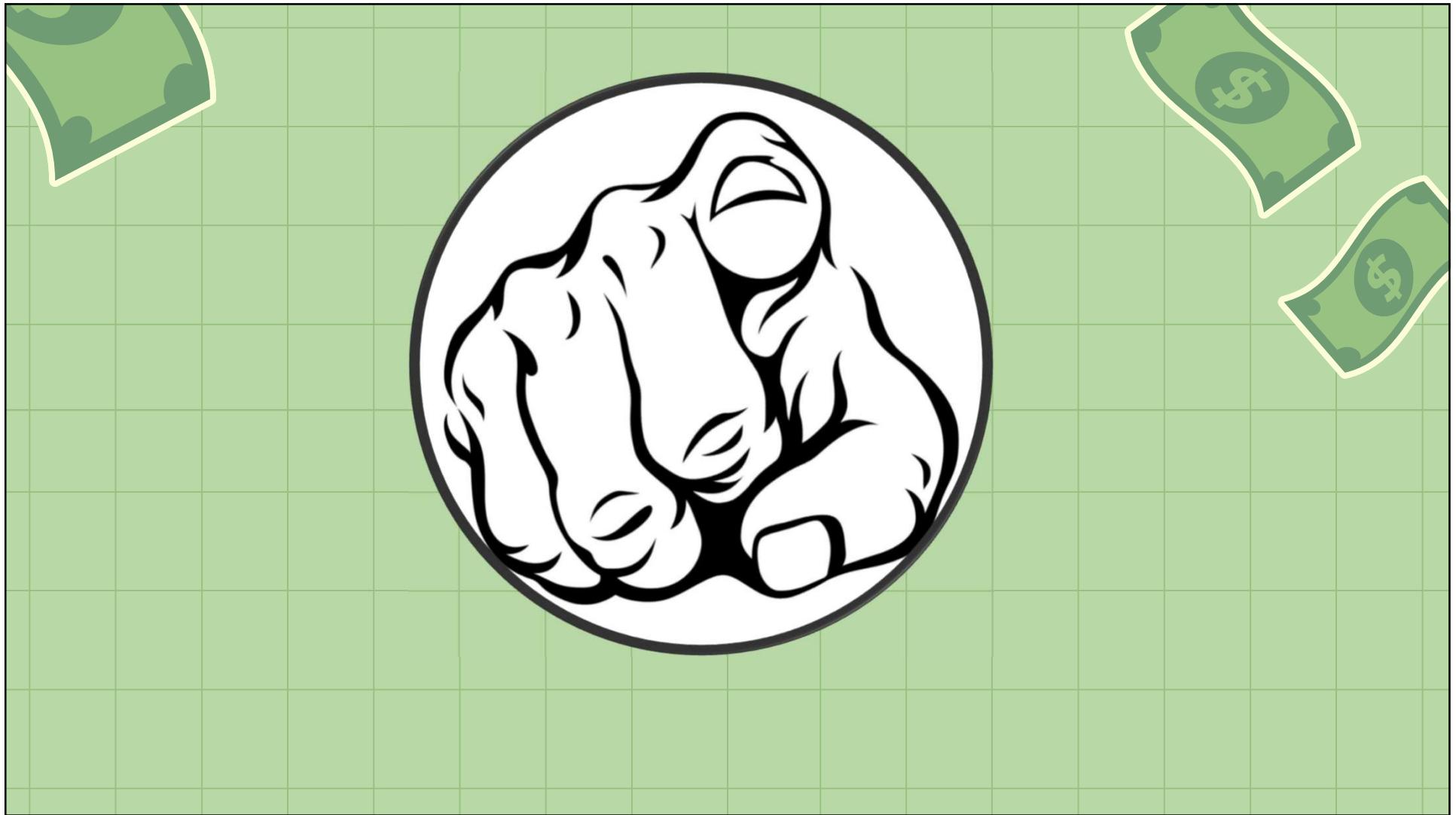


**Do You think our politicians  
are useless?**



A green grid background featuring numerous floating green dollar bills. The bills are scattered across the frame, some overlapping and others positioned alone. Each bill features a white dollar sign symbol in the center.

**Yes :(|**





### Economic Simulator

**Parameters**

**Agents**

- Worker
- Worker
- Worker
- Inward Commuter
- Farm
- Farm
- Farm
- Provider
- Provider
- Provider
- Manufacturer A
- Manufacturer B

3	1	0
0	0	1
1	3	3
Total: 12		

**Agent Properties**

- Worker
- Inward Commuter
- Outward Commuter
- Local Owned Retail
- Non-Locally Owned Retail
- Manufacturer A
- Manufacturer B
- Farm
- Provider

A manufacturer. The manufacturer imports Raw Product B (rice) and produces Consumer Product B (TV) for sale in a store. Manufacturing consumes labor (worker), with one worker being considered the owner and paid the profit.

[Delete Selected Agent](#) [Overwrite Selected Agent](#) [Insert Above Agent](#)

[Global Properties](#)
[Advanced Properties](#)

The map shows a city layout with several buildings and landmarks:

- GROCERY STORE LVL 1
- FARM LVL 1
- HEADQUARTERS
- CONSTRUCTION SLOT
- EXCHANGE
- SALE signs
- Construction slots
- Warehouses
- Buildings with workers
- Buildings with money symbols (\$)

Navigation icons at the bottom:

- Map
- Warehouse
- Search
- Chat
- Exchange

### Simulation

Visual representation of the simulation environment showing agents (workers, providers, manufacturers, farms) and resources (money, products) distributed across the city map.

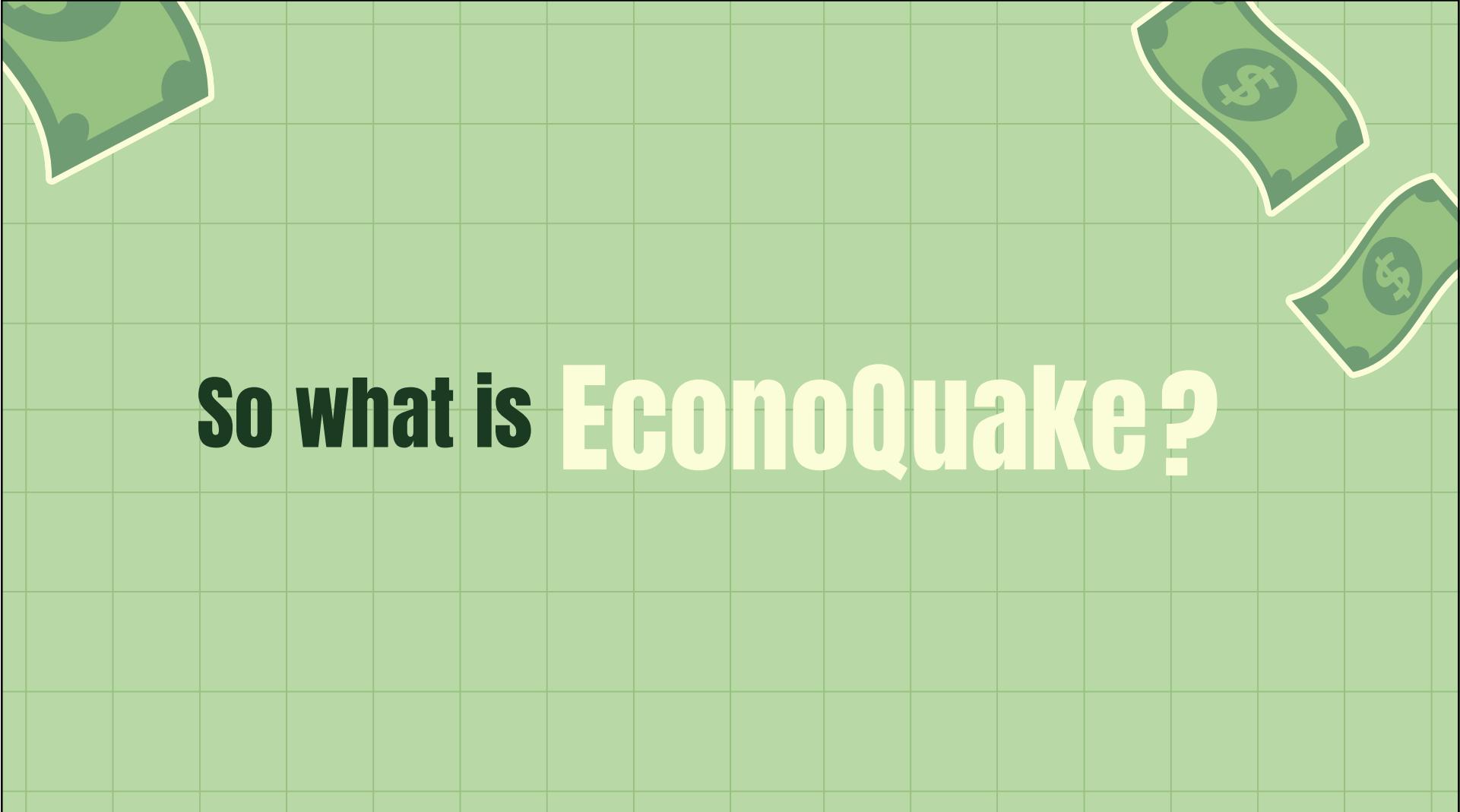
Control buttons at the bottom:

- [Restart Simulation](#)
- [Single Step Simulation](#)
- [Stop Simulation](#)
- [Animate Simulation](#)

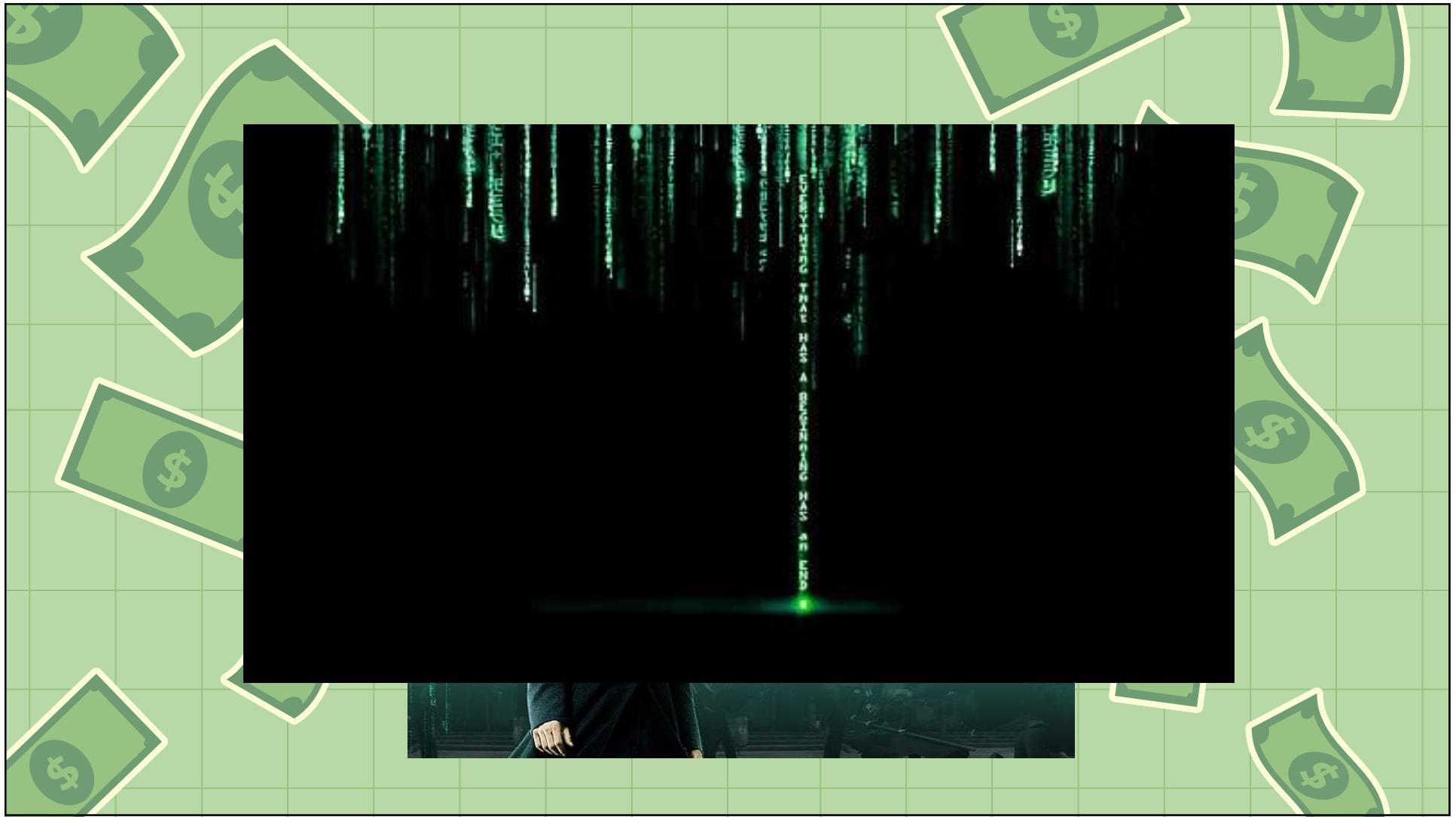


# EconoQuake

Grace Im and Yuan Yin



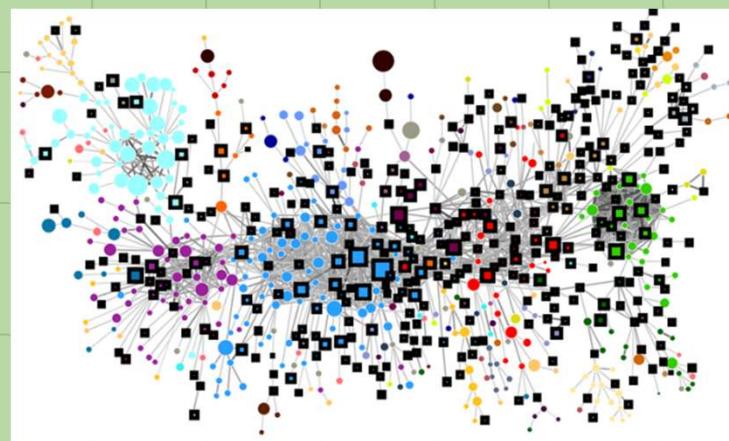
**So what is EconoQuake?**



# **Current Circumstances**

**Difficulty experimenting  
with economics**

**Real-world economies are  
complex and unpredictable**



# **Video Games**

**Video games are effective**

**89% agree helpful for learning**

**Teach the public economic concepts**





### Price/Quality Control

Price per Cup:

- 50

Lemons per Pitcher:

- 4

Day: 7 of 7  
Money: \$64.25

Temperature: 82°F / 28°C  
Weather: Hazy

Sugar per Pitcher:

- 4 + Cups

Ice per Cup:

- 4 + Cubes

Back to Store!

Bankrupt!

OK

Help!

Day: 1 of 7  
Money: \$10.50

Temperature: 55°F / 13°C  
Weather: Clear and Sunny

### End of Season Report

Total Income: \$94.85

Total Expenses: \$50.60

Liquidated Inventory Value: \$6.88

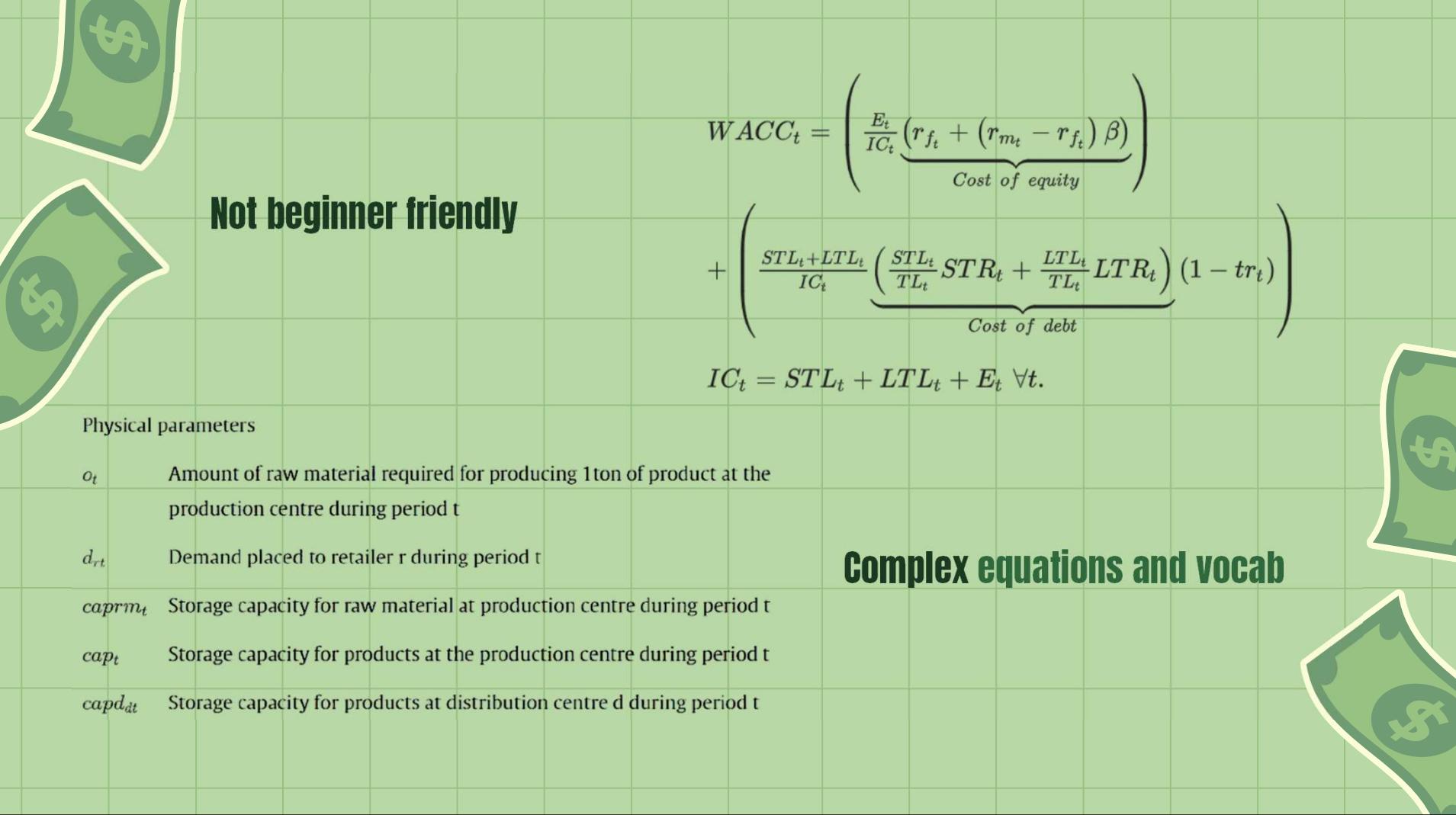
Net Profit/Loss: \$51.13

New High Score!

Previous Best: \$12.51

Congratulations!

Play Again?



## Not beginner friendly

$$WACC_t = \left( \frac{E_t}{IC_t} \underbrace{\left( r_{f_t} + (r_{m_t} - r_{f_t}) \beta \right)}_{\text{Cost of equity}} \right) + \left( \frac{STL_t + LTL_t}{IC_t} \underbrace{\left( \frac{STL_t}{TL_t} STR_t + \frac{LTL_t}{TL_t} LTR_t \right)}_{\text{Cost of debt}} (1 - tr_t) \right)$$

$$IC_t = STL_t + LTL_t + E_t \quad \forall t.$$

### Physical parameters

- $o_t$  Amount of raw material required for producing 1ton of product at the production centre during period t
- $d_{rt}$  Demand placed to retailer r during period t
- $caprm_t$  Storage capacity for raw material at production centre during period t
- $cap_t$  Storage capacity for products at the production centre during period t
- $capd_{dt}$  Storage capacity for products at distribution centre d during period t

## Complex equations and vocab

# Improvements



WIOD

**2000 - 2014**

# 43 Countries

# 56 Sectors

## **Intercountry Input-Output Table**

# **Equations**

**Multi Region Input Output (MRIO)  
model**

**Leontief input output function**



$$\mathbf{X} = (\mathbf{I} - \mathbf{A})^{-1} \mathbf{Y}$$

# Methods

**Pymrio, Pandas  
Library**



**Flask App**

**HTML, JS, CSS**

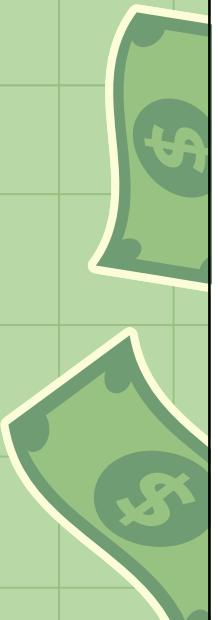
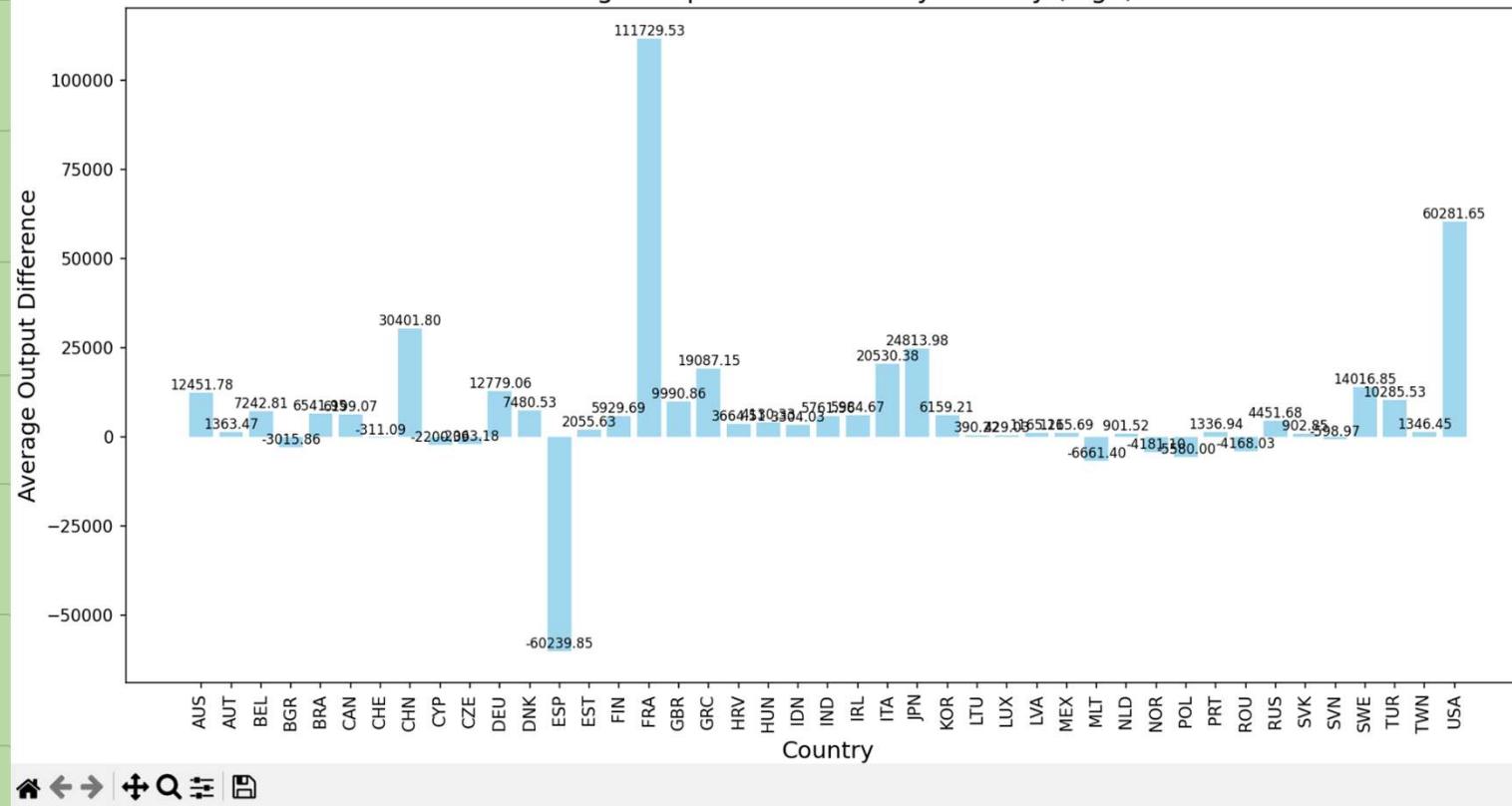


Figure 1

## Average Output Differences by Country (high)



# Interface

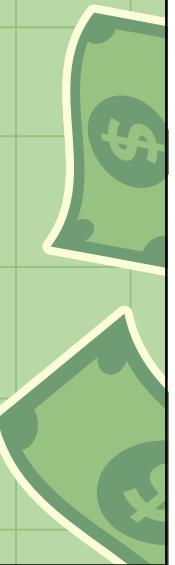
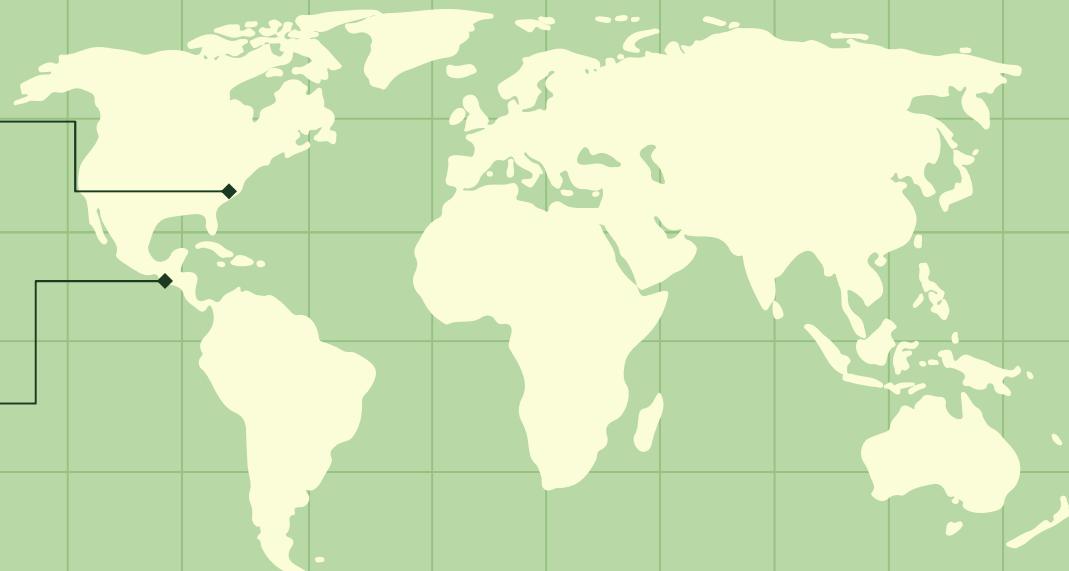
**Country 1** •

GDP

Product descriptions

**Country 2** •

Affected outputs and  
GDP



**Live demo**



# Significance

Economic  
Literacy

Concepts

Education

Interactive  
Simulations



# Future Plans

Design Alternatives

2025

2026

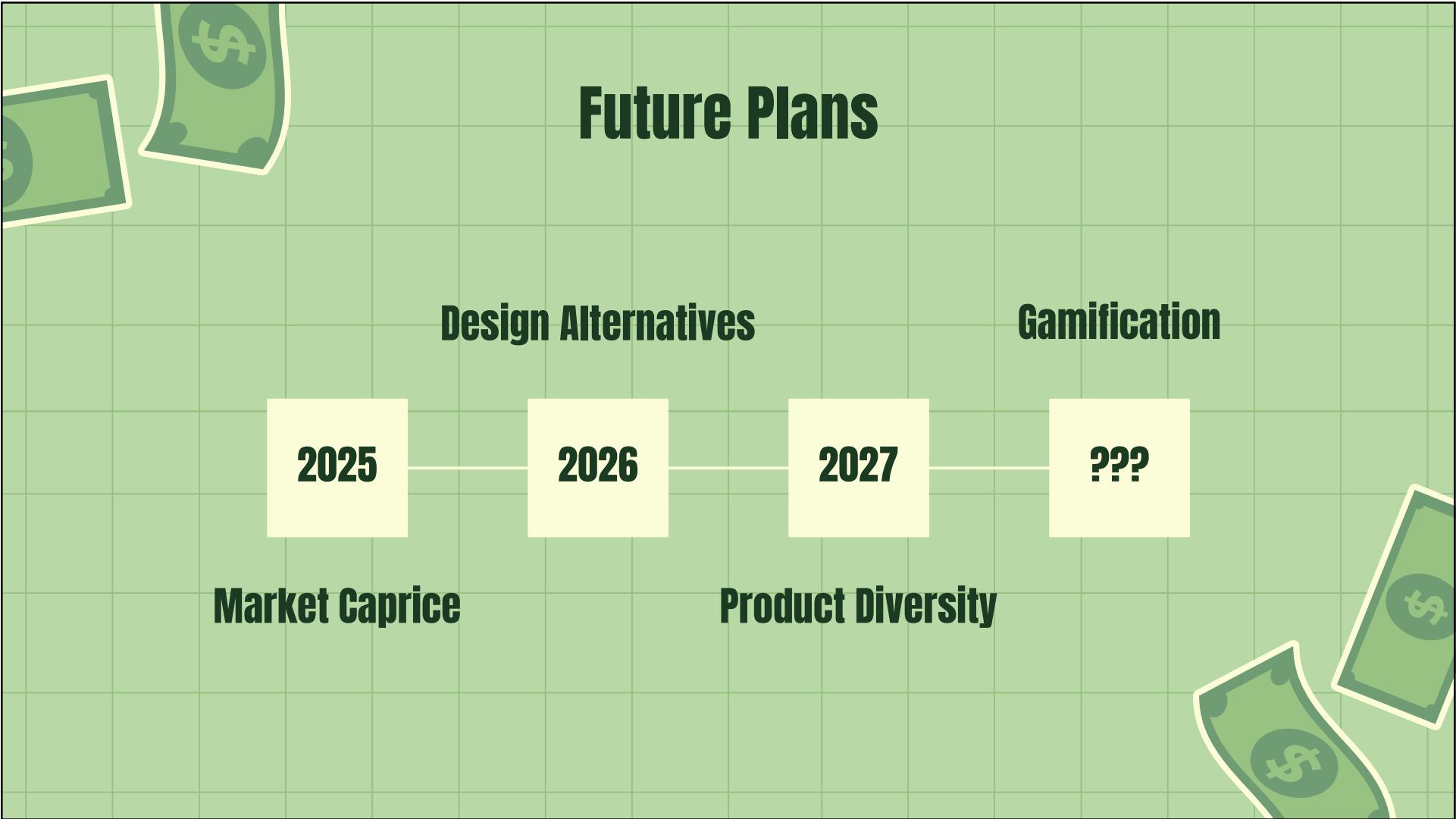
2027

???

Market Caprice

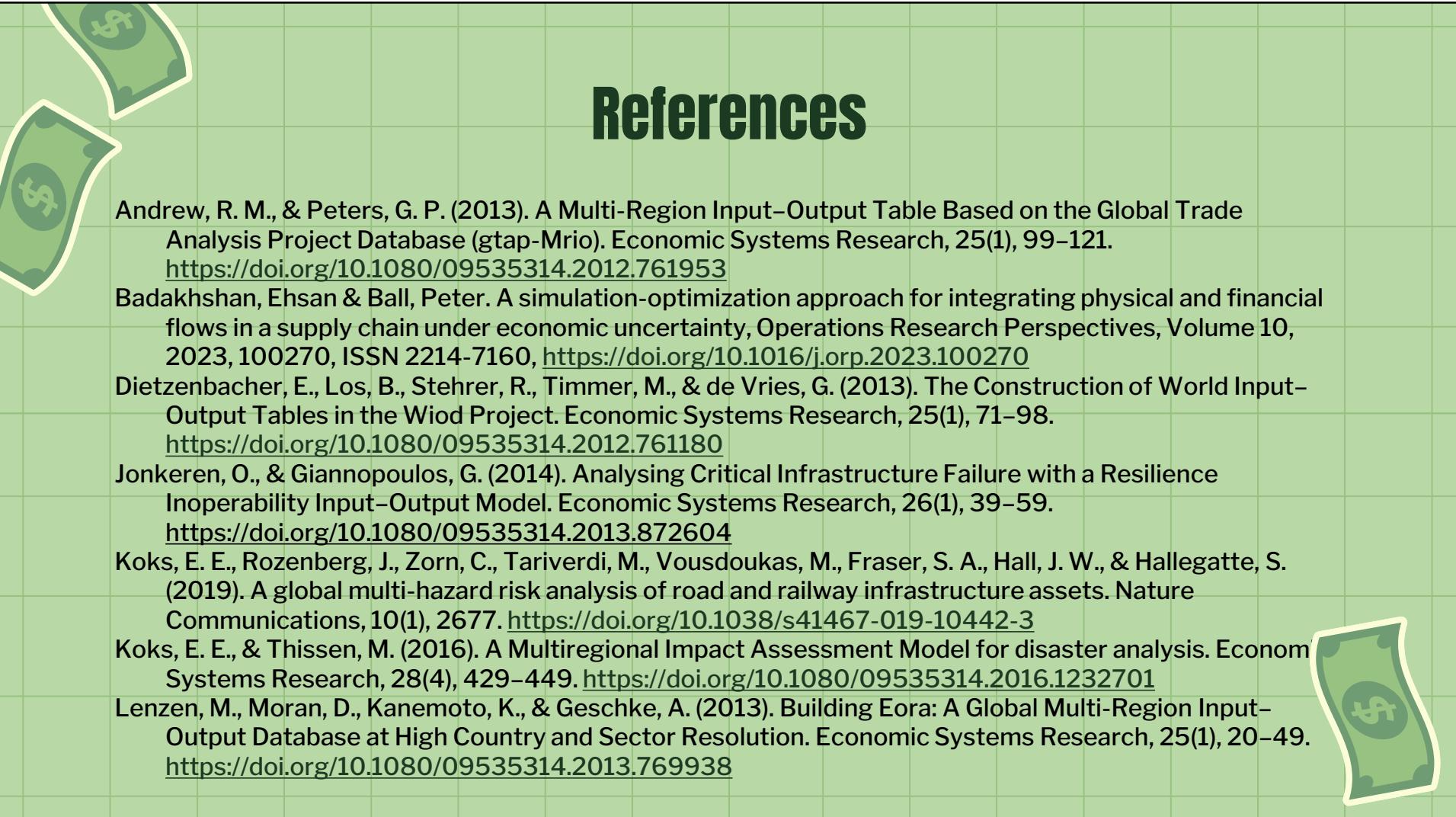
Product Diversity

Gamification



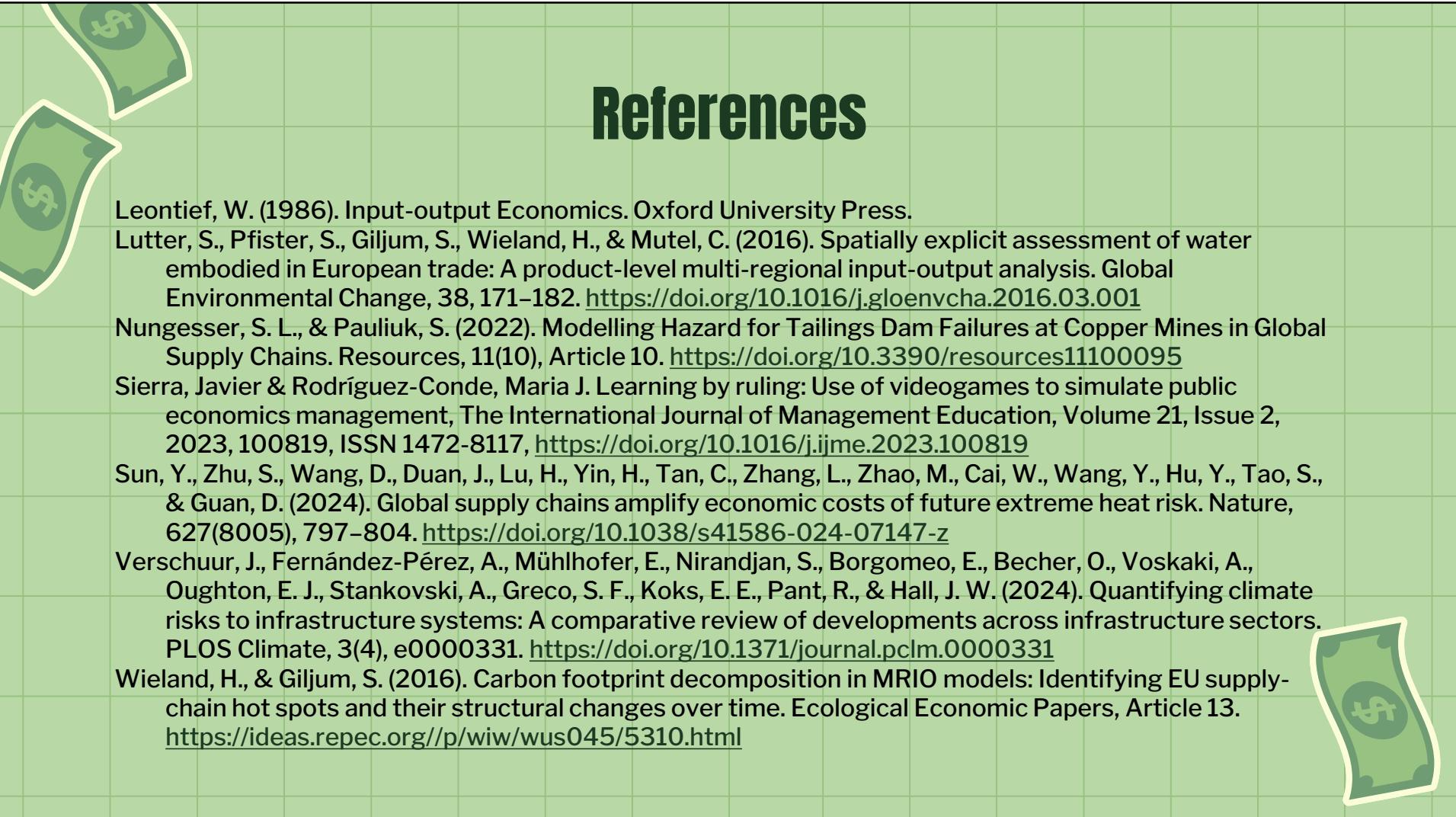


# EconoQuake



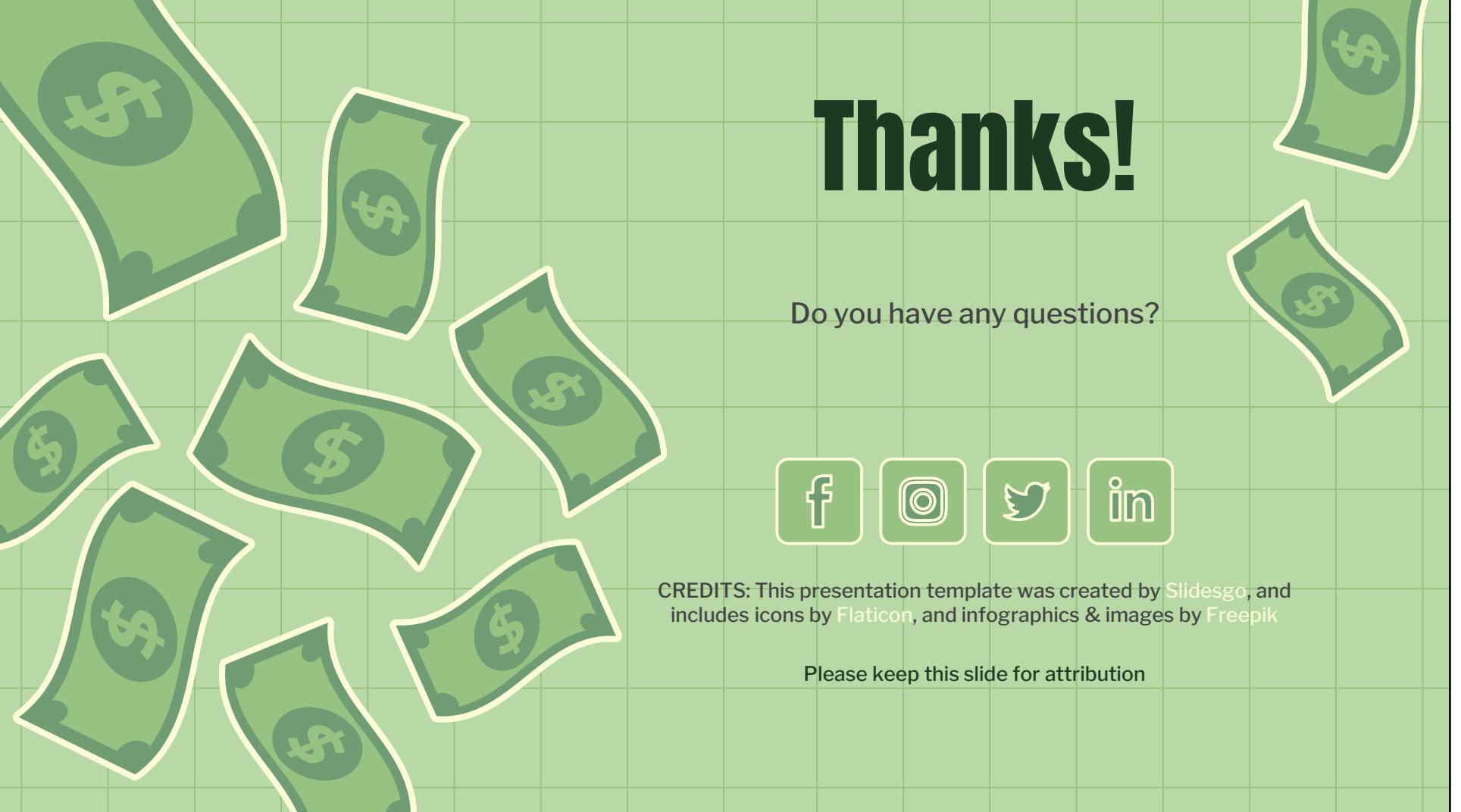
# References

- Andrew, R. M., & Peters, G. P. (2013). A Multi-Region Input–Output Table Based on the Global Trade Analysis Project Database (gtap-Mrio). *Economic Systems Research*, 25(1), 99–121. <https://doi.org/10.1080/09535314.2012.761953>
- Badakhshan, Ehsan & Ball, Peter. A simulation-optimization approach for integrating physical and financial flows in a supply chain under economic uncertainty, *Operations Research Perspectives*, Volume 10, 2023, 100270, ISSN 2214-7160, <https://doi.org/10.1016/j.orp.2023.100270>
- Dietzenbacher, E., Los, B., Stehrer, R., Timmer, M., & de Vries, G. (2013). The Construction of World Input–Output Tables in the Wiod Project. *Economic Systems Research*, 25(1), 71–98. <https://doi.org/10.1080/09535314.2012.761180>
- Jonkeren, O., & Giannopoulos, G. (2014). Analysing Critical Infrastructure Failure with a Resilience Inoperability Input–Output Model. *Economic Systems Research*, 26(1), 39–59. <https://doi.org/10.1080/09535314.2013.872604>
- Koks, E. E., Rozenberg, J., Zorn, C., Tariverdi, M., Voudoukas, M., Fraser, S. A., Hall, J. W., & Hallegatte, S. (2019). A global multi-hazard risk analysis of road and railway infrastructure assets. *Nature Communications*, 10(1), 2677. <https://doi.org/10.1038/s41467-019-10442-3>
- Koks, E. E., & Thissen, M. (2016). A Multiregional Impact Assessment Model for disaster analysis. *Economic Systems Research*, 28(4), 429–449. <https://doi.org/10.1080/09535314.2016.1232701>
- Lenzen, M., Moran, D., Kanemoto, K., & Geschke, A. (2013). Building Eora: A Global Multi-Region Input–Output Database at High Country and Sector Resolution. *Economic Systems Research*, 25(1), 20–49. <https://doi.org/10.1080/09535314.2013.769938>



# References

- Leontief, W. (1986). Input-output Economics. Oxford University Press.
- Lutter, S., Pfister, S., Giljum, S., Wieland, H., & Mutel, C. (2016). Spatially explicit assessment of water embodied in European trade: A product-level multi-regional input-output analysis. *Global Environmental Change*, 38, 171–182. <https://doi.org/10.1016/j.gloenvcha.2016.03.001>
- Nungesser, S. L., & Pauliuk, S. (2022). Modelling Hazard for Tailings Dam Failures at Copper Mines in Global Supply Chains. *Resources*, 11(10), Article 10. <https://doi.org/10.3390/resources11100095>
- Sierra, Javier & Rodríguez-Conde, María J. Learning by ruling: Use of videogames to simulate public economics management, *The International Journal of Management Education*, Volume 21, Issue 2, 2023, 100819, ISSN 1472-8117, <https://doi.org/10.1016/j.ijme.2023.100819>
- Sun, Y., Zhu, S., Wang, D., Duan, J., Lu, H., Yin, H., Tan, C., Zhang, L., Zhao, M., Cai, W., Wang, Y., Hu, Y., Tao, S., & Guan, D. (2024). Global supply chains amplify economic costs of future extreme heat risk. *Nature*, 627(8005), 797–804. <https://doi.org/10.1038/s41586-024-07147-z>
- Verschuur, J., Fernández-Pérez, A., Mühlhofer, E., Nirandjan, S., Borgomeo, E., Becher, O., Voskaki, A., Oughton, E. J., Stankovski, A., Greco, S. F., Koks, E. E., Pant, R., & Hall, J. W. (2024). Quantifying climate risks to infrastructure systems: A comparative review of developments across infrastructure sectors. *PLOS Climate*, 3(4), e0000331. <https://doi.org/10.1371/journal.pclm.0000331>
- Wieland, H., & Giljum, S. (2016). Carbon footprint decomposition in MRIO models: Identifying EU supply-chain hot spots and their structural changes over time. *Ecological Economic Papers*, Article 13. <https://ideas.repec.org/p/wiw/wus045/5310.html>



# Thanks!

Do you have any questions?



CREDITS: This presentation template was created by [Slidesgo](#), and includes icons by [Flaticon](#), and infographics & images by [Freepik](#)

Please keep this slide for attribution