

The GDC logo is rendered in white, bold, sans-serif capital letters. It is positioned at the top center of the slide, set against a large, solid red downward-pointing triangle. The background of the entire slide is a dark blue color, decorated with various geometric shapes: thin red lines forming a large 'X' across the frame, several red diamonds of varying sizes, and a large red downward-pointing triangle at the top and a blue upward-pointing triangle at the bottom. In the corners, there are small red squares and white squares arranged in small clusters.

GDC

Macroeconomics of Game economy

GAME DEVELOPERS CONFERENCE

MARCH 18–22, 2019 | #GDC19

About Me



Darina Emelyantseva

Lead Game economy designer

Lead Level designer

Experience

10-year experience of teaching students **Macroeconomics, Microeconomics, History of economic thought, Regulatory economics**, etc. at a National University.

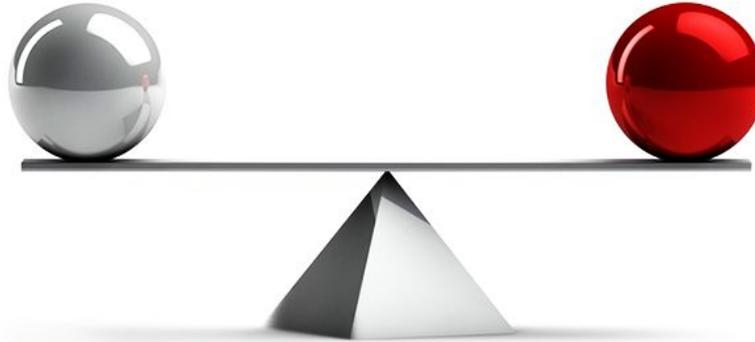
Involved in the research of **government regulation system, taxes, price-cap regulation** in Ukraine, etc.



Everything is in balance

$$Y = E = O$$

Y - Income E - Expenditure O - Output



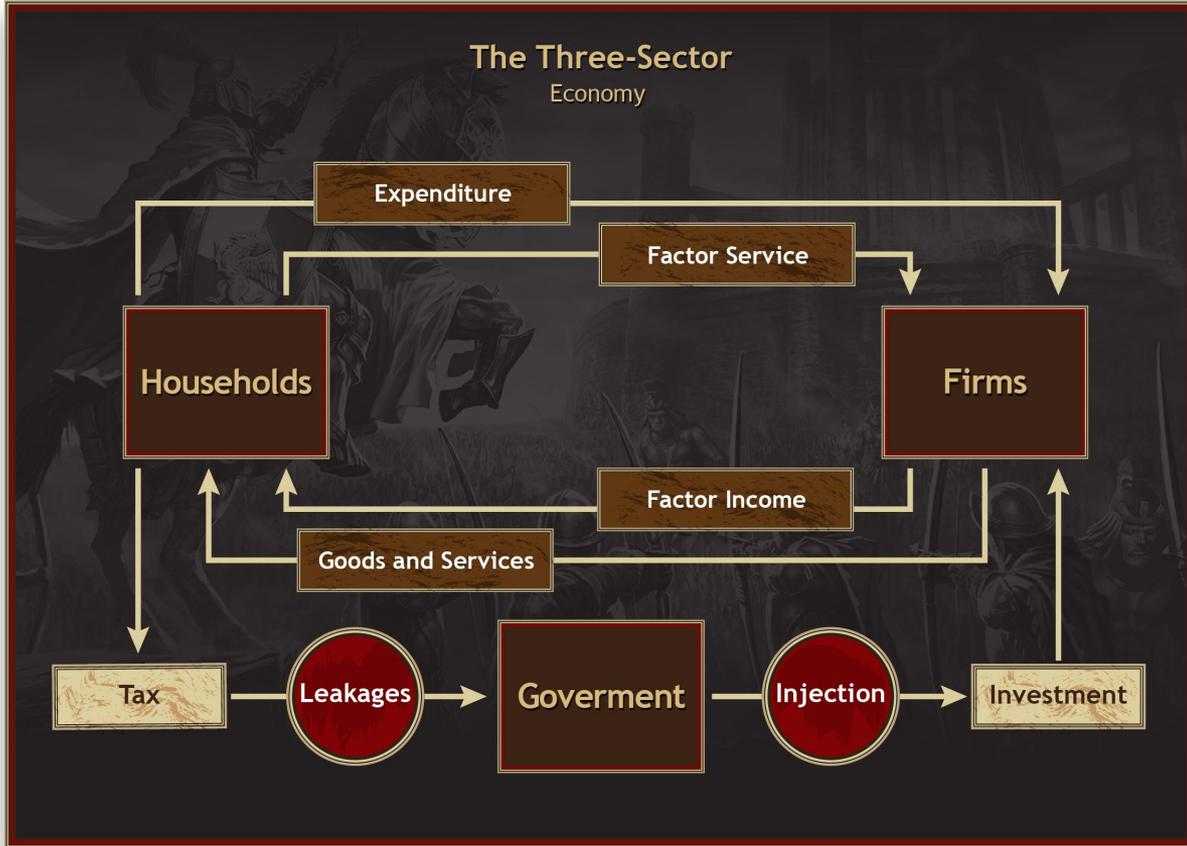
But we know that there is a failure of the market, economic cycles. **How it can be?**

To create
the Macroeconomic model

we use

Aggregation

Aggregation - the collecting of units or parts with similar attributes, behavior, etc. into a mass or whole.



Real Economy

3 agents:

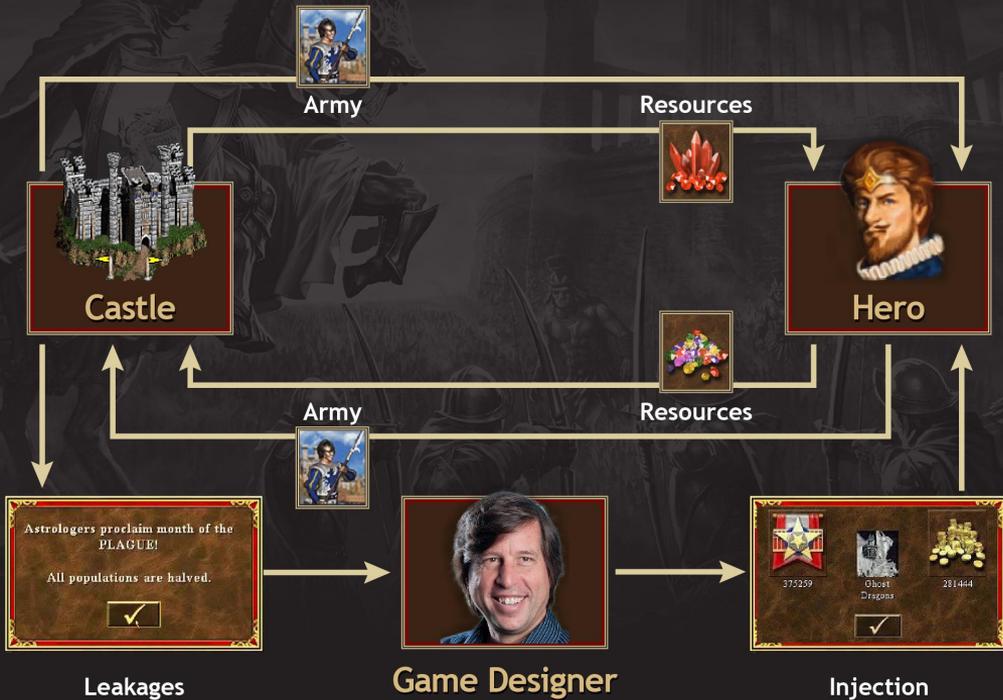
Households - maximization of benefit

Firms - maximization of profit

Government - sets ground rules

The Three-Sector

Economy of Heroes of Might and Magic



Game Economy

3 agents:

Town - upgrade to provide resources and armies

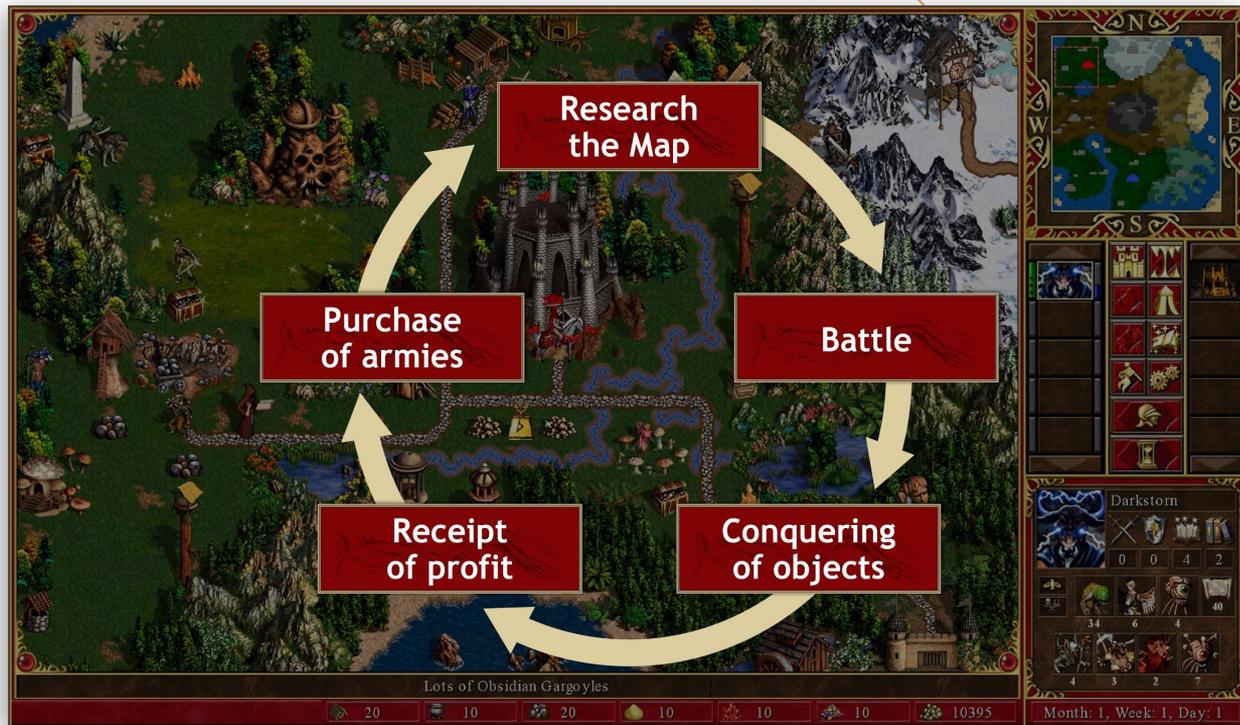
Heroes - conquer towns, exploring map

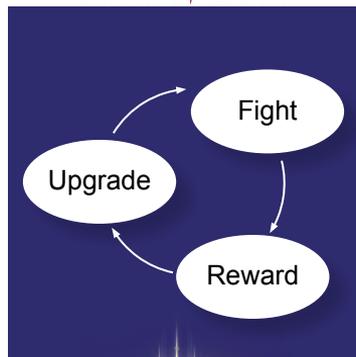
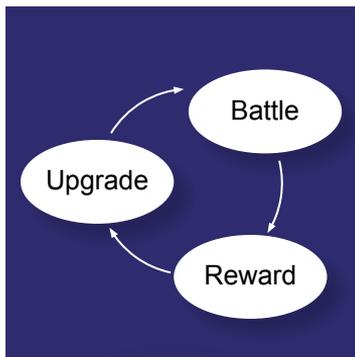
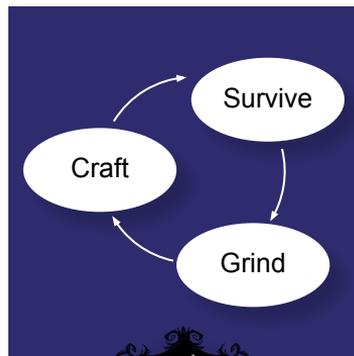
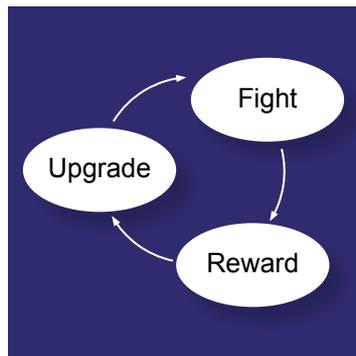
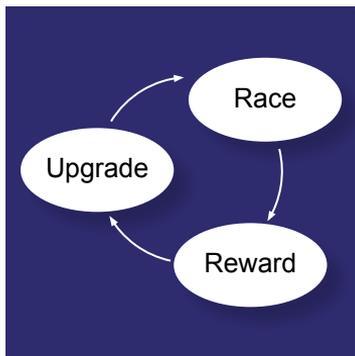
Game designer - sets ground rules

Core loop

The 3-sector economy model looks like a core loop of the game.

This is similar but based not on the actions of a player but on the resources flow.





Core loop

We can use this model for any game with player progression

Formulas in HoMM

PGDP

Maximum of income that a player can get in one day (move)

GDP (income approach)

Income from towns and mines

GDP (from the sources perspective)

Costs of town's upgrades + Costs of armies + Events costs

GDP (from the uses perspective)

Costs of enemy armies + Costs of armies that stay in the towns + Taxes (bad events from GD)

$$Y = E = O$$

This equality

can you help to create

Value measuring methodology for your game

e.g. **Maximum GDP** = Maximum income

Maximum GDP = Maximum purchases

Maximum GDP = Value of all monsters on the map



Income



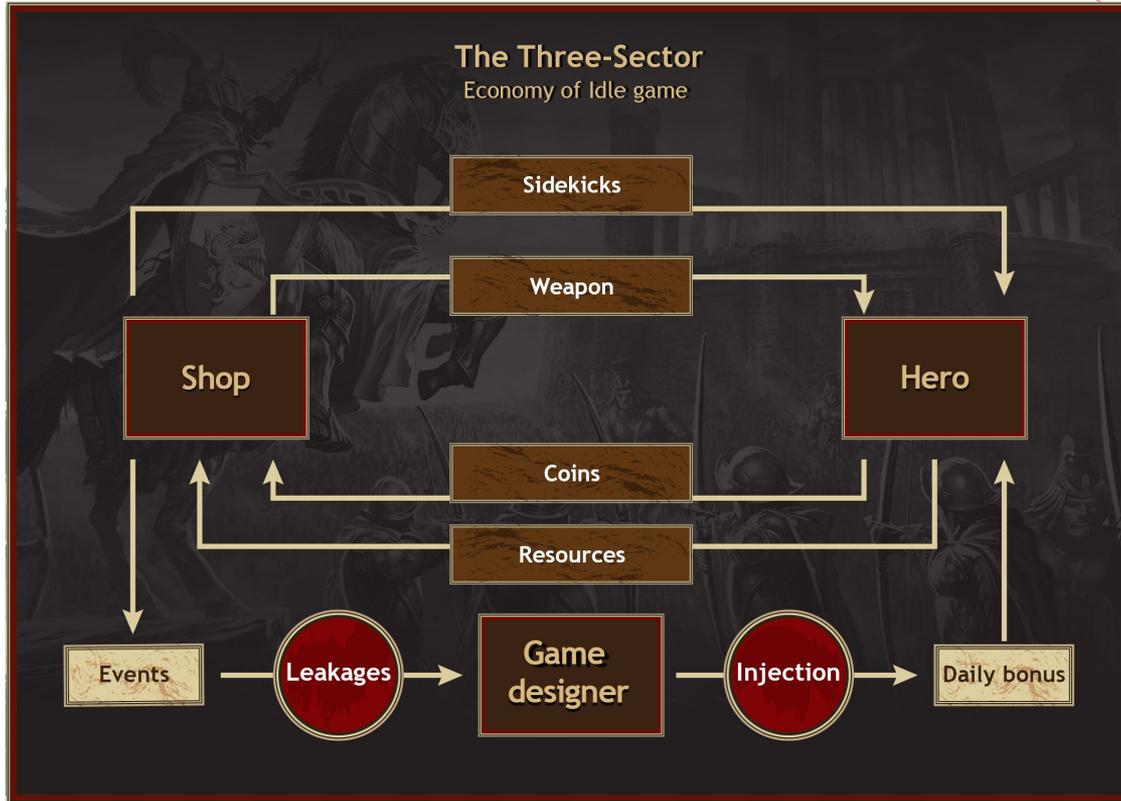
Output



Expenditures



Idle game economy



The households are source of resources. Resources are used by Hero-firm to create more profit

Idle game

The initial conditions

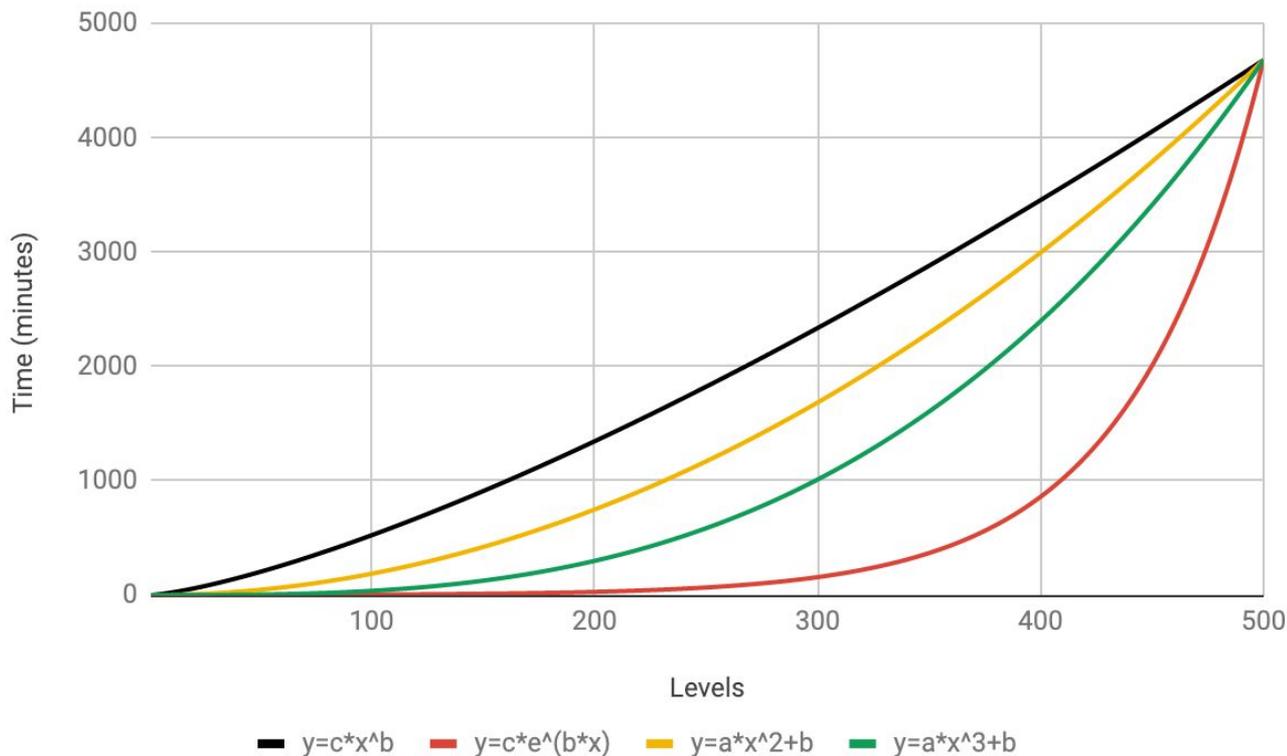
Player abilities	Shop	10 cities	4 seasons	2 Parts of the day
Health	Increase ability	Hong Kong	Winter	Day
DPS	Equipment	Berlin	Spring	Night
HRPS	Sidekicks	Paris	Summer	
		New York	Autumn	
		Toronto		
		London		
		Moscow		
		Beijing		
		Tokio		
		Sydney		

Total time of playing (days)	90
Session time (min)	13

Sessions in a day	4
Total time of playing in 1 day (min)	52

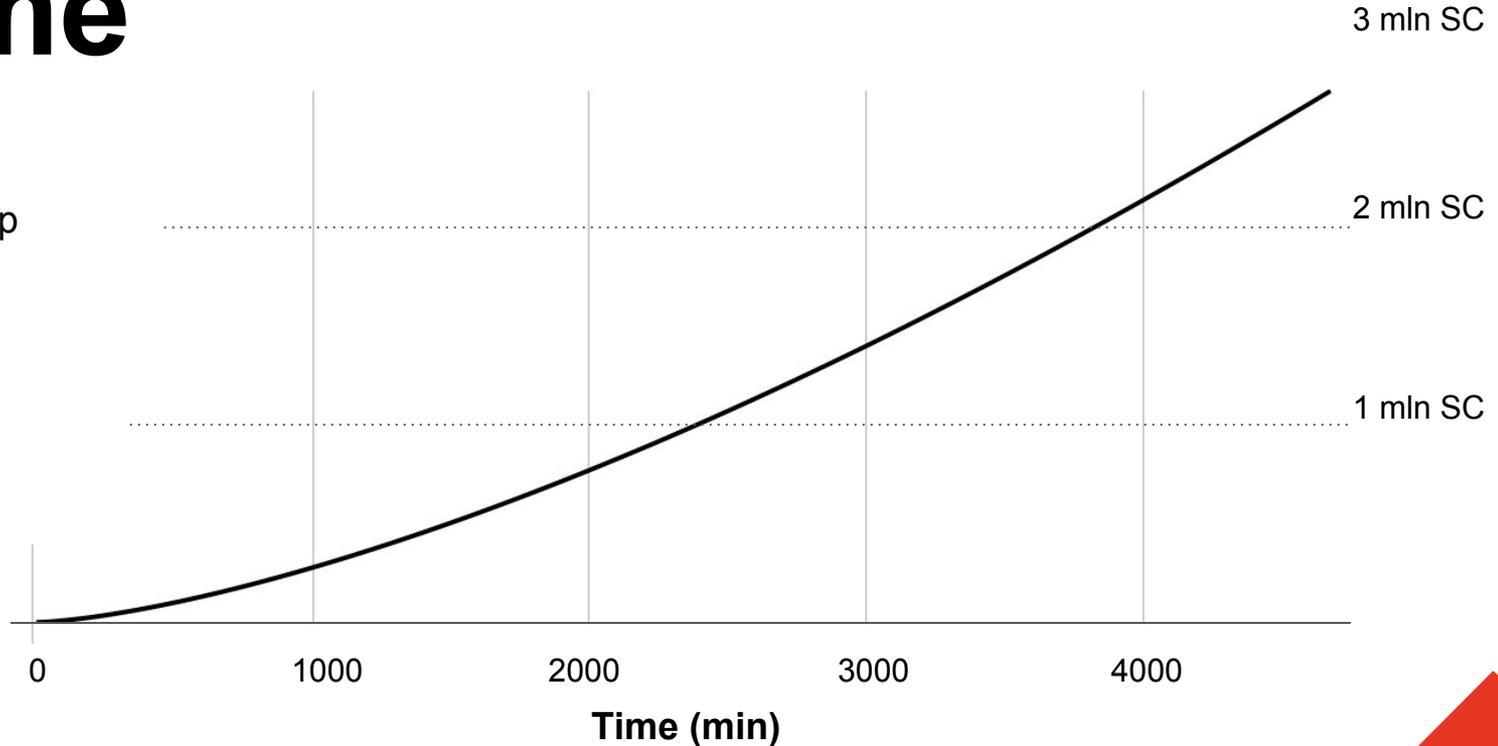
Choosing correct progression formula

Find the relationship between **content** and **time**



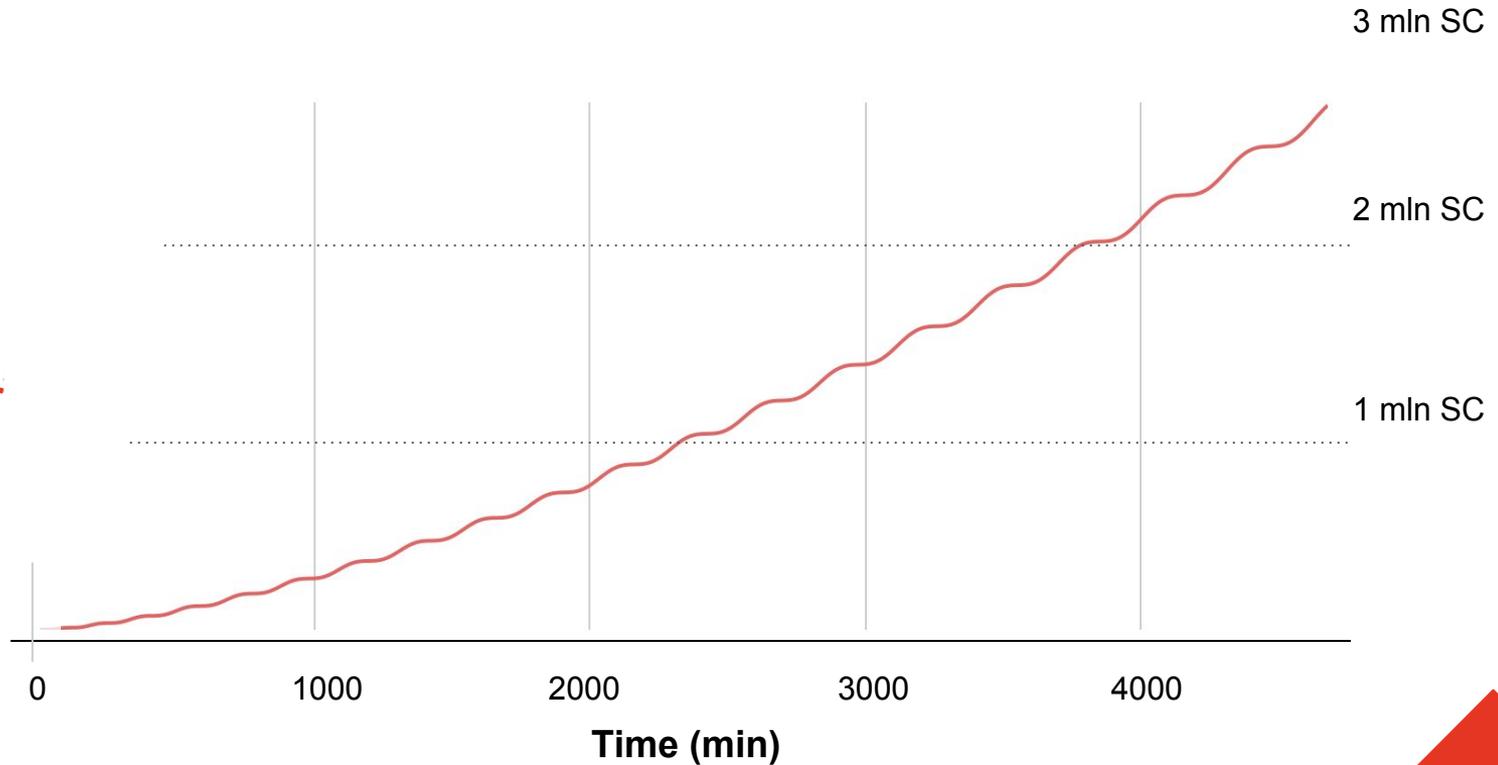
Income

Find the relationship
between **Time** and
Income (GDP)



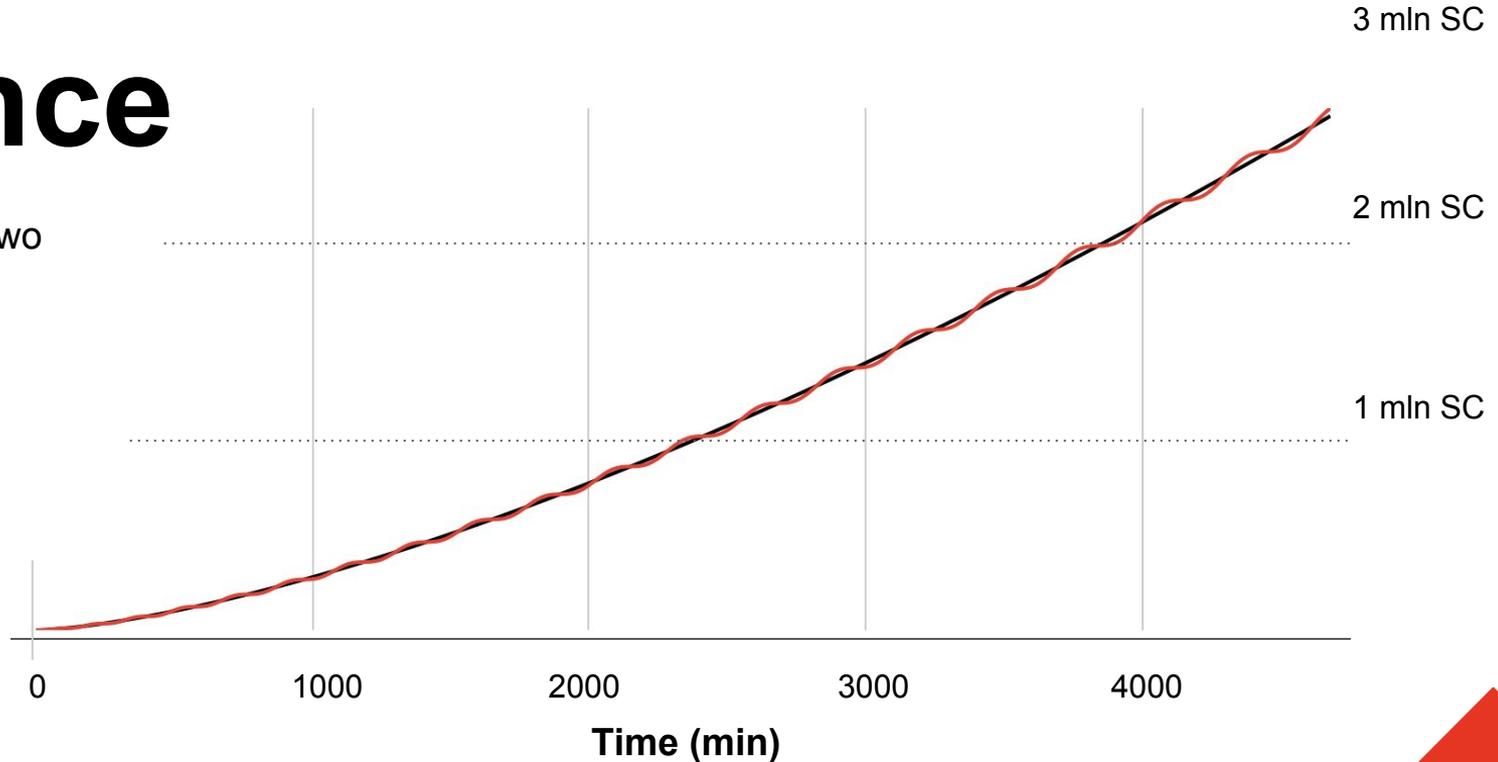
Cost

The relationship
between
**abilities/enemy's
power and time or
soft currency**



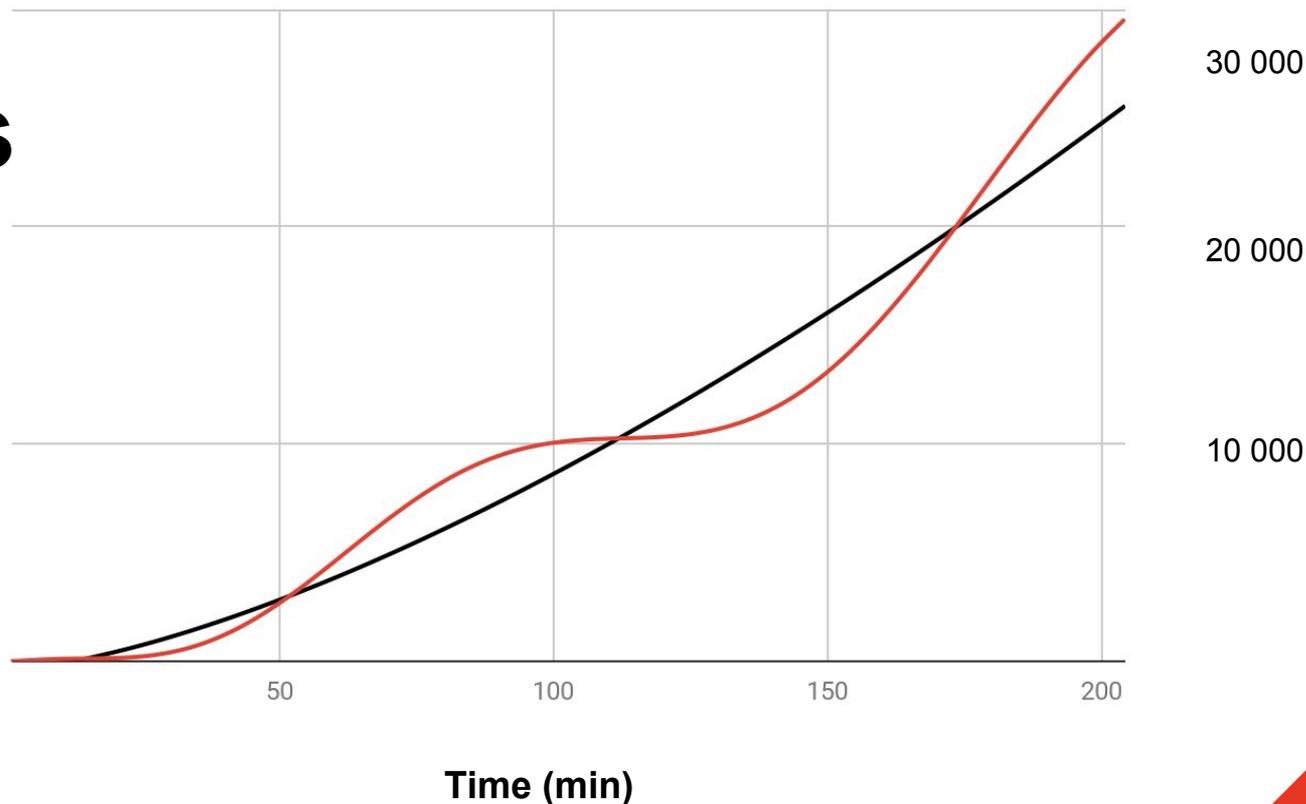
Long Term Balance

Let's combine the two
charts



First 50 Levels

At early stages, a player has certain resources and his income covers his expenses. Than, victory over enemies requires that a player accumulate powers and stock up on resources



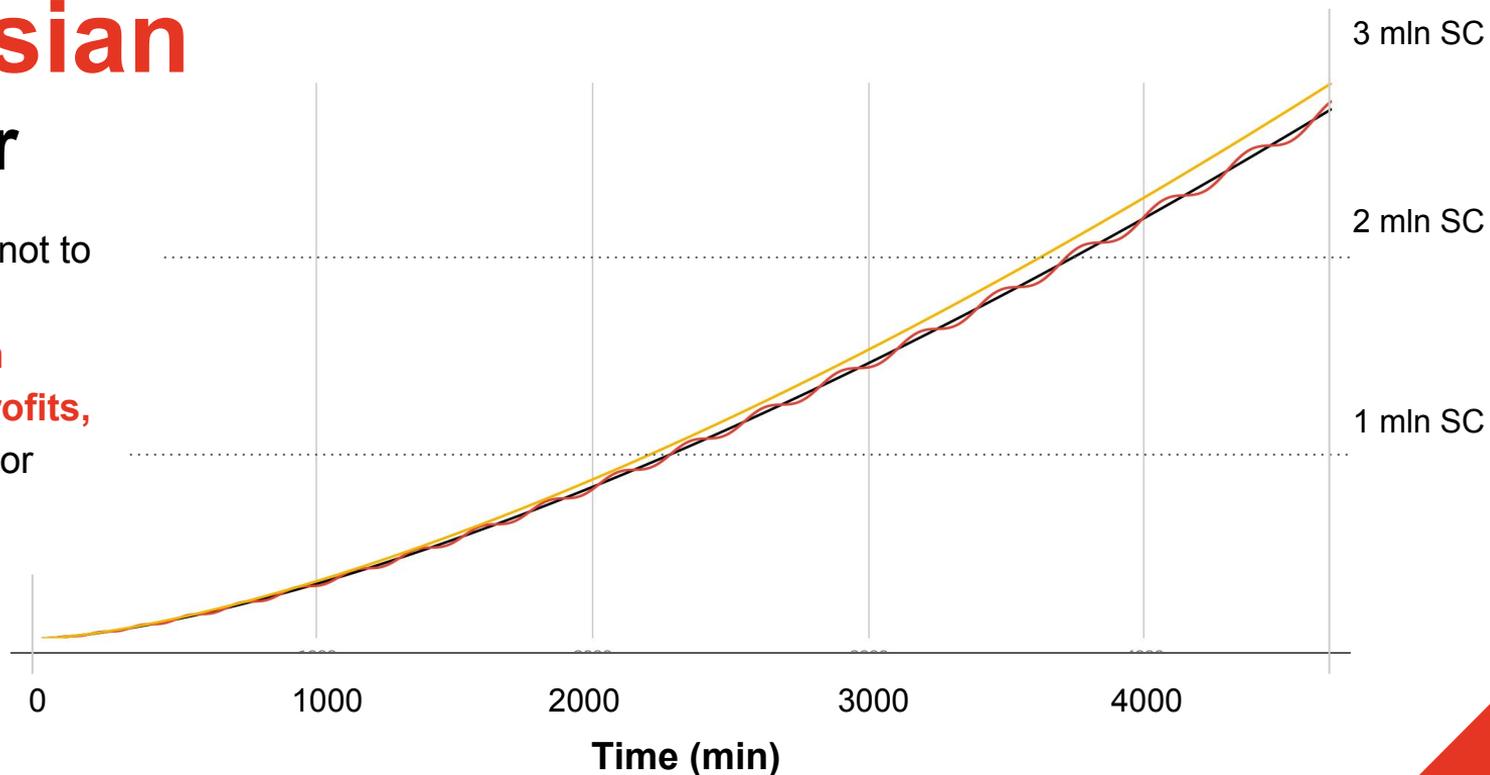


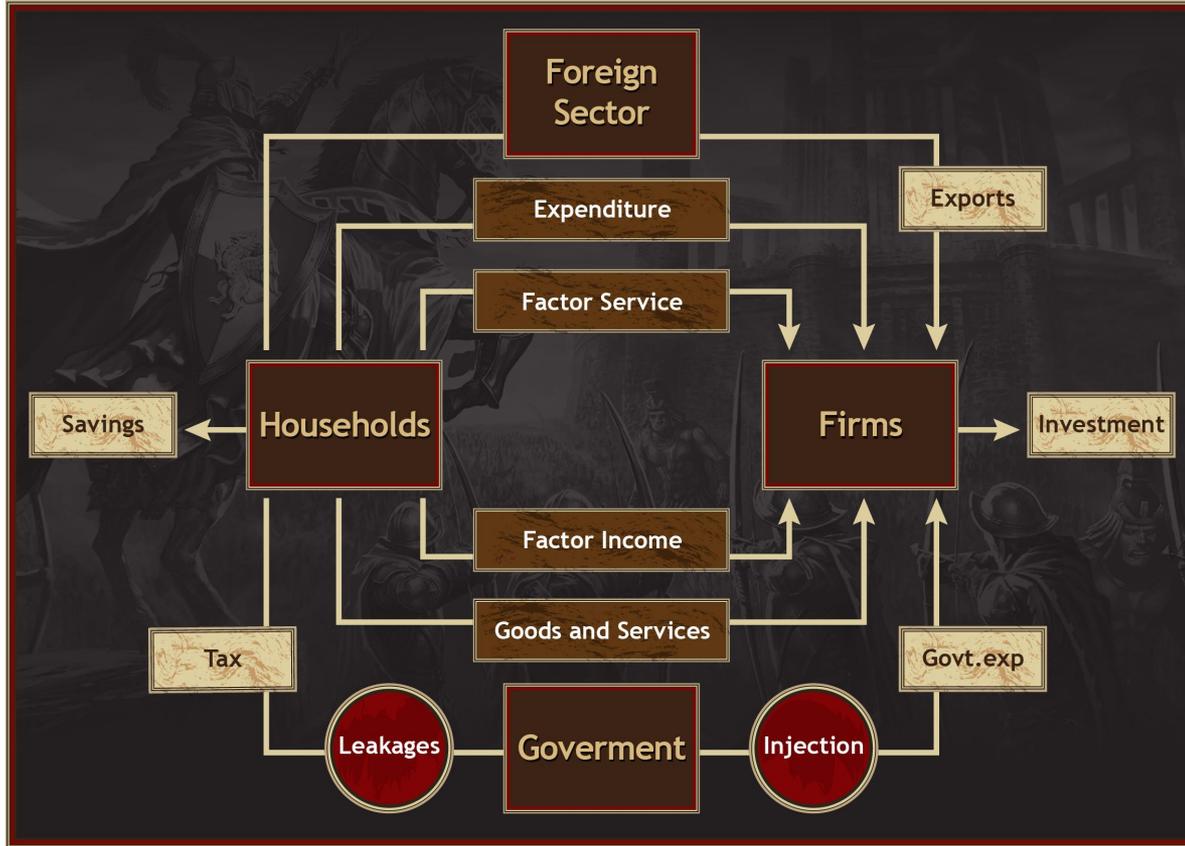
Investments in a player's progress

If an army of enemies joins a hero early in the game - **the hero become stronger that allowed him to incur smaller losses in battles and become stronger yet again as well as explore the map faster**

Influence of Keynesian multiplier

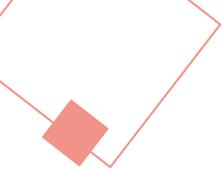
It is very important not to have investment resources, that **can bring long-time profits**, depend on chance or random factors.





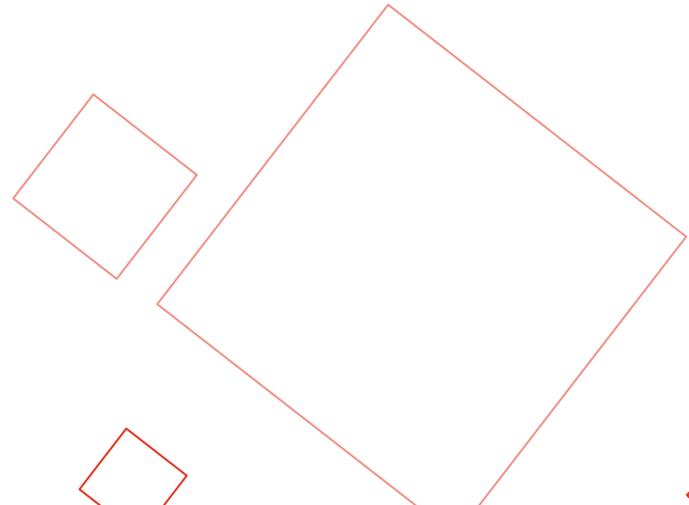
Four sector economy

The foreign sector in in-game economy is the source of investments (microtransactions), So it can give similar to the **Keynesian Multiplier** result



How to avoid this?

- ❖ Use **patience walls**
- ❖ Sell skins
- ❖ Create the balance based on **competition** (be sure that you have enough content)
- ❖ Use **dynamic balance game system**
- ❖ Create large **deficit**
- ❖ Use **depreciation** of tools
- ❖ etc.



In-game Pricing Methods

1. The value measuring methodology
2. The formula of compound interest
3. The equation of exchange

The equation of exchange

$$M \times V = P \times Y$$

Where: **M** = the money supply, usually the M1

V = the velocity of money

P = the price level

Y = real output, or real GDP.

The formula of compound interest

$$A = P (1 + r)^t$$

Where: **A** = the future price

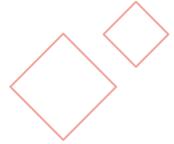
P = the initial price

r = the rate of growing (decimal)

t = the number of times the price will rise



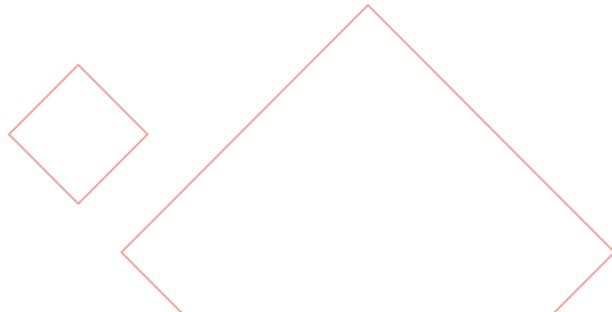
Pricing Methods



Cost + Profit are not the best option

Cherry-picking - highest possible price established because players purchase anyway

Follow-the-leader - following prices established by the main competitors





Inflation

- ❖ wearing-out of weapons
- ❖ auctions
- ❖ taxation at auctions
- ❖ premium goods
- ❖ rent
- ❖ payment for setting up a guild
- ❖ payments for relocating/passing the boards
- ❖ monthly contributions to guilds
- ❖ powering up (with a chance of bad luck)
- ❖ second-type currency
- ❖ lottery
- ❖ loan bonds
- ❖ etc.



Conclusion

- ❖ Create 3- or 4- sector economy
- ❖ Find maximum GDP
- ❖ Find all relationships between all resources
- ❖ Avoid increasing the investments in your economy
- ❖ Find needed prices
- ❖ ...
- ❖ PROFIT!!!

Thank you!

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