SITARE
University

Economics

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- Education
  - BS Computer Science, MS University, India
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- Work
  - 20+ years technology/product management experience
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What is Economics?

- **Definition:** Economics is the study of how individuals and businesses make choices to allocate **limited resources** against unlimited **wants/needs** (taking into consideration **opportunity costs**.)

- It focuses on decision-making regarding **production**, **consumption**, and **distribution** of goods and services.

What is Economics?

- Economics helps tech professionals understand **market dynamics**, **pricing strategies**, and **resource management**, key to product development and business decisions in tech.

- Understanding economics aids in areas like **software pricing**, **tech entrepreneurship**, and data-driven **decision-making**.
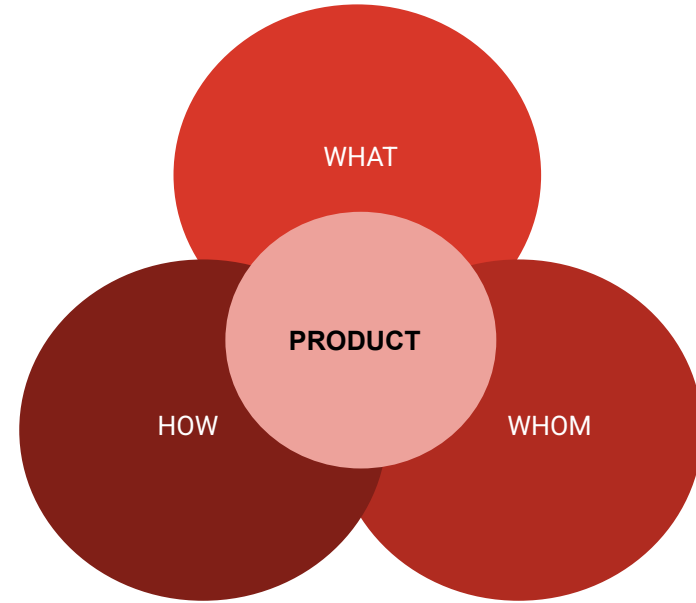
Basic Economic Questions

- **What to produce?**
  - Determining what products or services should be produced based on consumer demand and resource availability.
  - e.g. Deciding whether to develop a new mobile app or enhance an existing platform depends on market needs and resource allocation.
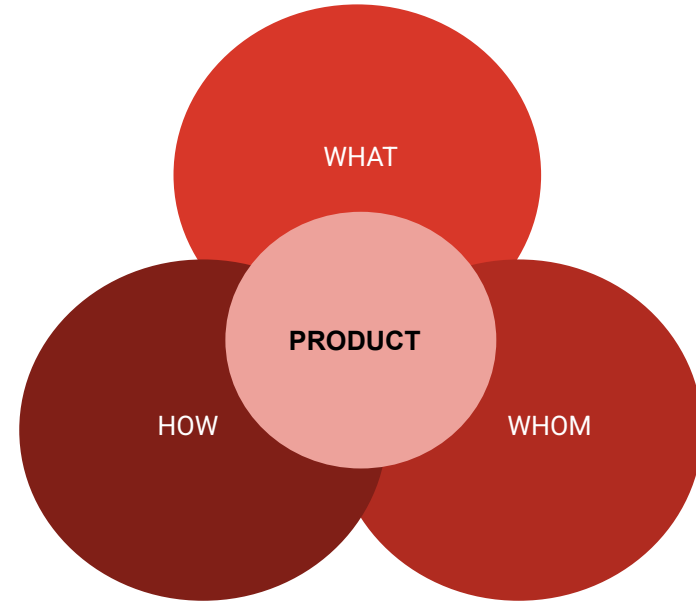
- **How to produce?**
  - Choosing the methods and resources used in production, balancing efficiency and sustainability.
  - e.g Opting between in-house development versus outsourcing certain components involves evaluating cost, quality, and time.
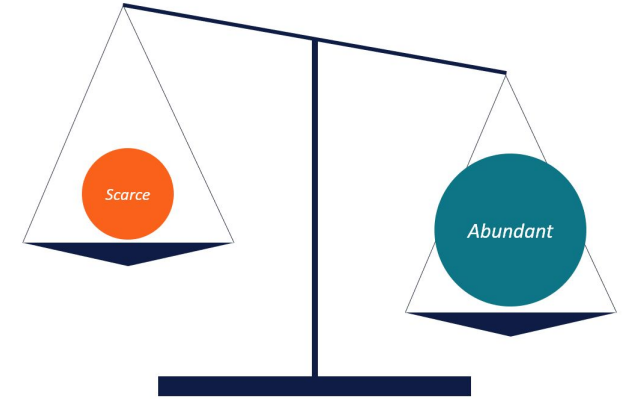
Basic Economic Questions

- **For whom to produce?**
  - Deciding users and distribution mechanisms and equity considerations.
  - E.g. Targeting your software to enterprise clients versus individual consumers affects pricing strategies and feature sets.
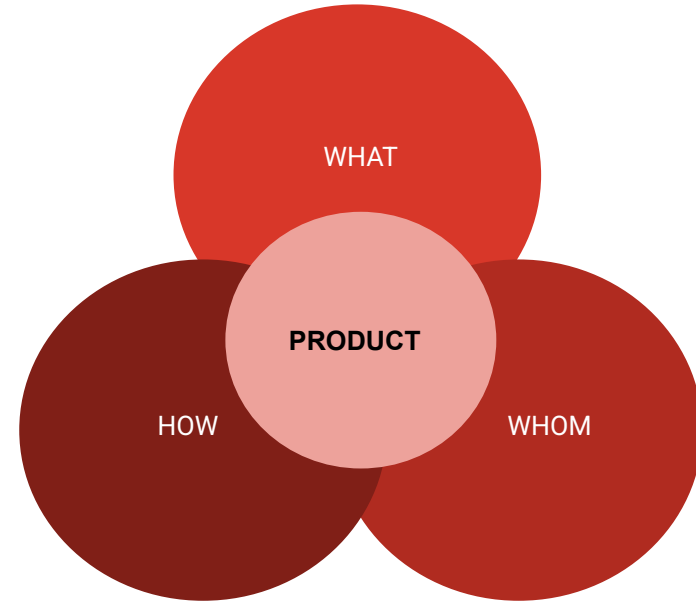
Basic Economics Problem - Scarcity/Choice/Opportunity Cost

Scarcity:

- **Definition:** Scarcity refers to the fundamental economic problem of having **limited resources** to meet **unlimited wants** and needs.
- In every economy, resources such as time, money, labor, raw materials, and technology are finite, meaning there isn't enough to produce everything everyone desires.
- **Example:** A cloud storage company provides limited storage capacity for its users, and its servers have a finite amount of space and processing power.
- With a growing user base and increasing demand for storage, the company's server resources become scarce.

Choice & Opportunity Cost:

- ○ **Definition:** Because resources are scarce, individuals, businesses, and governments must make **choices** about how to allocate them. These choices involve deciding what to produce, how to produce it, and for whom, as choosing one option often means forgoing another. This is known as **opportunity cost**, the value of the next best alternative when a choice is made.

- **Example**:
  - A tech startup has a limited team of developers and a fixed budget. The company has two options:
    - **Option A**: Enhance an existing app by adding a new AI-based recommendation feature.
    - **Option B**: Build a new app targeting a different user base.
  - If the company chooses **Option A**, the opportunity cost is the potential revenue, market share, and user growth that could have been achieved by developing and launching the new app
  - Conversely, if it chooses **Option B**, the opportunity cost is the increased user engagement and retention that could have come from improving the existing app.

- **Other Examples**:
  - Limited investment resources mean a startup must decide between scaling its app, improving infrastructure, or investing in marketing.

  - Choosing to spend your coding hours developing a new feature instead of working on documentation means the opportunity cost is the improved documentation.

  - A computer science student spends time coding a new project rather than attending a coding workshop—lost learning opportunities are the opportunity cost.

Microeconomics vs. Macroeconomics

- **Microeconomics (Bottom-up):**
  - Focuses on **smaller-scale economic concerns**, such as individual markets, consumers, and businesses.
  - Studies consumer preferences, market prices, production costs, and how **supply and demand** for specific goods and services interact in specific markets, and how individuals and businesses make financial decisions.
  - *e.g.* Analyzing how a software company sets prices for its products.

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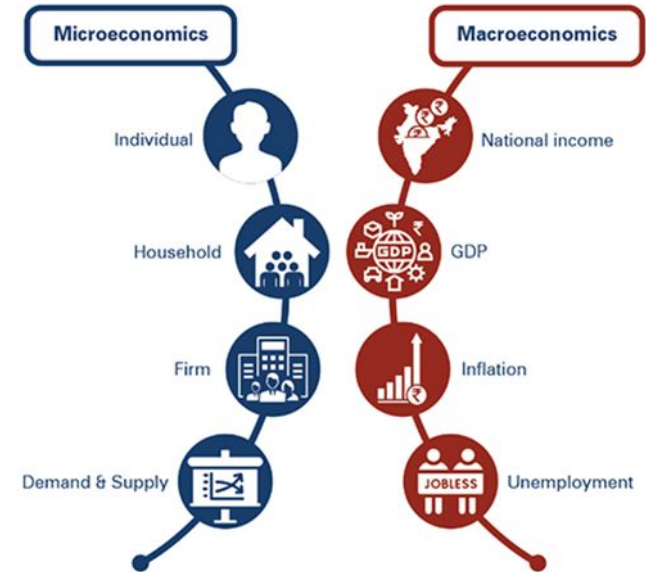
Microeconomics vs. Macroeconomics

- **Macroeconomics (Top-down):**
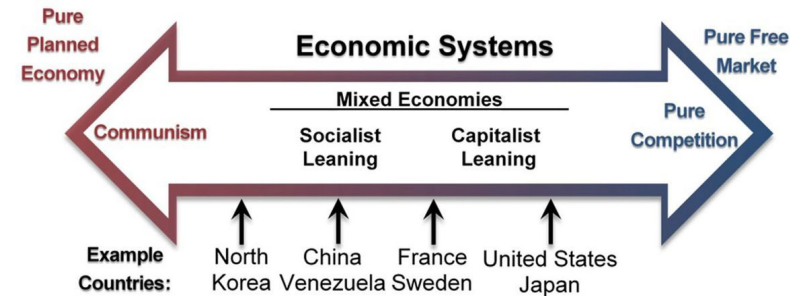 - Focuses on the **big picture**, studying the economy as a whole, including factors that impact nations and geographical regions.
  - Studies broad trends, such as employment, national income, inflation, and gross domestic product (GDP), and how the government contributes to economic growth.
  - *e.g.* Understanding how national economic policies affect the tech sector's growth.
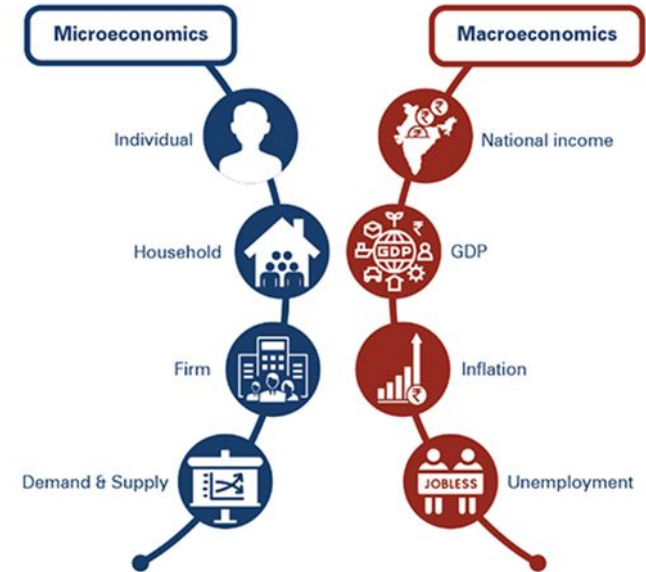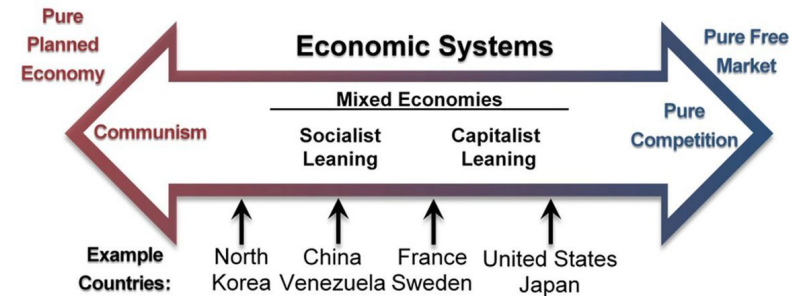
Types of Economic Systems

- **Market Economy:** Decisions driven by supply and demand with **minimal government intervention**.
    - **Key Features:** Innovation and competition drive success, private ownership, profit motive, supply/demand determine pricing and resource allocation
    - **Advantages:** Efficiency, Consumer Choice, Innovation
    - **Challenges:** Income Inequality, Market Failures (e.g., pollution), Limited Public Goods
    - **Examples:** US, Japan, Germany

Economic Systems

Pure Planned Economy — Communism

Mixed Economies — Socialist Leaning | Capitalist Leaning

Pure Free Market — Pure Competition

Example Countries: North Korea | China Venezuela | France Sweden | United States Japan
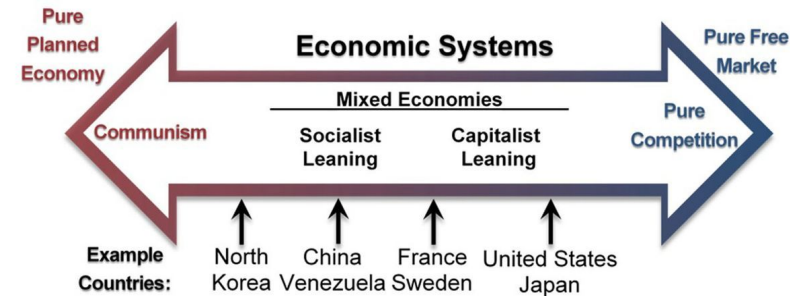
Types of Economic Systems

- **Command Economy:** Centralized decision-making where the government/state makes all decisions regarding production and distribution.
  - **Key Features:** Government Ownership, Centralized Planning, Limited Consumer Choice, Fixed Prices
  - **Advantages:** Income Equality, Economic Stability, Focus on Social Goals (e.g., health, education)
  - **Challenges:** Lack of Efficiency, Limited Innovation, Restricted Consumer Choice
  - **Examples:** North Korea, Cuba

Types of Economic Systems

- **Mixed Economy:** Combination of market and command systems.
    - e.g. India - private enterprises operate in industries like IT, manufacturing, retail, and services;
    - government maintains significant control over critical sectors like defense, railways, energy (coal, oil, gas), healthcare, education, and infrastructure.
    - Advantages: Balanced Economic Growth, Social Welfare and Equity, Innovation with Oversight
    - Challenges: Regulatory Burdens, Potential for Inefficiency, Public vs. Private Conflicts

Economic Systems

Pure Planned Economy — Mixed Economies (Socialist Leaning, Capitalist Leaning) — Pure Free Market

Communism — Pure Competition

Example Countries: North Korea, China Venezuela, France Sweden, United States Japan

International Economics

Trade Theories:

- **Comparative Advantage:** The ability of a country to produce a good at a lower opportunity cost than another. *e.g.:* A country with advanced software development skills may specialize in IT services.

Exchange Rates:

- The value of one currency in terms of another, determined by factors like interest rates, economic stability, and trade balances. *e.g.:* A strong USD can make imported hardware components cheaper for American tech companies.

Trade Policies:

- **Tariffs:** Taxes on imported goods to protect domestic industries.

- **Quotas:** Limits on the quantity of a good that can be imported.

- **Free Trade Agreements:** Agreements between countries to reduce trade barriers. *E.g.:* India-ASEAN (Association of Southeast Asian Nations) which includes countries like Indonesia, Malaysia, Singapore, Thailand, and Vietnam. Reduce or eliminate tariffs for electronics, textiles, chemicals
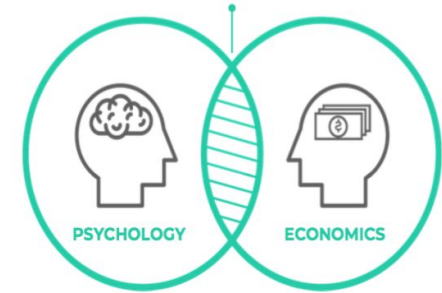
Behavioral Economics

Behavioral economics integrates insights from psychology into economic models to better understand how people make decisions. Example Concepts:

- **Loss Aversion:** People prefer avoiding losses to acquiring gains of the same value.
    - e.g. a developer may resist switching from a familiar but inefficient programming language to a more efficient one because they fear the "loss" of comfort and familiarity, even though the new language could lead to better productivity.

BEHAVIORAL ECONOMICS

PSYCHOLOGY   ECONOMICS

pc: marcberman

Behavioral Economics

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- **Anchoring:** Initial information heavily influences decision-making.
  - e.g. a laptop might be shown as "was ₹80,000, now ₹60,000." The original price serves as an anchor, making the current price appear as a significant discount, even if the laptop's true market value is closer to ₹50,000.

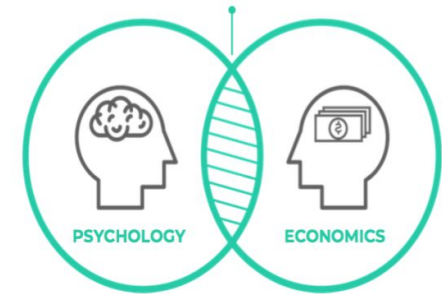**BEHAVIORAL ECONOMICS**

PSYCHOLOGY   ECONOMICS

Behavioral Economics

Behavioral economics integrates insights from psychology into economic models to better understand how people make decisions. Example Concepts:

- **Herd Mentality: Definition**: People follow the majority, sometimes ignoring their own logic.
    - e.g. a team of developers might all start using a specific framework just because it's popular, even if it's not the best fit for their project, simply to follow the trend.

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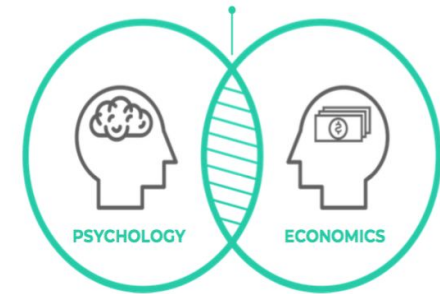
Ethical Considerations in Economics

- As technology drives economic change, ethical questions about **fairness, privacy, and job displacement** arise.
- Computer scientists must consider the economic and social impact of the technologies they create, ensuring they are both profitable and ethical.
- e.g.: Ethical debates around AI, facial recognition, and data privacy involve balancing innovation with protecting consumer rights and preventing inequality.

pc: econadlink

Role of Economics in Computer Science

Pricing Strategies in Software:

- Software companies use economic principles to **set prices that maximize profit** while staying competitive.

- Prices are determined by factors such as production costs, competition, consumer demand, and market positioning.

| Plans	Good	Better	Best	
Users	5 users	20 users	100 users	Total users, Active users, Concurrent users
Features	Basic Functionality	Basic Functionality + Feature A	Basic Functionality + Feature A + Feature B + Feature C	
Storage & Value Metric	10 MB storage 1 project	50 MB storage 3 projects	250 MB storage Unlimited projects	# of uses, # of downloads, length of time/use
Transaction	$ per year $ per additional 10 MB storage	$ per year $ per additional 20 MB storage	$ per year $ per additional 50 MB storage	

Types of Pricing Models:

- **Freemium:** Basic software is free, but advanced features are paid (e.g., Spotify, Zoom).

- **Subscription:** Regular payments for access to the software (e.g., Netflix, Adobe Creative Cloud).

- **Pay-per-Use:** Charges based on usage, common in cloud services (e.g., AWS, Google Cloud).

- **One-Time Purchase:** Users buy the software outright (e.g., Microsoft Office).

Plans	Good	Better	Best	
Users	5 users	20 users	100 users	Total users / Active users / Concurrent users
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Role of Economics in Computer Science

- **Tech Entrepreneurship:** For computer scientists interested in launching startups, economics is crucial for understanding how to **build viable business models**, **secure funding**, **manage costs, and scale their business**.

- Learning about venture capital (VC) financing and investment economics helps students **pitch their tech startups to investors** by understanding what factors investors consider, like market size, revenue potential, and risk.

*pc: etimes*
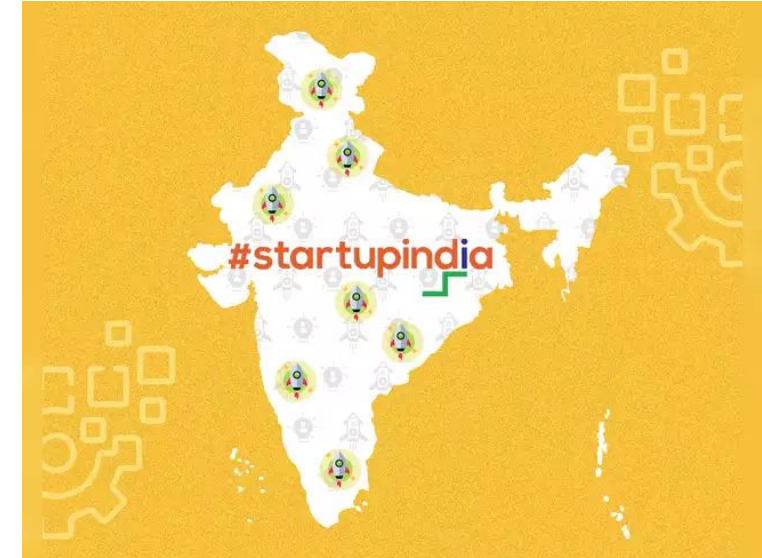
Role of Economics in Computer Science

- **Tech Entrepreneurship Examples:**
  - A tech startup must decide whether to allocate resources toward developing a new app feature or expanding into a new market.
  - Entrepreneurs need to assess both consumer demand and available market supply to create products or services that fit a need (example AirBnB).
  - Tech startups in emerging sectors like AI, fintech, or blockchain attract venture capital because investors anticipate future market demand and high returns (e.g. OpenAI)

Role of Economics in Computer Science

- **Data analytics and machine learning:**
  - **Econometric models** are widely used in tech to predict trends and consumer behavior
  - e.g. **demand forecasting** techniques to help online platforms stock products efficiently,
  - e.g. **financial technology (fintech)** algorithms for risk assessment, fraud detection, or financial forecasting
  - e.g. **online marketplaces** like Ebay and ride sharing services like Uber use auction mechanisms, surge pricing, and market equilibrium
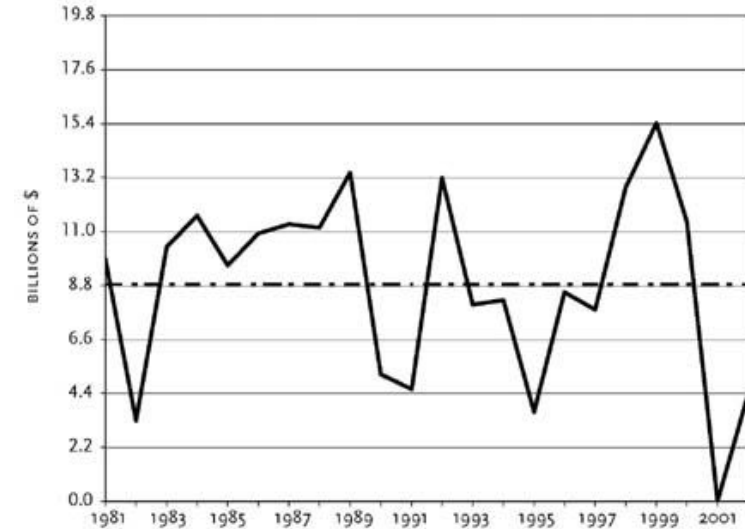
Role of Technology in the Economics

- **Technology drives economic growth** by increasing productivity, reducing costs, and enabling new business models from automation to AI to cloud computing.
  - e.g. the rise of the gig economy (e.g., Uber, TaskRabbit) is a direct result of advances in technology, which changed how labor and services are supplied and demanded.
  - Self-driving cars or warehouse automation (e.g., Amazon's robots) reduce the need for human labor in certain sectors but create opportunities in tech development

pc: economistzone

Role of Technology in the Economics

- **Innovation drives economic growth** by disrupting traditional industries and create new markets and jobs.

  - e.g. Airbnb or Zoom have disrupted traditional markets by leveraging technology to provide new services.

  - e.g. AI and robotics, allow businesses to produce goods and deliver services faster and at lower costs enabling economic growth without needing a proportionate increase in labor.

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