The background of the slide is a detailed woodcut illustration by M.C. Escher titled 'Relativity'. It depicts a complex, multi-level architectural structure with various platforms, stairs, and railings. Several figures in different types of clothing are shown moving through this space. The perspective is unusual, with multiple 'gravities' or directions of 'up' and 'down' indicated by the orientation of the platforms and the movement of the figures, creating a visual paradox. The overall style is that of a 19th-century woodcut, with fine lines and cross-hatching for shading.

# Impossible examples in microeconomic textbooks : what justifications ?

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# The paradigmatic dimension of examples

“It is, of course, the sense of “paradigm” as standard example that led originally to my choice of that term.” (Kuhn, “Second Thoughts on Paradigm”, *The essential Tension*, p. 307)

“Nothing could be better calculated to produce “mental sets” or *Einstellungen*.” (Kuhn, *The Essential Tension*, p. 229)

# Worlds described by examples in Microeconomics textbooks *Real/Abstract/Imaginary/Impossible*

**Real** (including simplifications and plausible inventions):

“We begin our discussion of costs at Caroline’s Cookie Factory. Caroline, the owner of the firm, buys flour, sugar, chocolate chips, and other cookie ingredients. She also buys the mixers and ovens and hires workers to run this equipment. She then sells the cookies to consumers. By examining some of the issues that Caroline faces in her business, we can learn some lessons about costs that apply to all firms in an economy.” (Mankiw, 2015, p. 260)

Worlds described by examples in  
Microeconomics textbooks  
*Real/Abstract/Imaginary/Impossible*

**Abstract** (output not specified):

“A netput vector is a vector from  $\mathbb{R}^k$ , where a negative component connotes a net input into the firm’s production process and a positive component connotes a net output. So, for instance, if  $k = 5$ , the netput vector  $(-2, 0, 3, -1, 2)$  is interpreted as the firm transforming two units of the first commodity and one unit of the fourth into three units of the third and two units of the fifth.” (Kreps, 2013, p. 319)

# Worlds described by examples in Microeconomics textbooks *Real/Abstract/Imaginary/Impossible*

## **Imaginary** (imaginary output):

« In a particular economy, a product called *pfillip*, which is a nonnarcotic stimulant, is produced by a competitive industry. Each firm in this competitive industry has the same production technology, given by the production function:  $y = k^{1/6} l^{1/3}$

where  $y$  is the amount of *kapitose* (a specialty chemical) used in production, and  $l$  is the amount of *legume* (a common vegetable) used in production. » (Kreps, 1990, p. 274)

# Impossible worlds *or* Inconsistent examples

Numb. of workers	Output (quant. of cookies produced per hour)	Marginal Product of Labor
0	0	
		50
1	50	
		40
2	90	
		30
3	120	
		20
4	140	
		10
5	150	
		5
6	155	

“When the number of workers goes from 1 to 2, cookie production increases from 50 to 90, so the marginal product of the second worker is 40 cookies. And when the number of workers goes from 2 to 3, cookie production increases from 90 to 120, so the marginal product of the third worker is 30 cookies.” (Mankiw, 2015, p. 264)

## Impossible worlds *or* Inconsistent examples

“An example is the reconstruction of concrete sidewalks using jackhammers. It takes one person to use a jackhammer—neither two people and one jackhammer nor one person and two jackhammers will increase production.” (Pindyck & Rubinfeld, 2015, 234-235)

“If the proportions are fixed, then an extra unit of one factor, unaccompanied by an increase in the other, unit of one factor, unaccompanied by an increase in the other, will yield precisely no addition to the total product.” (Hicks, 1932, 81)

# Impossible examples

Examples which

- ✓ either describe an impossible world (*impossible-world examples*)
- ✓ or describe real world but are inconsistent with the very concept or hypothesis they are supposed to exemplify (*real-world inconsistent examples*)



# Choice of textbooks

- « Popular » microeconomic textbooks : widely used by students
- Examination of « microeconomic textbook » rankings provided by three websites :
  - Goodreads (reader recommendations)
  - Bookauthority (multiple criteria, « expert domain » recommendations)
  - Amazon Best-sellers

# Textbook categorization

*(chapters on production and factor markets)*

## **Beginner textbooks :**

- best-sellers (undergraduate)
- Aim at helping students « understand the world »

- Krugman & Wells, *Microeconomics*, 2004
- Mankiw, *Principles of Microeconomics*, 1997
- McConnell, Brue & Flynn, *Microeconomics with connect*, 2015
- Perloff, *Microeconomics*, 1997
- Pindyck & Rubinfeld, *Microeconomics*, 1989

# Textbook categorization

## *(chapters on production and factor markets)*

### **Numerous impossible examples in beginner textbooks :**

Krugman & Wells, *Microeconomics*, 2004 :

- George & Martha's farm (p. 330 *sqq.*)
- Magnificent Blooms, "a florist specializing in floral arrangements" (p. 353)
- Noelle's Christmas tree farm (p. 361 *sqq.*)

Mankiw, *Principles of Microeconomics*, 1997 :

- "Caroline's cooking factory" (p. 260)
- "Conrad's coffee shop" (p. 266)

Pindyck & Rubinfeld, *Microeconomics*, 1989 :

- a "clothing factory" (p. 252)

McConnell, Brue & Flynn, *Microeconomics with connect*, 2015 :

- a farmer with "80 acres of land –planted in corn" (p. 184)
- "a wood-shop manufacturing furniture frames" (p. 184)

# Textbook categorization

*(chapters on production and factor markets)*

## Advanced textbooks :

- graduate students
- Aim at helping student master the techniques of microeconomic modelling

- Kreps, *Microeconomic Foundations I*, 2013
- Mas-Colell, Whinston & Green, *Microeconomic Theory*, 1995
- Varian, *Microeconomic Analysis*, 1980

➤ **NO IMPOSSIBLE EXAMPLES**

# Textbook categorization

*(chapters on production and factor markets)*

## Intermediate textbooks:

- Undergraduate students
- Aim at linking a thorough presentation of the theory to contemporary economic issues

- Perloff, *Microeconomics with calculus*, 2014
- Varian, *Intermediate Microeconomics: A Modern Approach*, 1987

➤ **FEW IMPOSSIBLE EXAMPLES**

## Impossible examples in microeconomic textbooks : what justifications ?

- ✓ None!
- ✓ Impossible examples are presented as if they were possible real-world ones.
- ✓ The same basic story-line can switch from real to impossible without any warning.

What can students possibly learn  
through impossible examples?  
*The case for marginal product of labor*

*“holding the quantity of all other inputs fixed”*

*“holding the **used** quantity of all other inputs  
fixed”*

What can students possibly learn  
through impossible examples?  
*The case for marginal product of labor*

Two inputs:

Labor & equipment/capital/machines/factory/land

*Where have all the other inputs gone?*



What can students possibly learn  
through impossible examples?  
*The case for marginal product of labor*

“In the analysis that follows, we make an important simplifying assumption: we assume that the size of Caroline’s factory is fixed and that **Caroline can vary the quantity of cookies produced only by changing the number of workers she employs**. This assumption is **realistic in the short run** but not in the long run.”  
(Mankiw, 263, we emphasize)

# What can students possibly learn through impossible examples?

## *The case for marginal product of labor*

"Factory", "capital", "equipment", "machines" are *oversized* and *include* all material inputs:

"Assume a wood shop is manufacturing furniture frames. It has a specific amount of **equipment such as lathes, planes, saws, and sanders**. If this shop hired just one or two workers, total output and productivity (output per worker) would be very low. The workers would have to perform many different jobs, and the advantages of specialization would not be realized. Time would be lost in switching from one job to another, and machines would stand idle much of the time. In short, the plant would be **understaffed**, and production would be inefficient because there would be too much capital relative to the amount of labor. The shop could eliminate those difficulties by hiring more workers. Then the equipment would be more fully used, and workers could specialize on doing a single job." (McConnell, Brue & Flynn, 184, we emphasize)

What can students possibly learn  
through impossible examples?  
*The case for marginal product of labor*

“The marginal product of any input in the production process is the increase in the quantity of output obtained from one additional unit of that input” (Mankiw, 264)

# What can students possibly learn through impossible examples?

## *The case for marginal product of labor*

"Factory", "capital", "equipment", "machines" does not include all other inputs:

“Marty’s Frozen Yogurt is a small shop that sells cups of frozen yogurt in a university town. Marty owns three frozen-yogurt machines. His other inputs are refrigerators, frozen-yogurt mix, cups, sprinkle toppings, and, of course, workers. He estimates that his daily production function when he varies the number of workers employed (**and, at the same time, of course, yogurt mix, cups, and so on**) is as shown in the accompanying table. [similar to Mankiw’s table 6.1] (...) **c. What is the marginal product of the first worker? The second worker? The third worker?** Why does marginal product decline as the number of workers increases?” (Krugman & Wells, 353, we underline)

What can students possibly learn  
through impossible examples?  
*The case for marginal product of labor*

---

In both cases, “marginal product of labor” seems to designate the increase in the quantity of output that arises from one additional unit of labor, *and “of course” from an additional used quantity of all other inputs.*

---

What can students possibly learn  
through impossible examples?  
*The case for income distribution theory*

The marginal productivity theory of income distribution:

Price of each input = its marginal productivity

« To each according to the value of what he or she creates »

(McConnell, Brue & Flynn, 325)

Two unfortunate pedagogical consequences (of ill-defined marginal product) :

1. it leads to an absurd distribution theory
2. it encourages students to interpret our world through this theory without further questioning .

## An "absurd" distribution theory

“If the proportions are fixed, then (...) the withdrawal of one unit [of factor] will lead to a far greater diminution in the product that can fairly be attributed to that unit alone, since its removal put corresponding units of other factors out of action. If all the factors were paid according to their marginal products calculated in this second manner, their total pay would undoubtedly be far in excess of the value of the goods they produced. Which is absurd.”  
(Hicks, 1932, 81)

# An "absurd" distribution theory

IF

- constant returns to scale
- $n$  inputs needed to produce an output
- choice of units of measures so that the quantity of each of the  $n$  inputs needed to produce one unit of output equal 1.
- quantities of  $n - 1$  inputs (sufficiently) excessive.

THEN

- marginal product of labor (as defined in beginner textbooks) = 1.
- and :

$$\text{total production cost} = n \times \text{total product!}$$



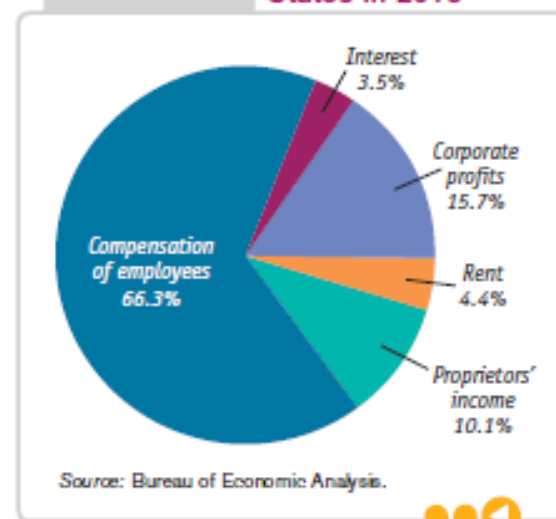
Propaganda about income distribution?

# Propaganda about income distribution?

“It leads us to the **marginal productivity theory of income distribution**, which says that each factor is paid the value of the output generated by the last unit of that factor employed in the factor market as a whole—its equilibrium value of the marginal product. To understand why the marginal productivity theory of income distribution is important, look back at Figure 19-1, which shows the factor distribution of income in the United States, and ask yourself this question: who or what decided that labor would get 66% of total U.S. income? Why not 90% or 50%?

The answer, according to the marginal productivity theory of income distribution, is that the division of income among the economy's factors of production isn't arbitrary: it is determined by each factor's marginal productivity at the economy's equilibrium. The wage rate earned by *all* workers in the economy is equal to the increase in the value of output generated by the last worker employed in the economy-wide labor market.” (Krugman & Wells, 555)

**FIGURE 19-1** Factor Distribution of Income in the United States in 2013



Thank you  
for your  
attention



M. C. Escher, *Ascending and Descending*, 1960