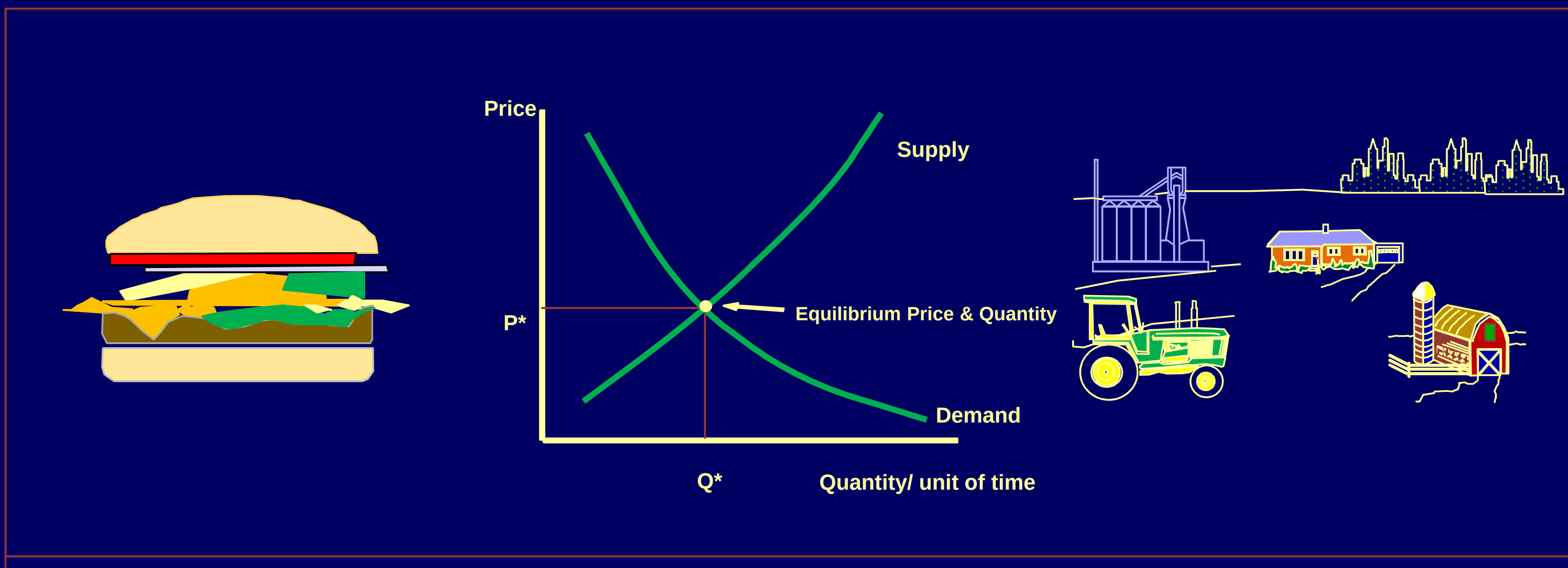
ECONOMICS OF FOOD and AGRICULTURE

THIRD EDITION



DAVID L. DEBERTIN

Preface

Economics of Food and Agriculture (Third edition, 2014)

This is a heavily-revised version of an introductory agricultural economics text book “Economics of Food and Agriculture” that was originally published by Kendall Hunt, in 1990. The information on the original edition is as follows:

- **Economics of Food and Agriculture**
- **David L. Debertin**
- **Paperback**
- **Publisher:** Kendall Hunt Pub Co (June 1990)
- **Language:** English
- **ISBN-10:** 0840359691
- **ISBN-13:** 978-0840359698

The material is intended for use as a series of classroom presentations for an introductory agricultural economics course. No mathematics prerequisites other than basic algebra are required.

The 1990 versions of this book relied heavily on graphs that I constructed myself using secondary data. Now there are many other detailed sources, most notably the graphs contained in the USDA ERS chart gallery. In updating this version to the present, I retained a few of the graphs that were in the original version, but then located graphs created by the USDA ERS in their Chart gallery in order to add to and supplement the original information.

These slides were originally constructed employing Harvard Graphics routines. At that point in computing history, clip art as opposed to photographs was being used extensively. By retaining some of the quirky clip art from the original version, I have also retained some of the look and feel of the original edition.

This is the introductory-level version of a series of books I have written with microeconomics and production economics. The other available books are:

Applied Microeconomics: Consumption, Production and Markets

This is a microeconomic theory book designed for upper-division undergraduate students in economics and agricultural economics. This book is available as a free download at http://purl.umn.edu/158321

Amazon markets bound print copies of the book at amazon.com at a nominal price for classroom use. The book can also be ordered through college bookstores using the following ISBN numbers:

ISBN-13: 978-1475244342

ISBN-10: 1475244347

Basic introductory college courses in microeconomics and differential calculus are the assumed prerequisites.

. **Agricultural Production Economics** (Second Edition, Amazon Createspace 2012) is a revised edition of the Textbook Agricultural Production Economics published by Macmillan in 1986 (ISBN 0-02-328060-3). As the author, I own the copyright. This is intended primarily for adoption at the beginning graduate level. Amazon markets bound print copies of the book at amazon.com at a nominal price for classroom use. The book can also be ordered through college bookstores using the following ISBN numbers:

ISBN-13 978-1469960647
ISBN-10 1469960648

Agricultural Production Economics is available as a free e-download at http://purl.umn.edu/158319

A companion 100-page color book Agricultural Production Economics (The Art of Production Theory) is also a free download. A bound print copy is also available on amazon.com at a nominal cost under the following ISBN numbers:

ISBN- 13: 978-1470129262
ISBN- 10: 1470129264

This book is also available as a free e-download at http://purl.umn.edu/158320

List of Chapters

An Introduction

to

Agricultural Economics

Problems in Agriculture of an Economic Nature:

1. Historic low returns to labor and other resources
2. Historic low family farm income
3. Government involvement in agriculture
4. Conflicts among taxpayers, consumers, farmers:

Consumers--want a clean, high-quality food supply and cheap food (or food stamps!).

Taxpayers--want low government outlays.

Farmers--want high incomes.

Environmentalists--want food free of chemicals produced in a manner which does not pollute the environment or increase global temperatures.

The interests of all of these groups may be in conflict.

Farmers cannot have high incomes unless consumers and taxpayers are willing to pay.

Food free of insect damage may have pesticide residues.

Low-cost food may be genetically modified

Choice

Human beings have unlimited wants.

Human beings have limited resources for fulfilling these wants (income is limited).

Economics is concerned with how to best fulfill *unlimited* wants given *limited* resources.

Unlimited Wants

Limited Resources

How to *Best Fulfill* These Wants?

Optimization under Scarcity

Agricultural Economics

Agriculture is a declining industry, with low returns to resources invested in agriculture. This leads to

problems and opportunities

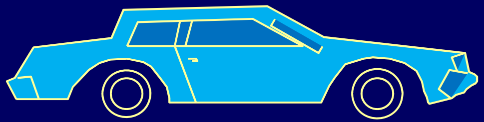
for agricultural economists.

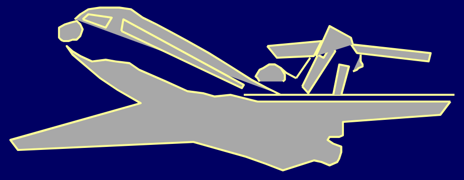
Model Building

In order to build a model of the real world, you must first understand the real world.

For an agricultural economist, this usually means understanding agriculture.

Agricultural economists abstract from reality when models are built. This means "leaving out" unimportant elements of the problem in order to more fully understand the important elements.





An economic model can be used to

simulate

what might happen if particular economic policies are put in place.

An economic model can be used to *simulate* what might happen if particular economic policies are put in place.

Set of Conditions → **Economic Policy Decision** → **Outcome**

Drought → **Drought Relief Legislation** → **Improved Farm Incomes**

Micro- versus Macroeconomics:

Micro prefix

"small"

"individual"

"single decisionmaker"

Consumer as the decisionmaker

Producer as the decisionmaker

Macro Prefix

"large"

"whole"

"entire"

Aggregate issues

many producers

many consumers

The U.S. Economy
The Farm Economy

Opportunity Cost

If I choose this option,

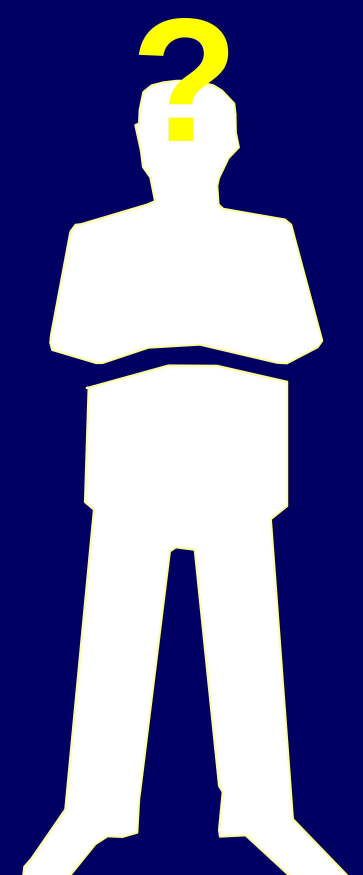
then I forgo the opportunity

to do something else.

What is the cost

in terms of

forgone opportunities?



What is my "next best" Alternative?

Assume that $500,000 is invested in a farm.

As an alternative, this money could have earned 2% when invested in a bank certificate of deposit (CD).

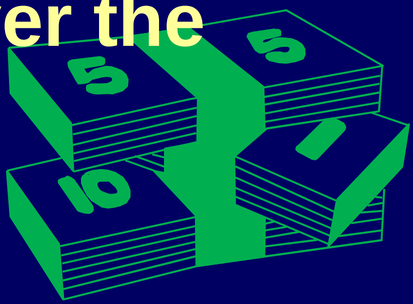
Opportunity cost is the return from the next best risk-free investment.

$10,000 is the opportunity cost of my $500,000 investment.

This is an expense, whether we realize it or not.

As an alternative, invest the $500,000 in the stock market.

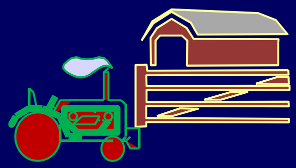
Here the return has averaged 22% over the last 3 years.



$110,000 is the opportunity cost.

BUT-- THE INVESTMENT IS NOT RISK FREE!

Agricultural Economics



Economic problems applied to agriculture.

Some are microeconomic problems
concerned with agricultural producers
and consumers of agricultural commodities.

Some are macroeconomic problems
concerned with how the national economy
affects agriculture.

All involve the concepts of:

1. *Scarcity* (limited resources)
2. *Unlimited wants*

Within an agricultural setting
what is the best, or optimal
way to satisfy unlimited wants
given limits and scarcity?

What is a Farm?

Old definition (before 1974)

Sells $250 worth of agricultural products

OR

10 or more acres.

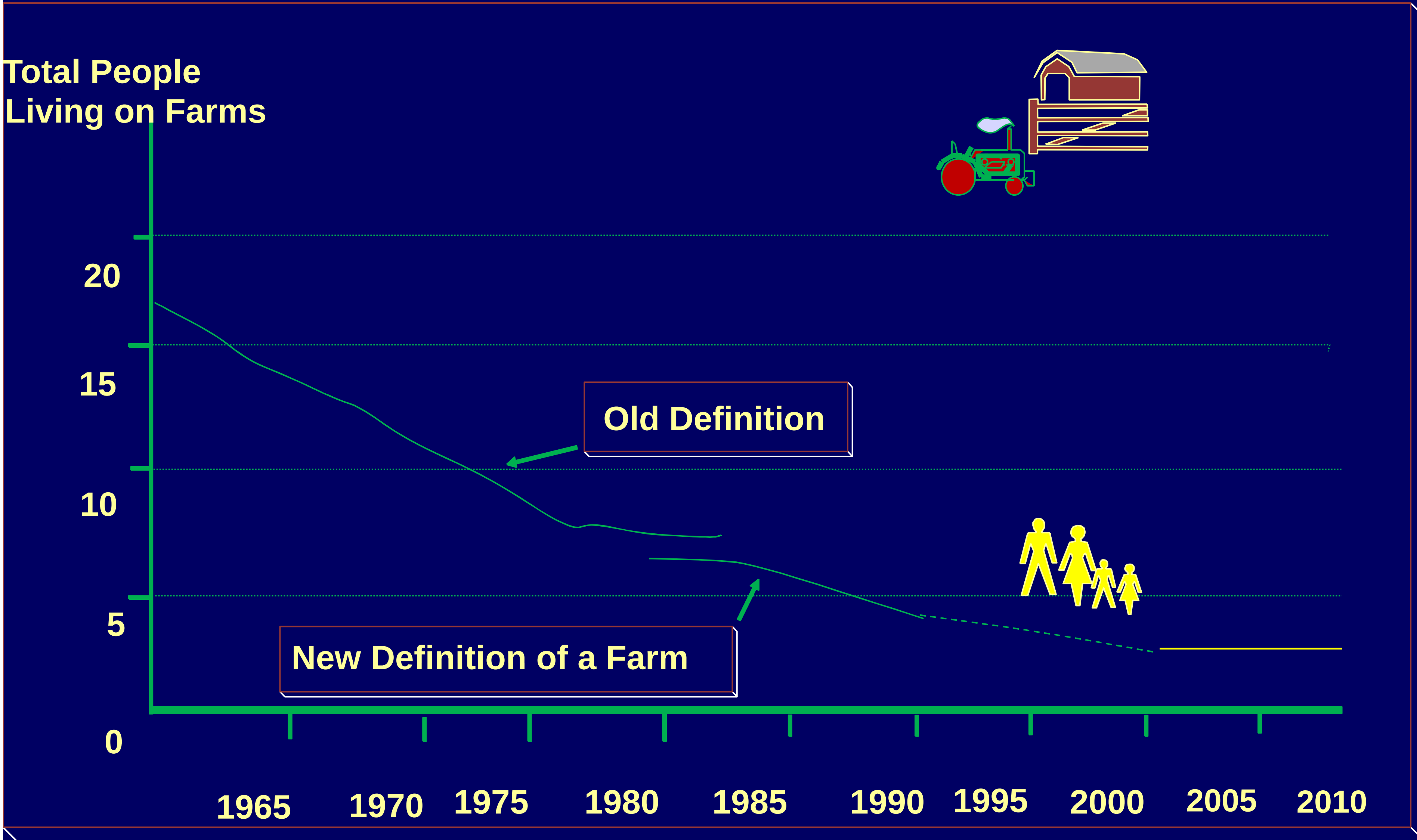
New definition (after 1974)

Sells or "could sell"

$1000 worth of agricultural products.

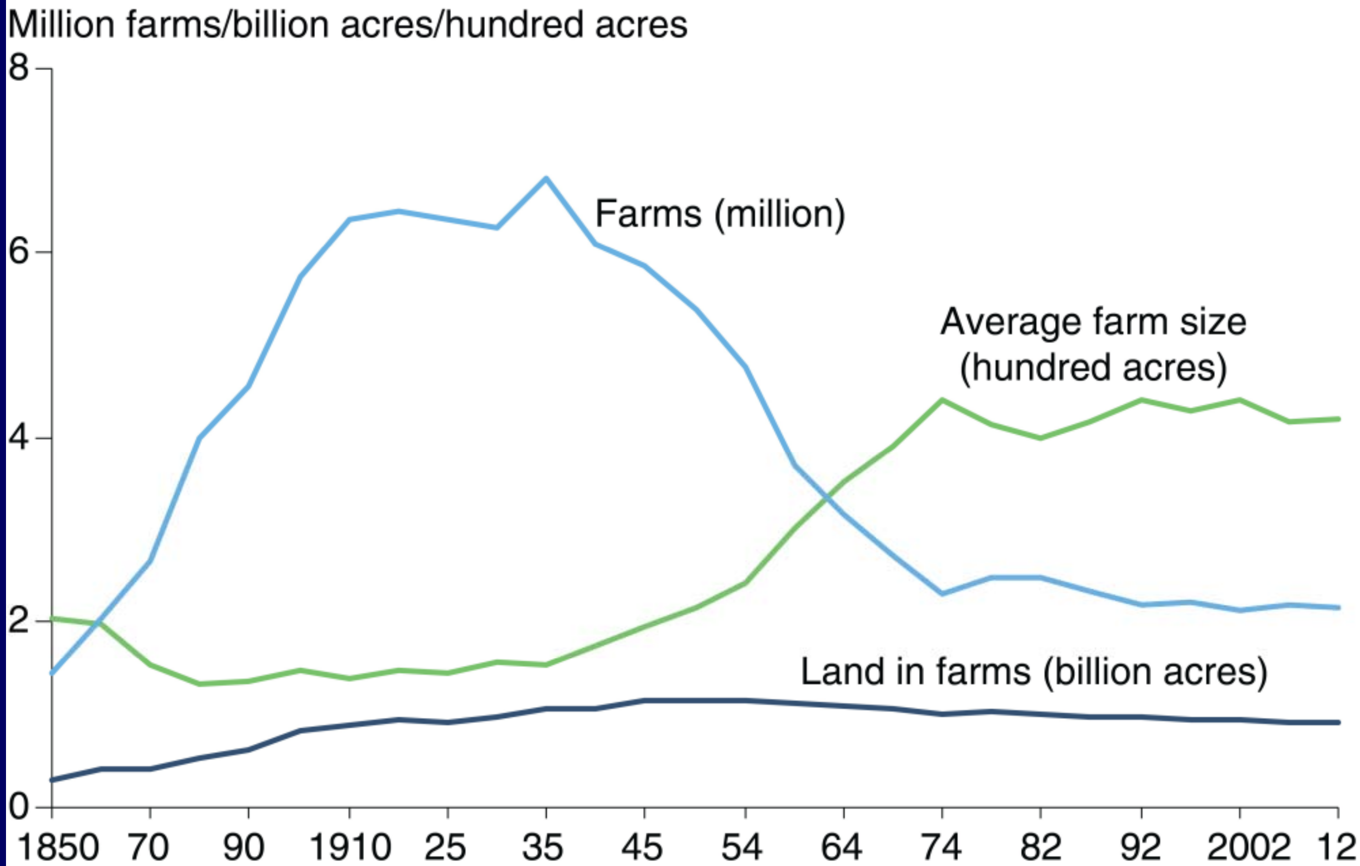
Lots of small farms!

Total Farm Population

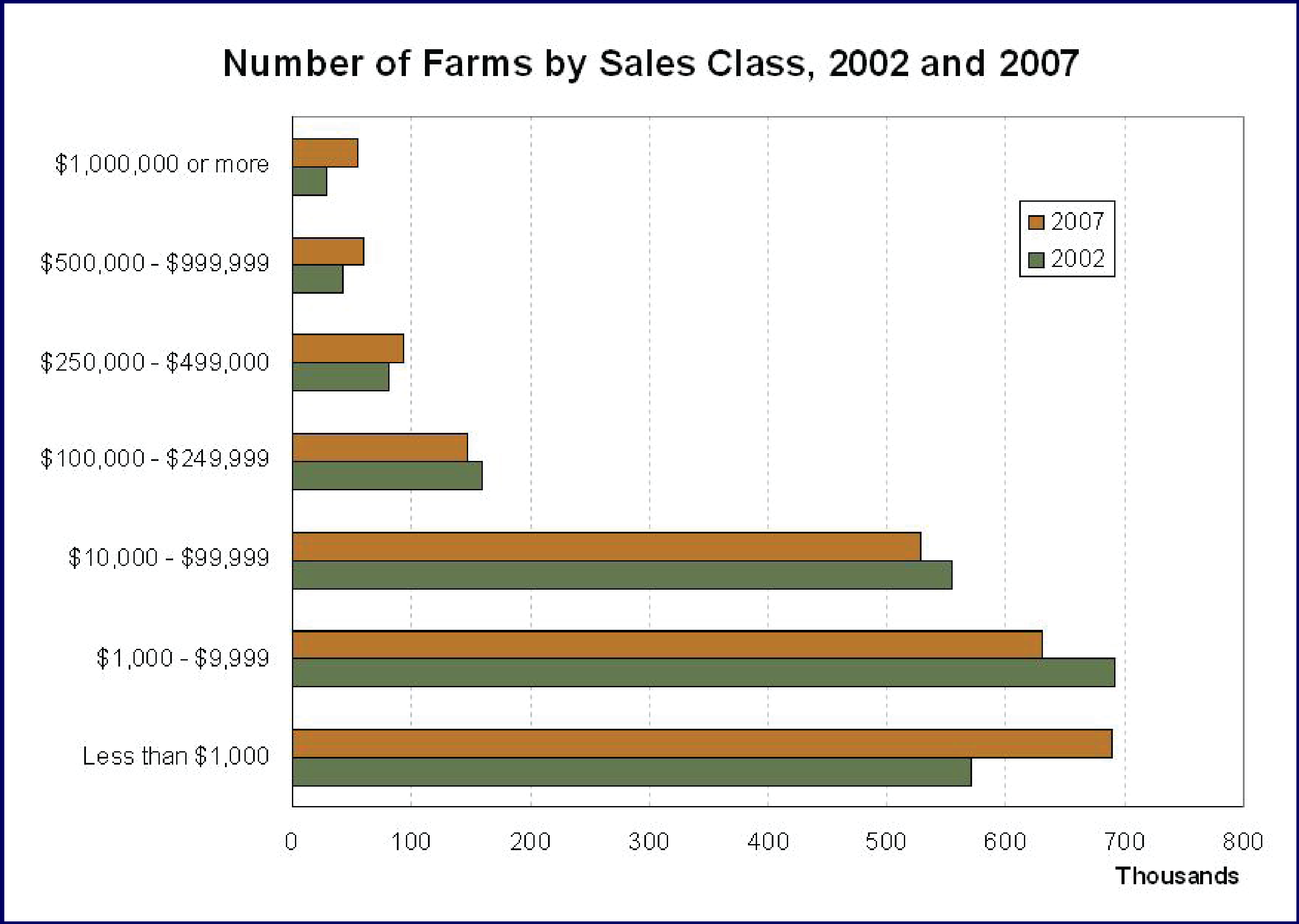


Approximately 4,700,000 people were living on farms in 2000
This has changed little if at all from 2000-2010

Farms, Land in Farms and Average Acres Per Farm, 1850-2012

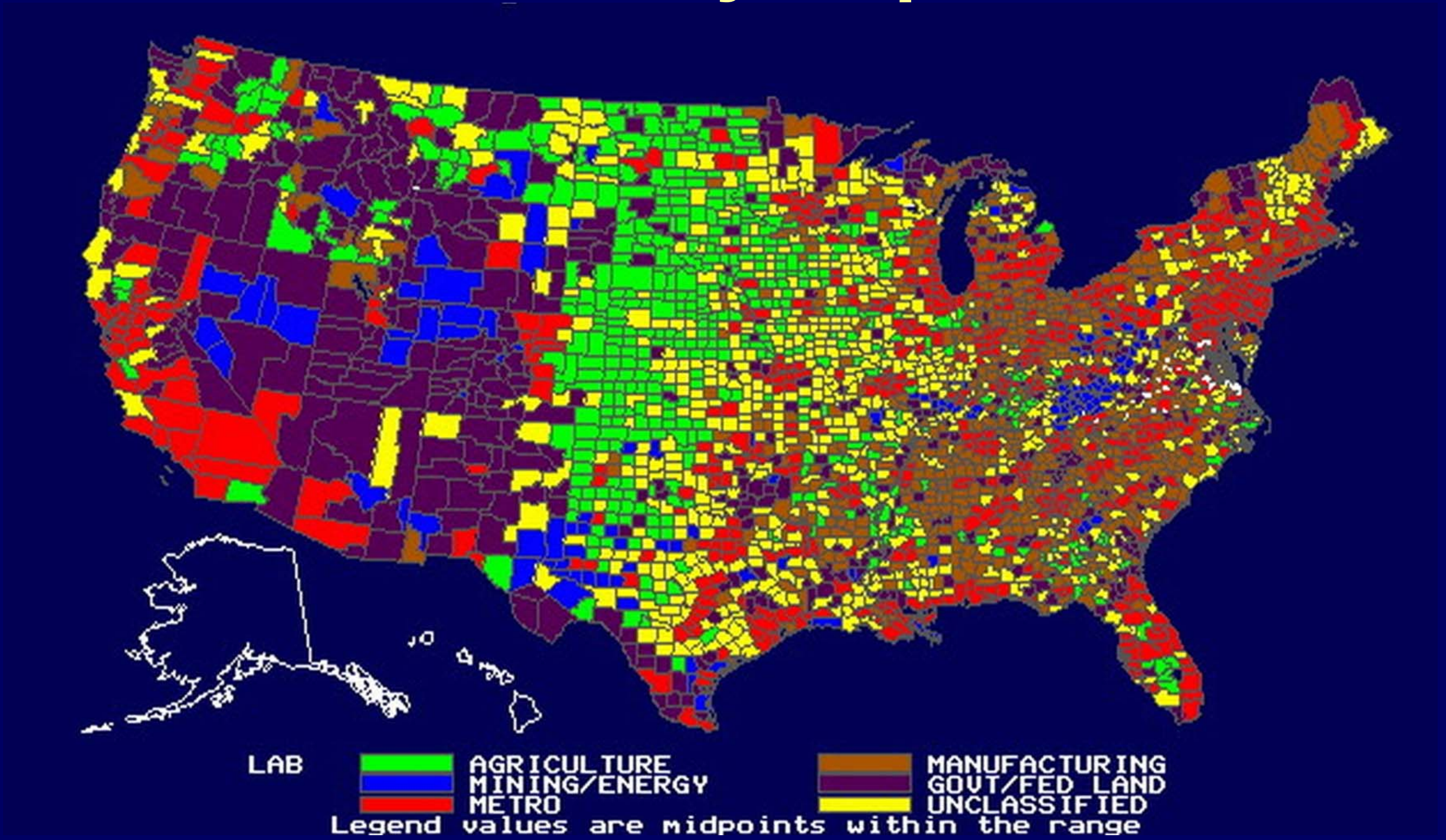


Source: USDA, Economic Research Service using data from USDA, National Agricultural Statistics Service, Census of Agriculture and "*Farms, Land in Farms, and Livestock Operations: 2012 Summary*," for 2012 data.



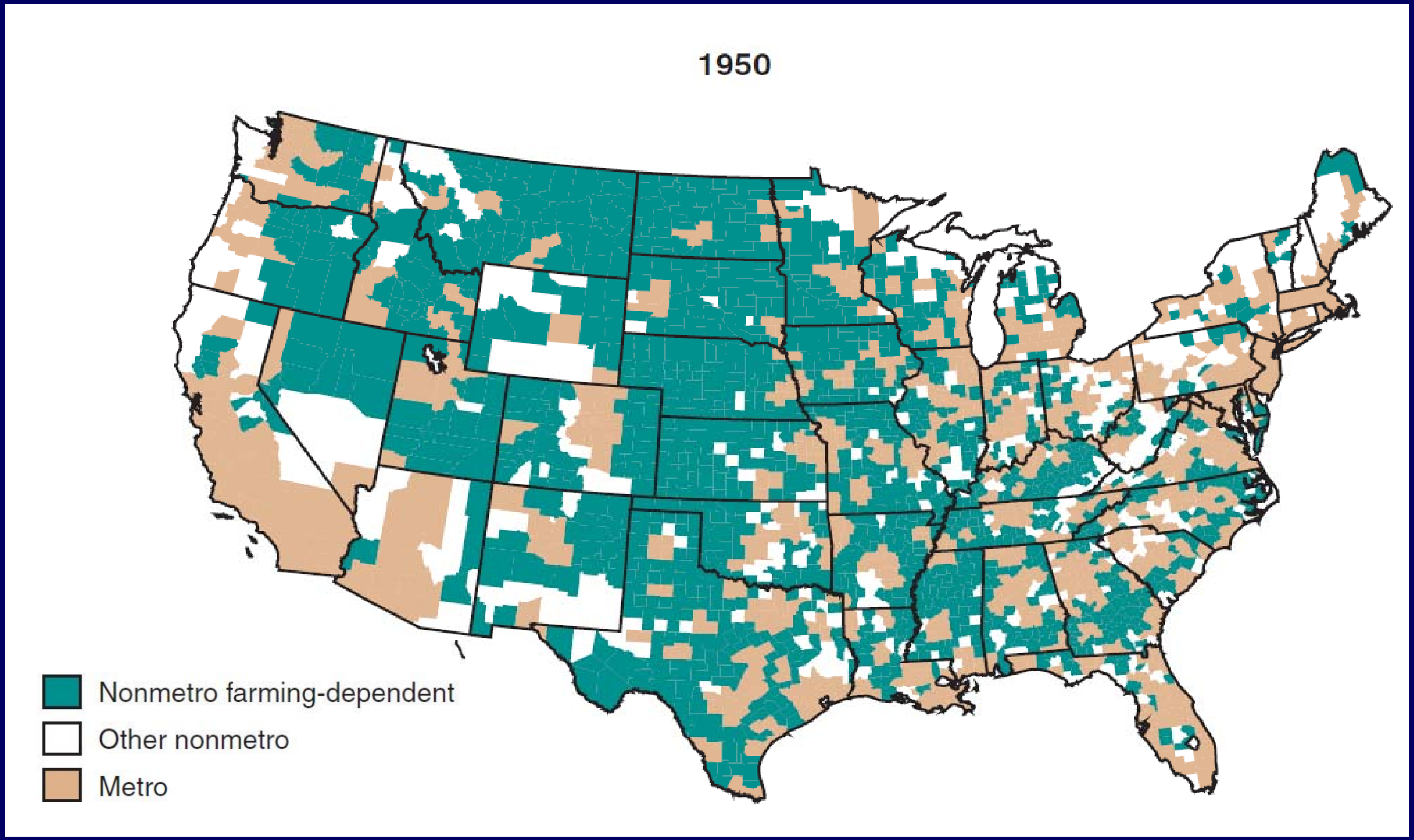
Source: USDA Census of Agriculture, 2002 and 2007

USDA County Dependence



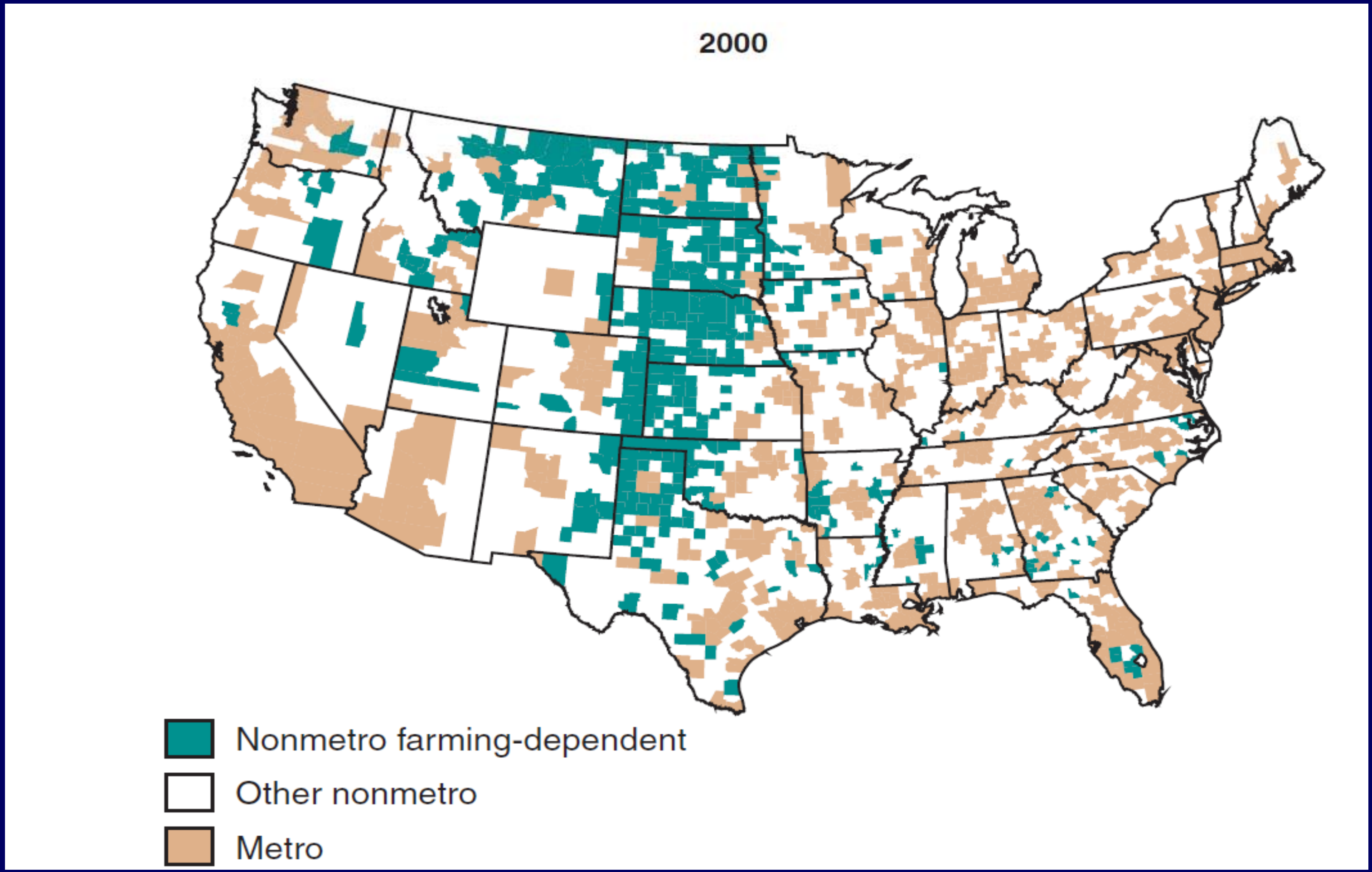
Source: USDA. Data are for 1989.

Non-metro Farming-Dependent Counties, 1950



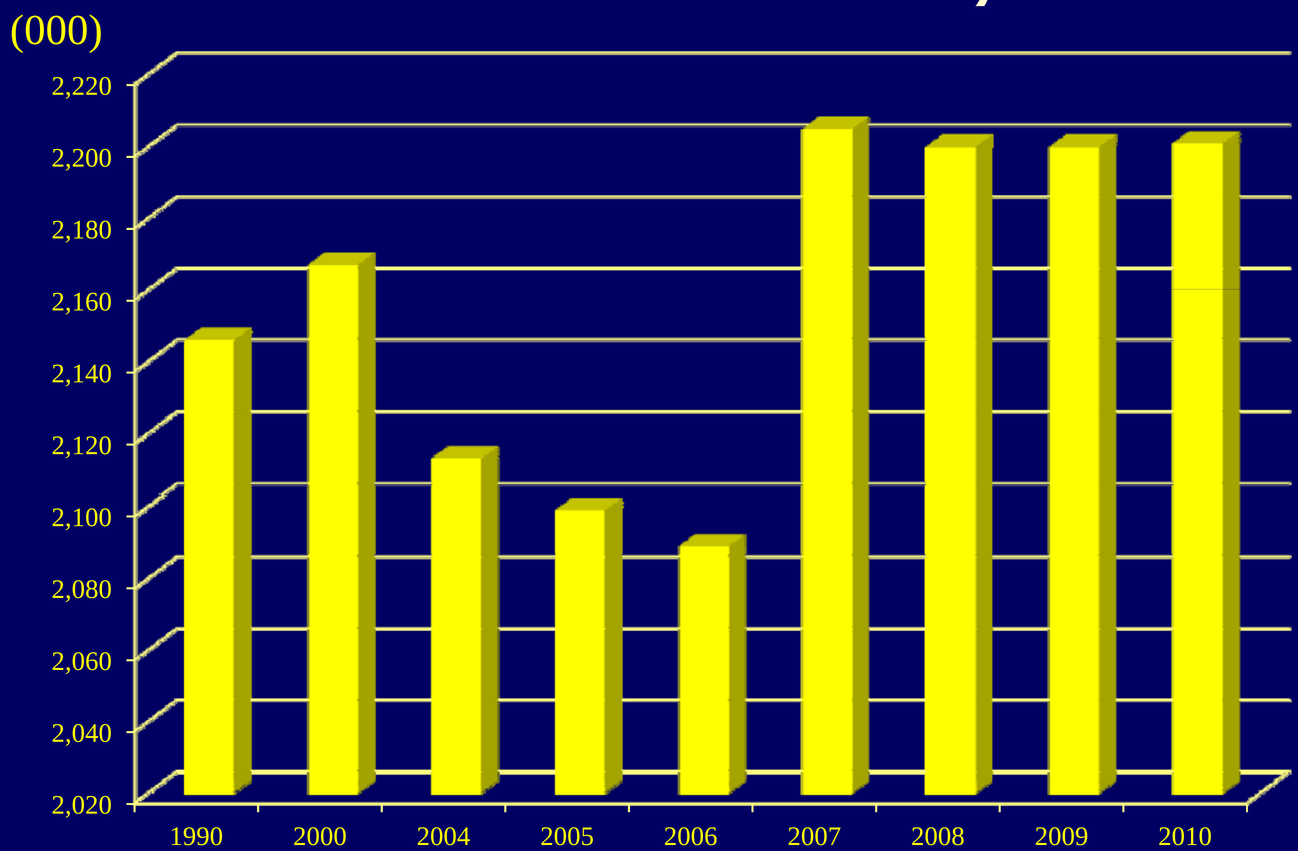
Source: USDA ERS

Non-metro Farming-Dependent Counties, 2000



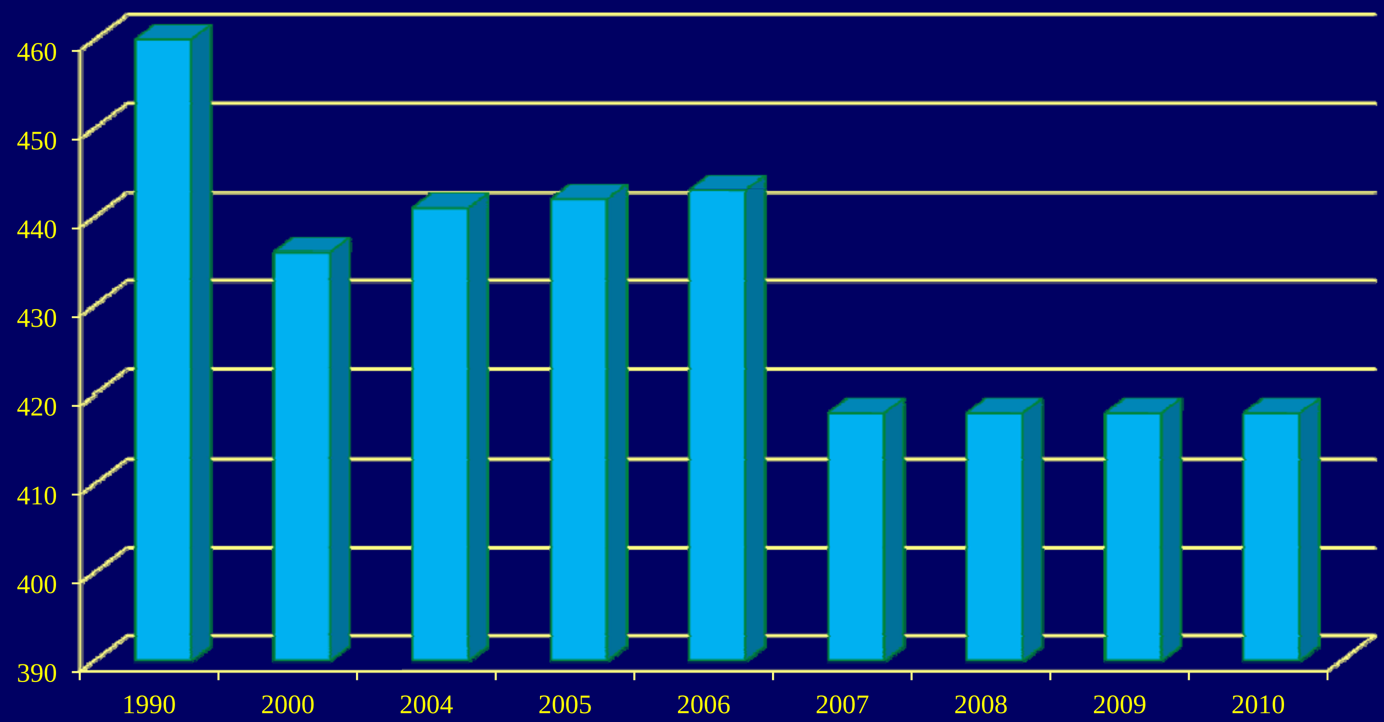
Source: USDA ERS

Number of farms, US

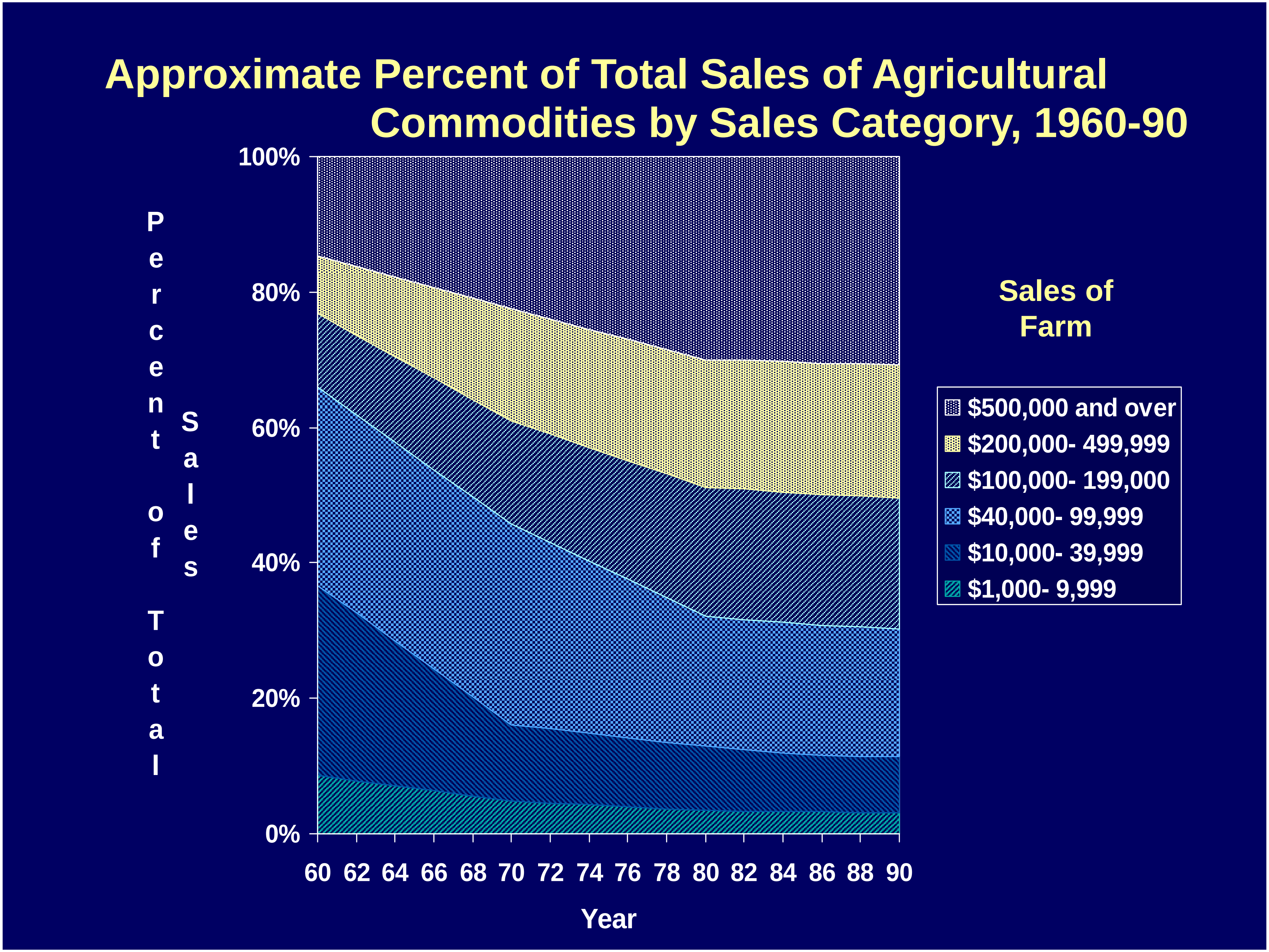


Source: Compiled from USDA Census of Agriculture Data

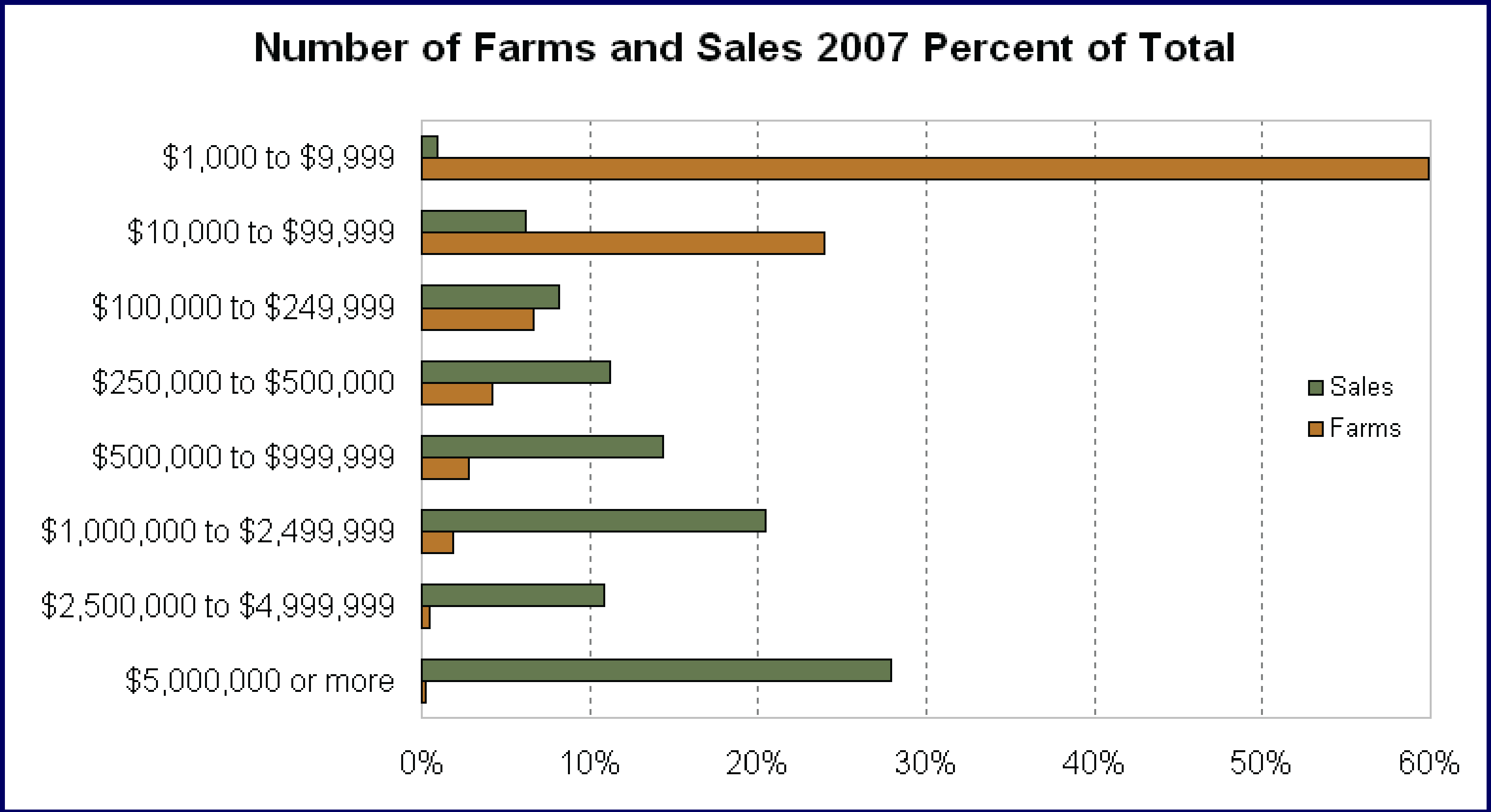
Average Acres of All US Farms



Source: Compiled from USDA Census of Agriculture Data



Approximate Percent of Total Sales of Agricultural Commodities by Sales Category, 1960-90
Percent of Total Sales
100%
80%
60%
40%
20%
0%
60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90
Year
Sales of Farm
$500,000 and over
$200,000- 499,999
$100,000- 199,000
$40,000- 99,999
$10,000- 39,999
$1,000- 9,999



Source: USDA Census of Agriculture, 2007

The U.S. Farm Economy

Declining number of workers in production, output per worker continues to increase, and production of agricultural commodities exceeds demand by those who can afford.

This leads to low prices for agricultural commodities and low returns to many of the resources invested in agriculture.

An Historical Perspective

1960s were characterized by
low prices and oversupply.

Early 1970s were a boom time:

High Prices
Huge Export Market
Rapid Increases in Land Values

Many farmers thought that the
good times would last forever, and that
land prices would increase, forever.

What Happened in the 1980s ?

Real interest rates increased
Export markets dried up
Commodity prices plummeted
Land values a fraction of their previous level

By the early 1980s, farming was in a major crisis.
Lots of parallels between the farmland value crisis of the 1980s and the home price crisis of 2007-2013

What Happened in the 1990s ?

There was a slow recovery as
the federal government put
big dollars into farm program payments,
real interest rates have declined, and
agricultural commodity exports increase
as the value of the dollar declined.

Most importantly, farmland values
began to stabilize, and increased in a few regions

The farming sector continued to face major problems:

Major droughts affected the production of crops and livestock in 1988 and 1989

Debt/equity ratios returning to "normal."

Federal farm program payments reduced from pre 1988 levels, but still at high levels.

Prices of crops increased from 1987 levels, but beef and dairy producers worse off because of higher grain prices.

What is Happening in the 2000s ?

There has been a rapid appreciation in farmland prices (again).

Generally, farmers have done ok, with usually adequate prices and crop yields

Crop producers have probably done better than livestock producers, overall.

Rural areas were generally less adversely affected by the 2007-2008 recession, high unemployment, and declining prices for residences than were urban areas.

The first decade of the 21st century was something of an economic rebirth for many rural areas.

There are new opportunities for young farmers.

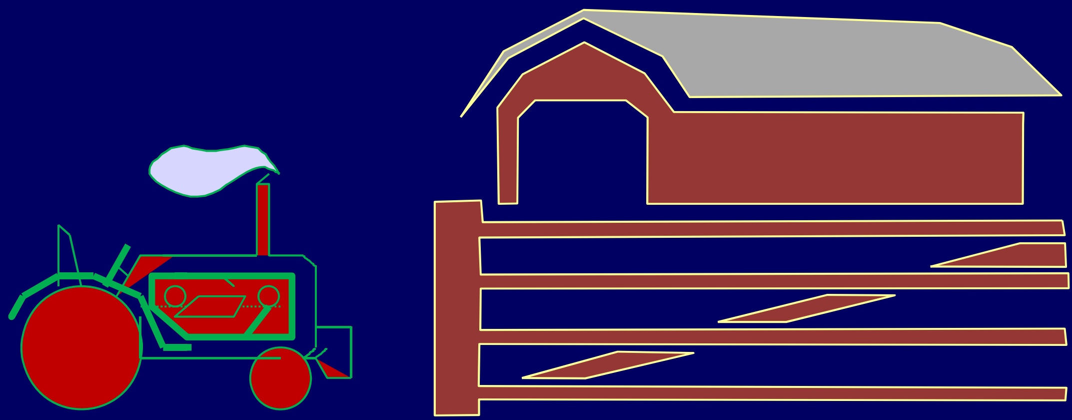
Long run problems remain:

1. Oversupply--too much capacity to produce
2. Countries that need the food often don't have the money to buy
3. Still low returns to resources used in agricultural production:
   - labor
   - management

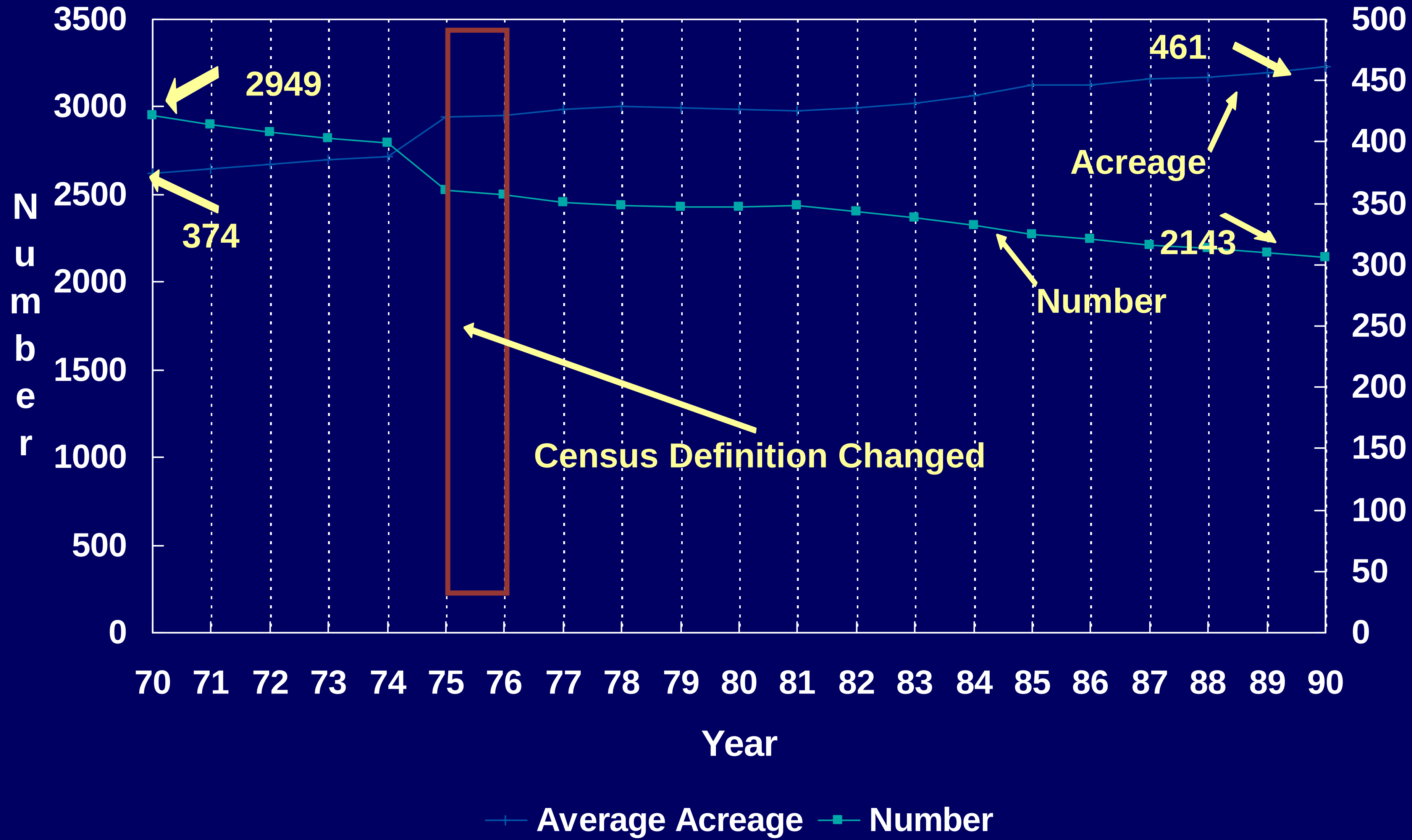
Many farmers still would be better off doing something else!

The Changing Structure of U.S. Agriculture

Number of farms declines nationwide as average acreages increase

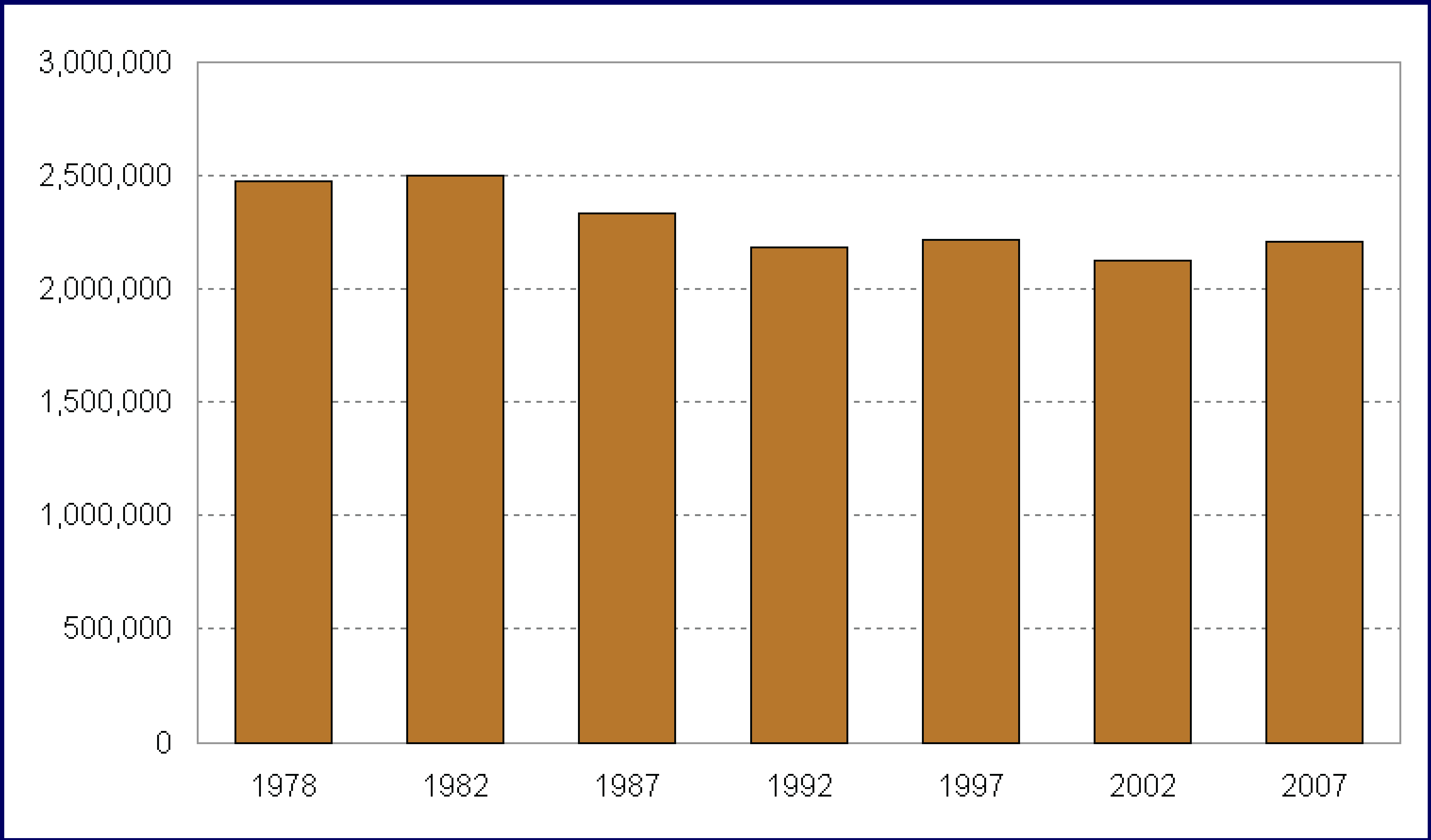


Number and Average Acreage of Farms, U.S., 1970-90



Number in thousands

Number of Farms, U.S., 1978-2007

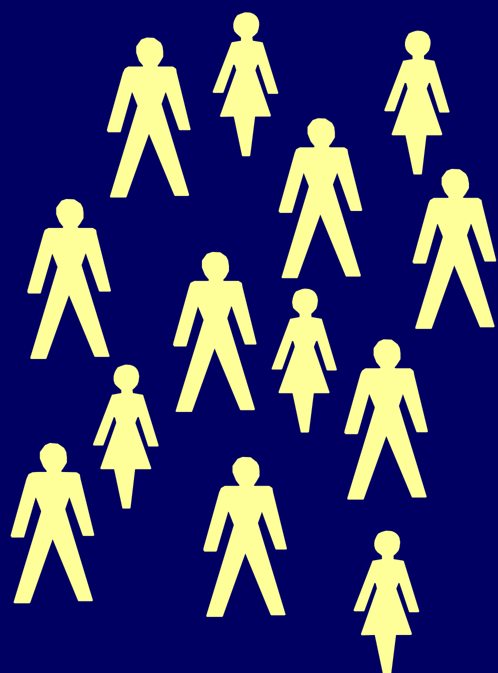


Source: USDA Census of Agriculture, Various Years

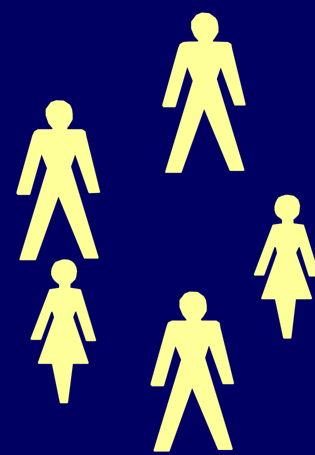
Since 1990, the total number of farms in the US has changed very little, remaining at just over 2,000,000 farms. There continues to be a decline in numbers of smaller, full-time commercial farms, but this is approximately offset by increases in numbers of part-time and hobby farms.

Living on small acreage is an increasingly popular lifestyle!

Total Farm Population:



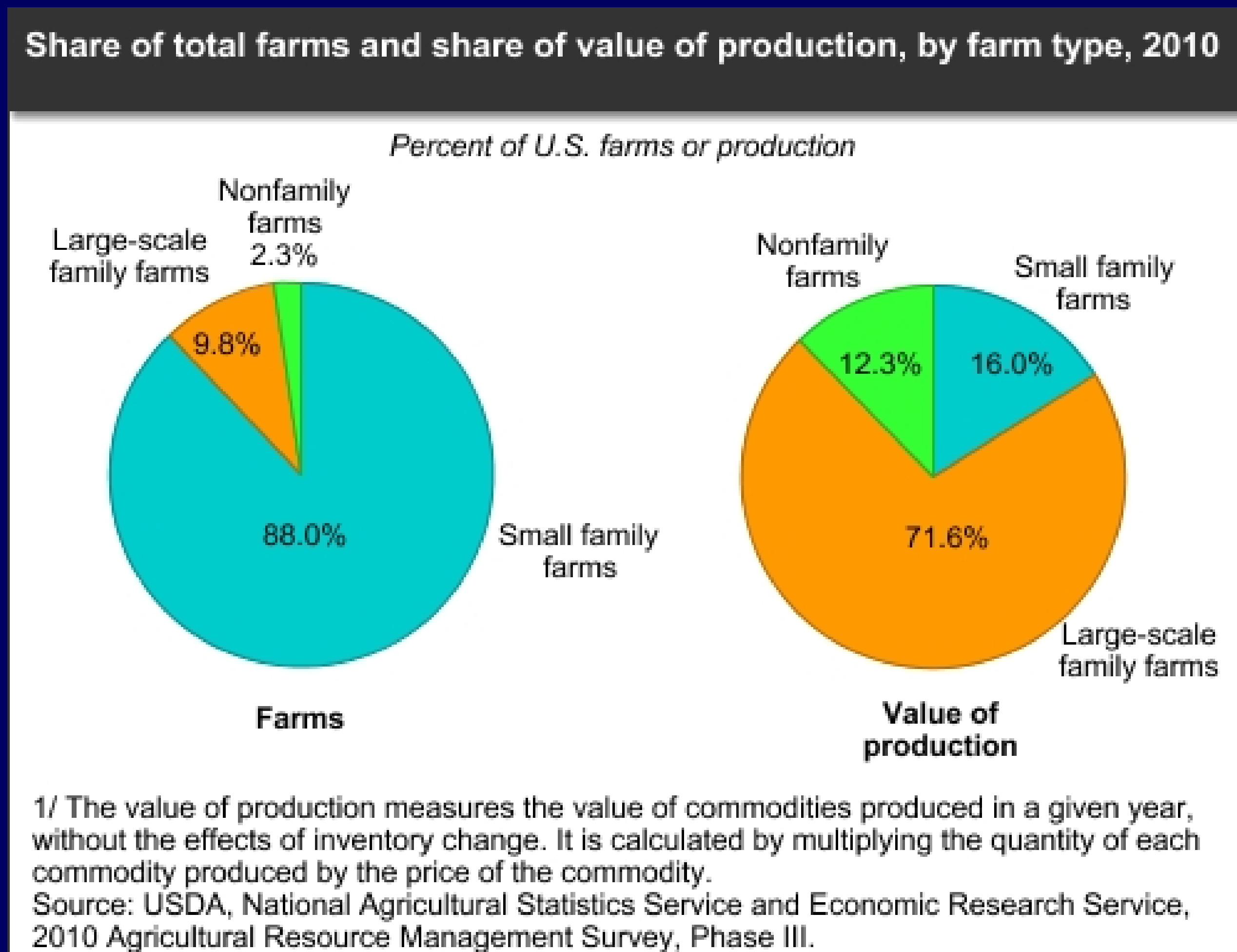
1960   15 million



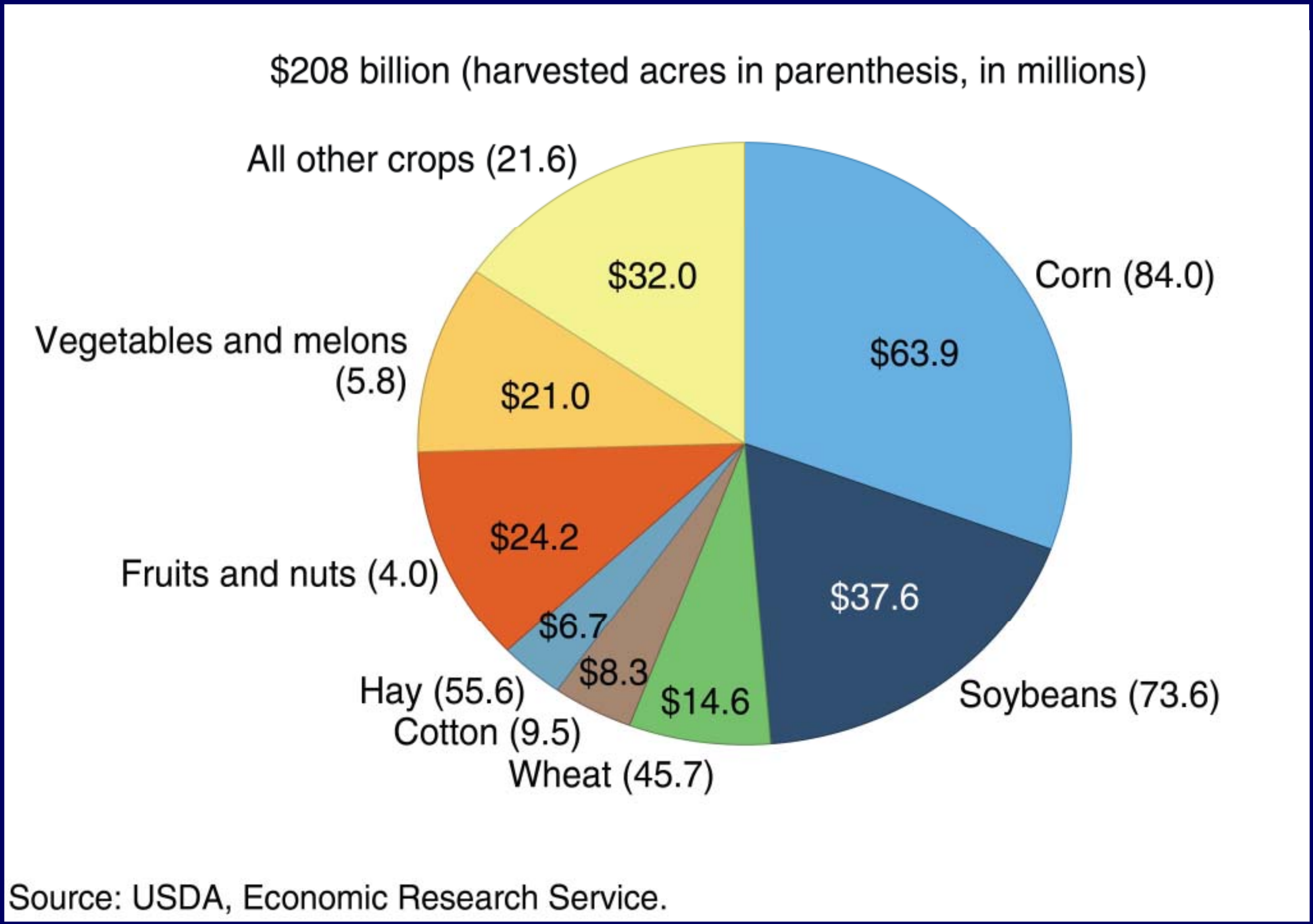
2010 4.7 Million

From 1990 to 2010, the total number of people living on farms in the US has also changed very little, remaining at about 4,700,000 people. However, the US total population continues to increase, so the *percentage of the total US population living on farms continues to decline over time.*

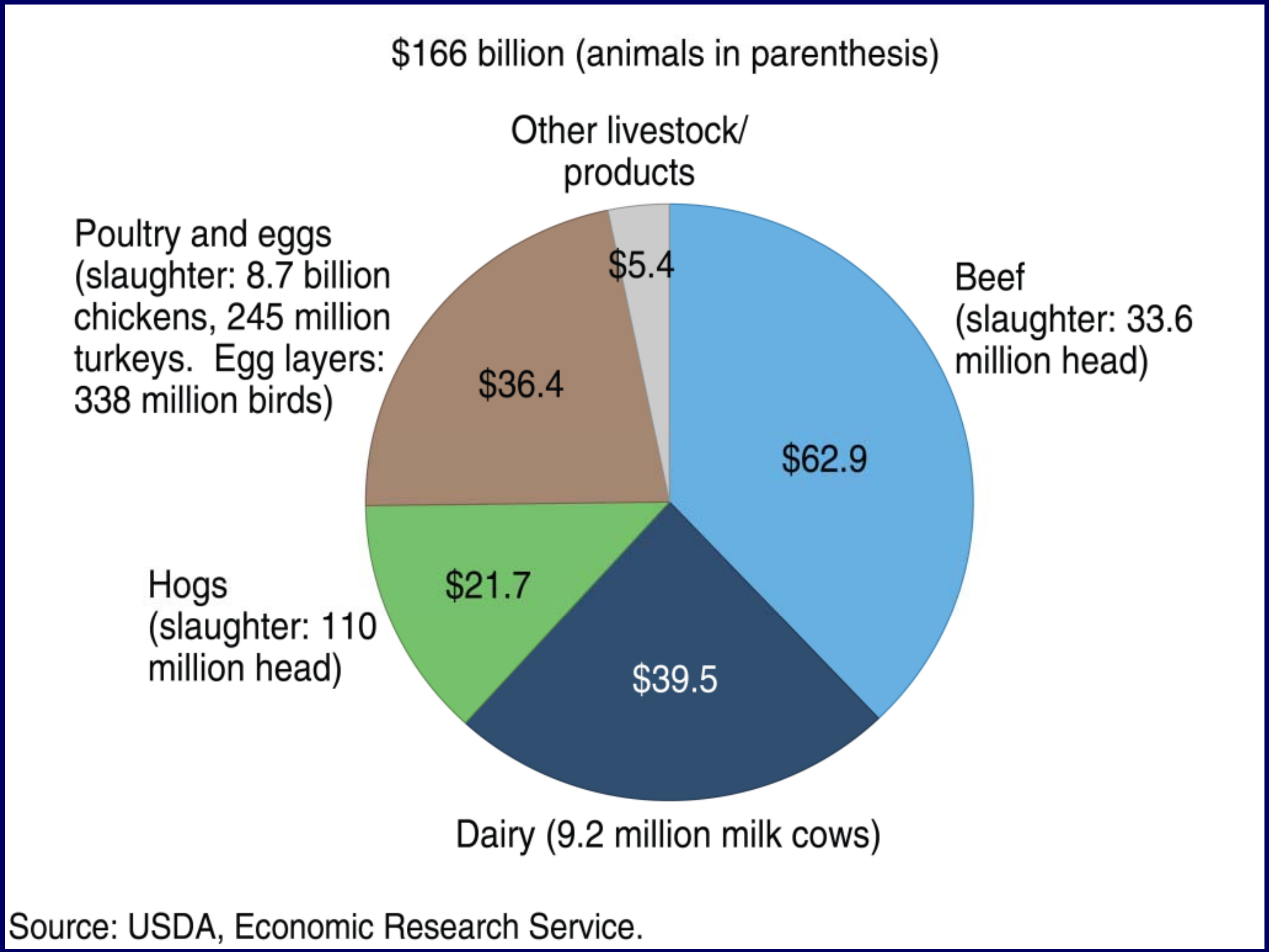
Small family farms are 88% of US farm numbers but only 16 % of the Output



US Cash Recepts from Crop Sales, 2011



US Cash Recepts from Livestock Sales, 2011

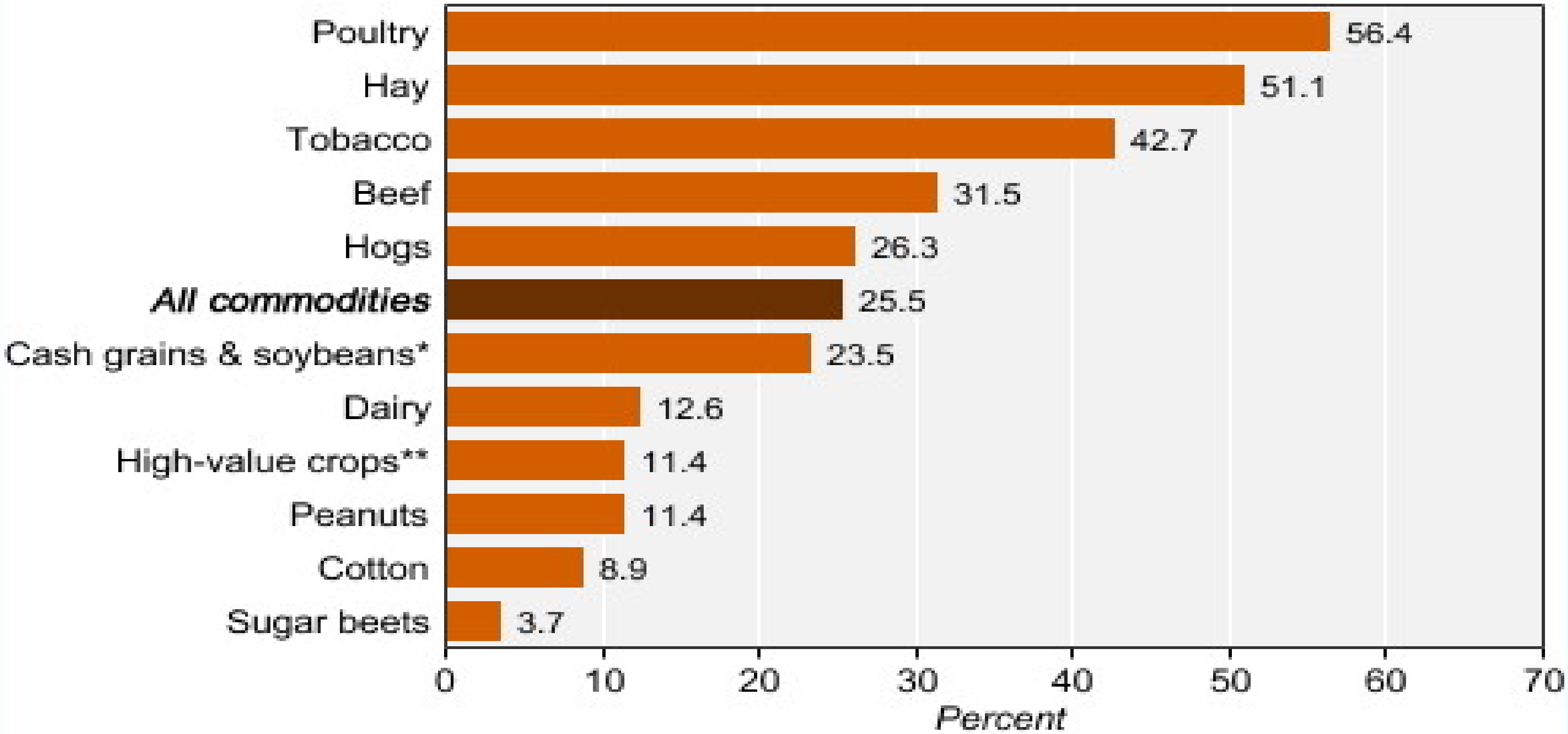


Number and Size of Farms Varies From State to State

Number of Farms and Average Acreage, Selected States, 2002 and 2007

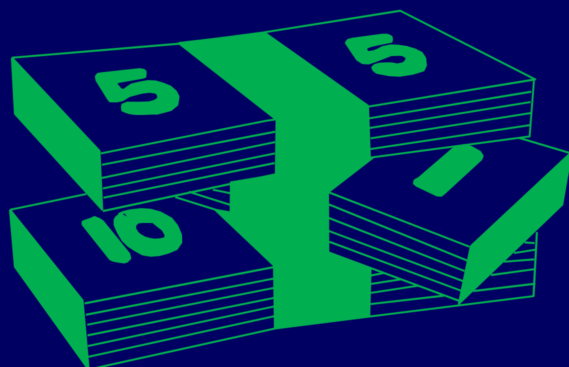
	Numbers (000)		Average Acreage	
	2002	2007	2002	2007
United States	**2,167**	**2,201**	**436**	418
Arizona	11	16	2,514	1,684
California	83	82	337	311
Indiana	63	62	240	239
Iowa	94	92	346	333
Kansas	65	66	736	705
Kentucky	90	86	152	163
Montana	28	29	2,133	2,068
North Carolina	56	52	166	164
North Dakota	31	32	1,279	1,241
Rhode Island	1	1	75	57
Texas	228	248	573	527
Wisconsin	78	78	206	195
Wyoming	9	11	3,750	2,745

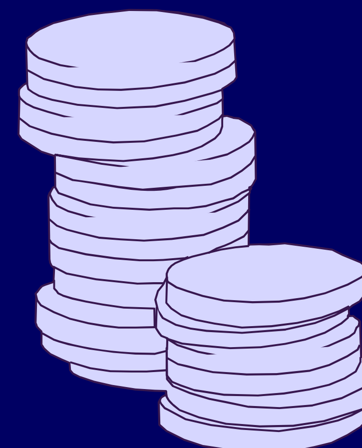
Share of US Agricultural Production from Small Family Farms by Commodity, 2011



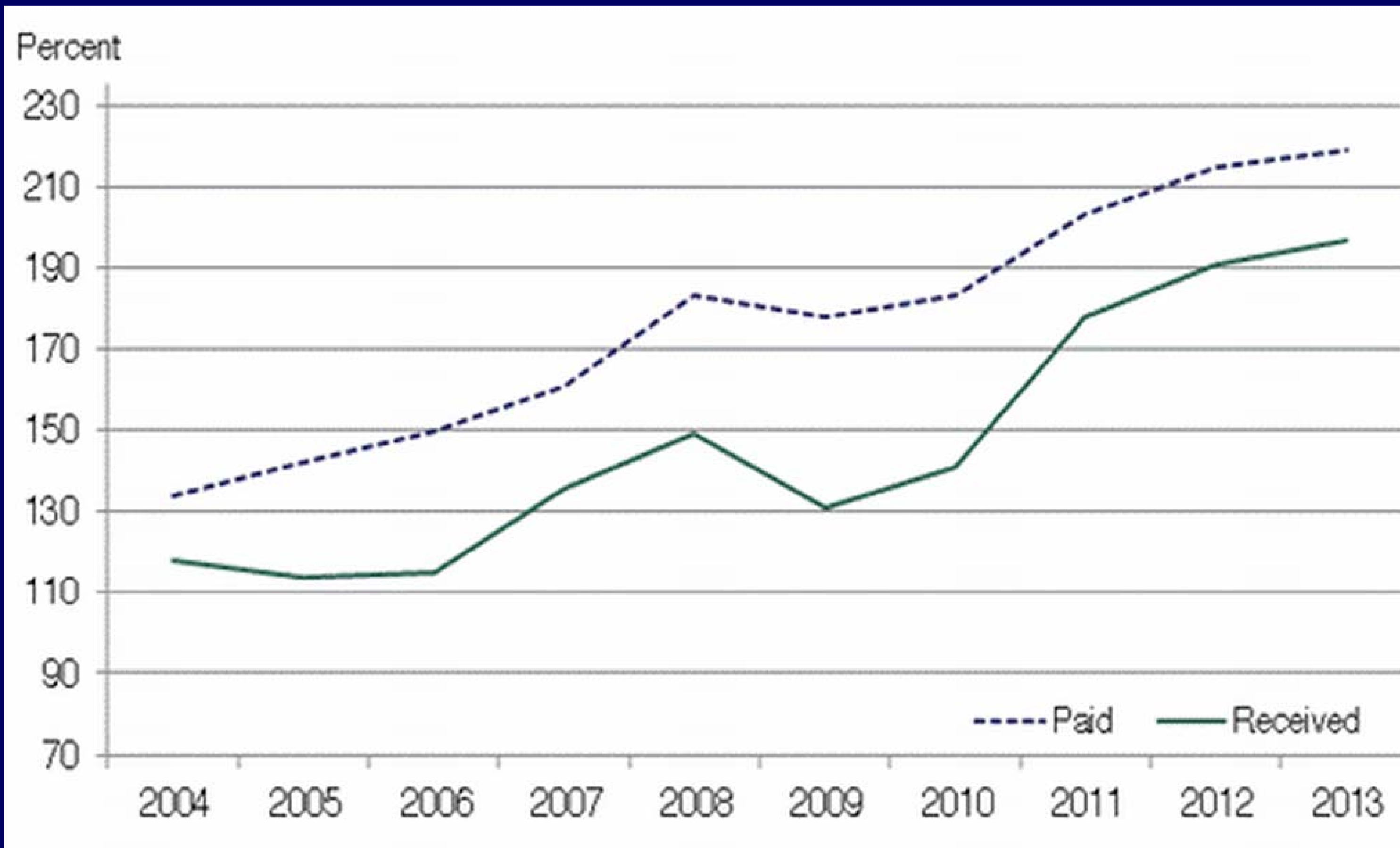
*Includes barley, corn, grain sorghum, rice, soybeans, wheat, and oats.
**Includes vegetables, fruits/tree nuts, and nursery/geenhouse products.
Note: Small family farms have gross cash farm income (GCFI) < $350,000.
Source: USDA, Economic Research Service and USDA, National Agricultural Statistics Service, 2011 Agricultural Resource Management Survey.

Farm prices have been approximately keeping up with input prices





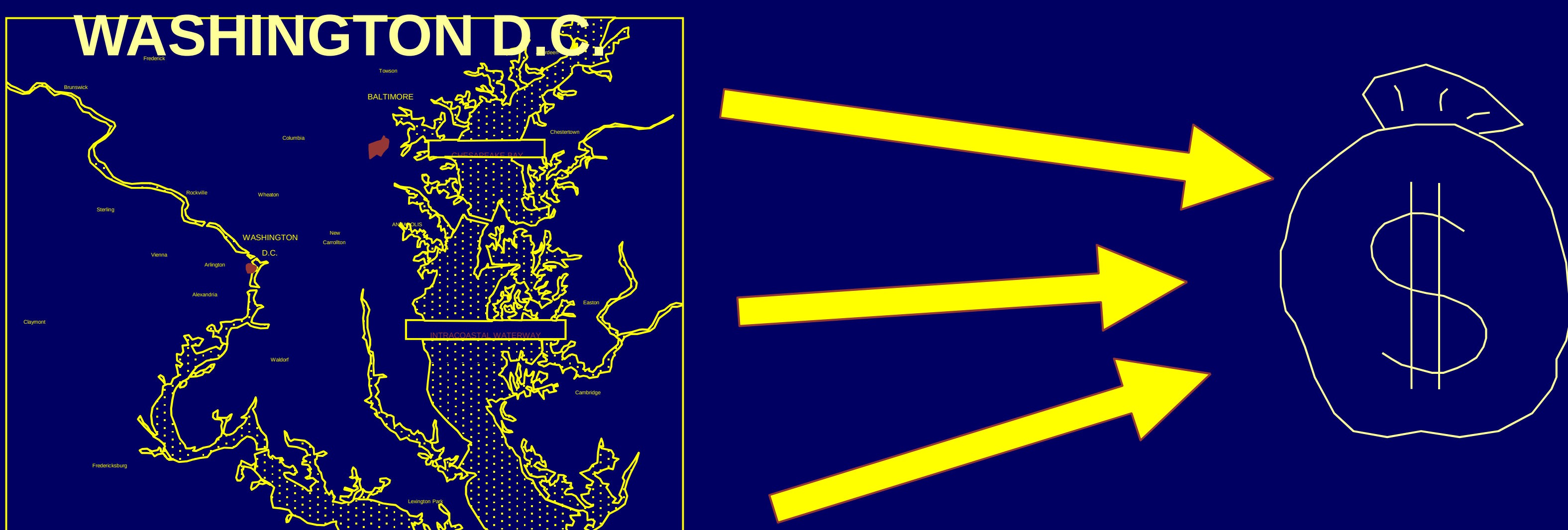
Prices Received and Prices Paid, US Annual average, 1990-92=100



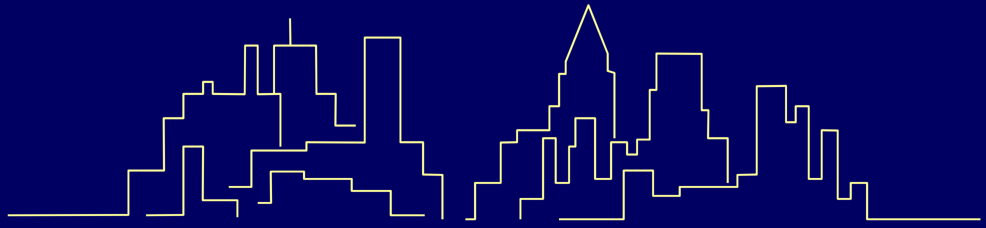
Source: USDA NASS

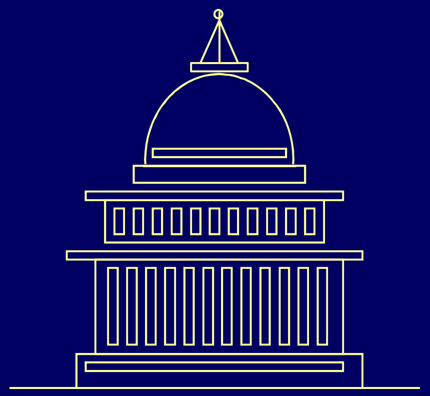
Gross Farm income has been increasing in most recent years

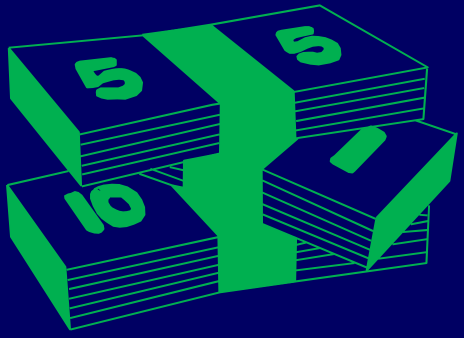
Net Farm Income is propped up by government payments



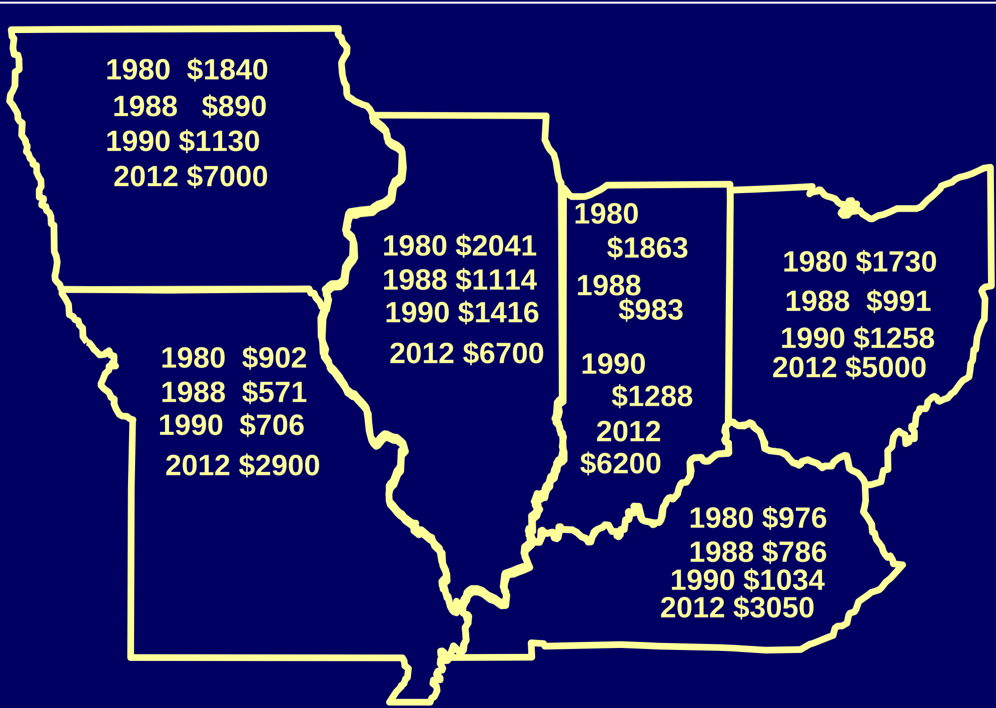
Off-Farm income and government payments make up an increasing share of the farmer's Income for many farms



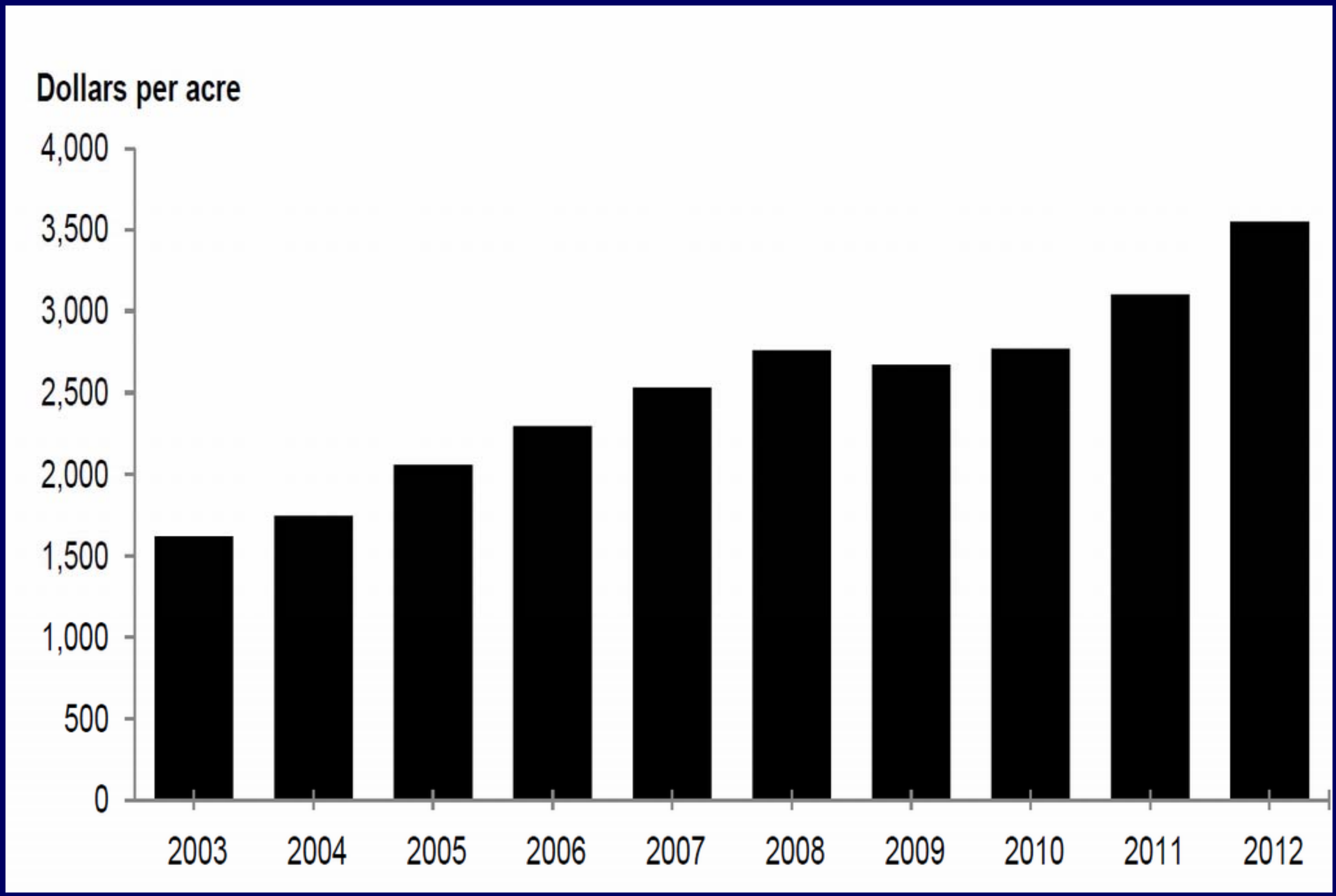




Land and building values declined in many states From 1980-1990, but have rebounded spectacularly through 2012



Average Cropland Value, United States

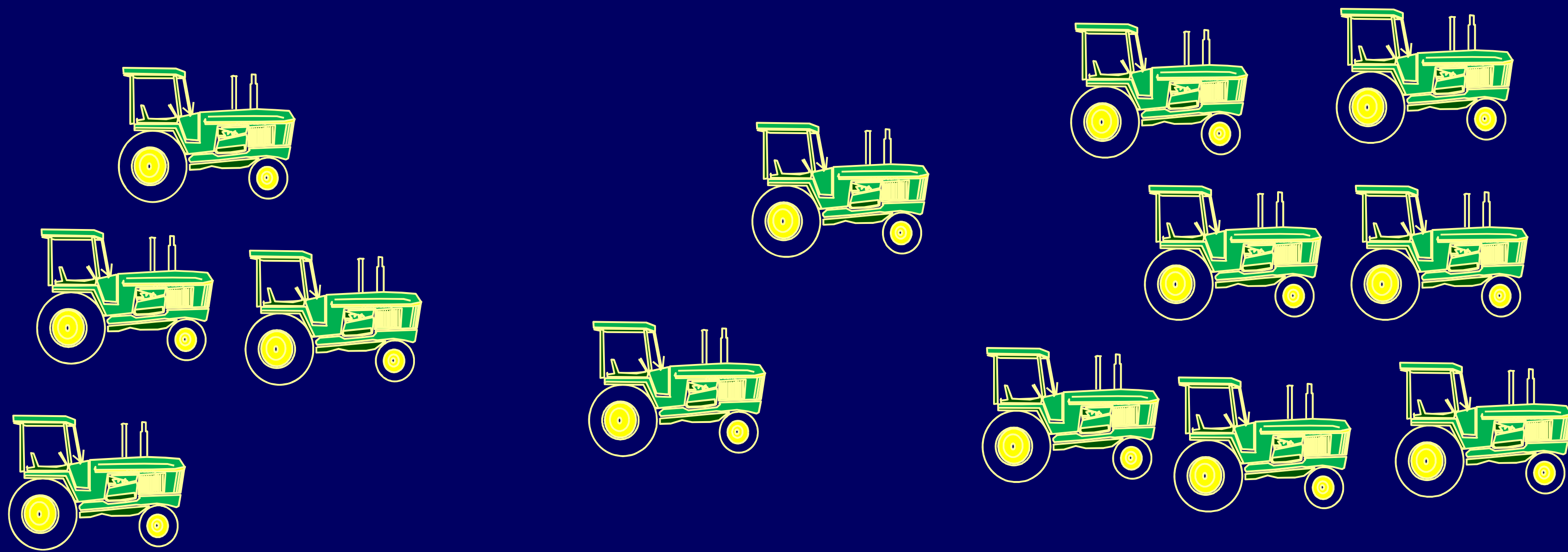


Source: USDA NASS

Land prices have gotten so expensive that fewer and fewer active commercial farmers own significant amounts of their own land, but instead rent land from retired farmers (or their widows).

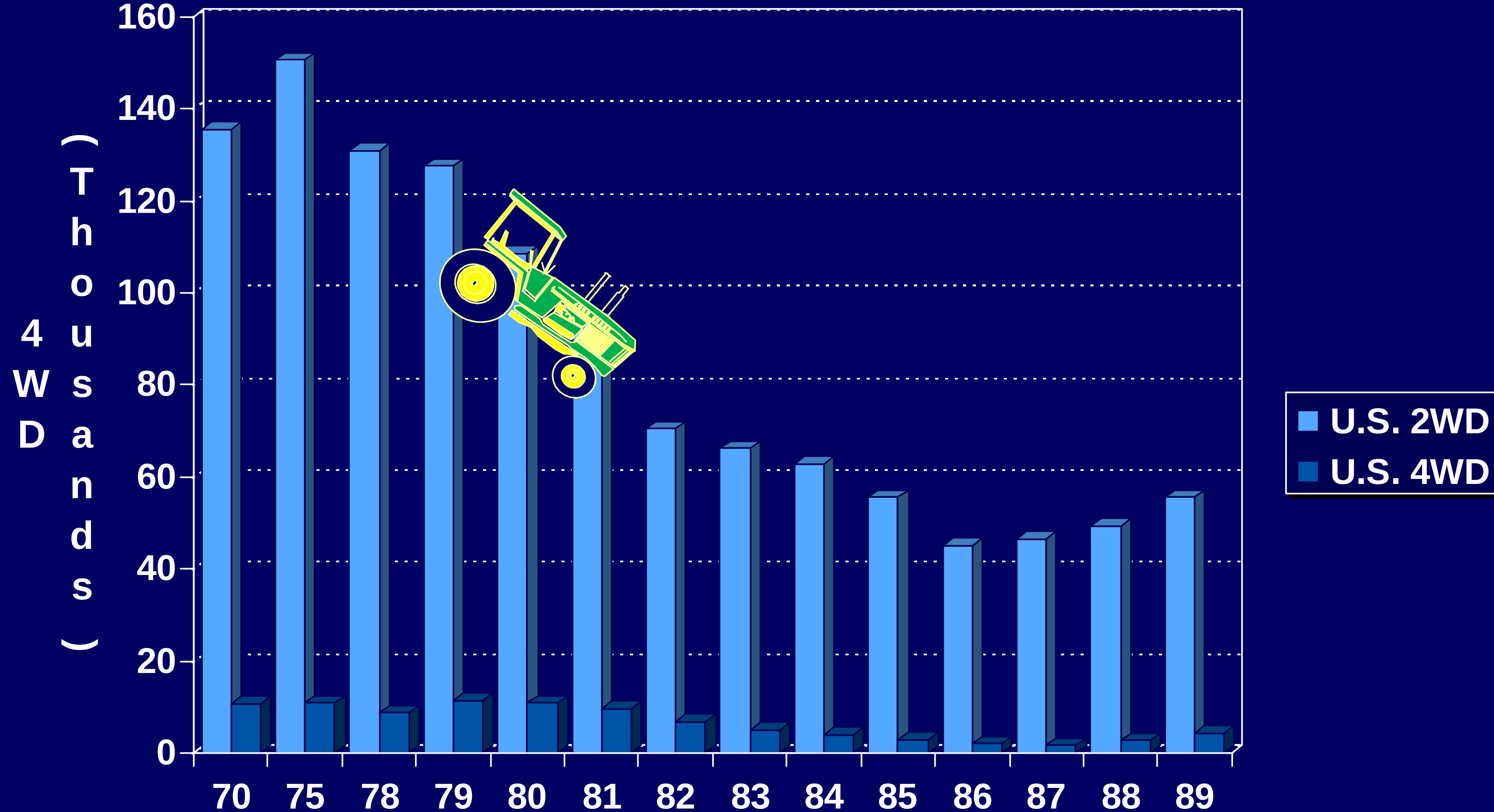
This often works well for both the active and the retired farmer. The active farmer does not need to tie up cash that could be more profitably used elsewhere in land payments. The retired farmer gets the appreciation (far better than a bank CD) as well as a steady income stream from the rent paid.

The Demand for Farm Machinery tends to move with crop prices (and income tax considerations)

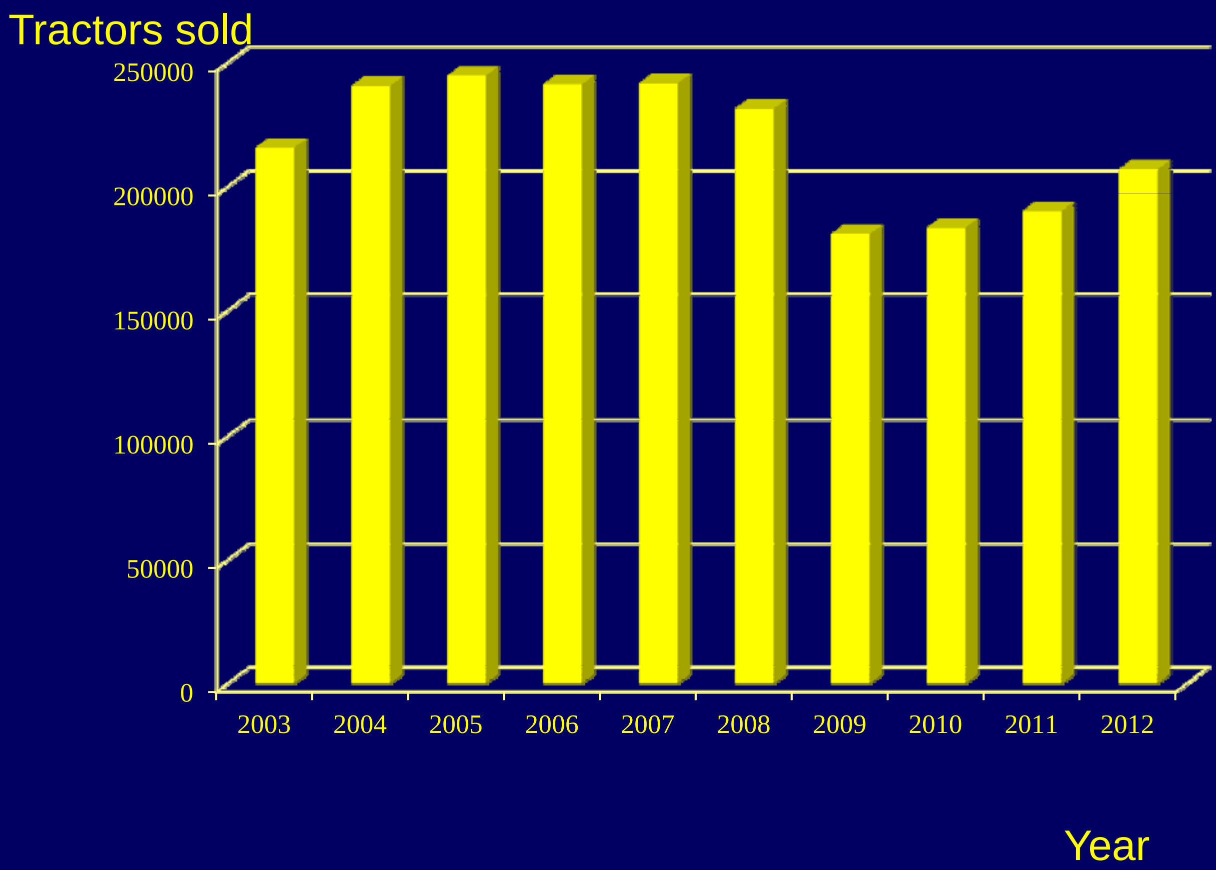


1970 **1990** **2010**

Retail Sales of Two- and Four-Wheel Drive Tractors, 1970-89

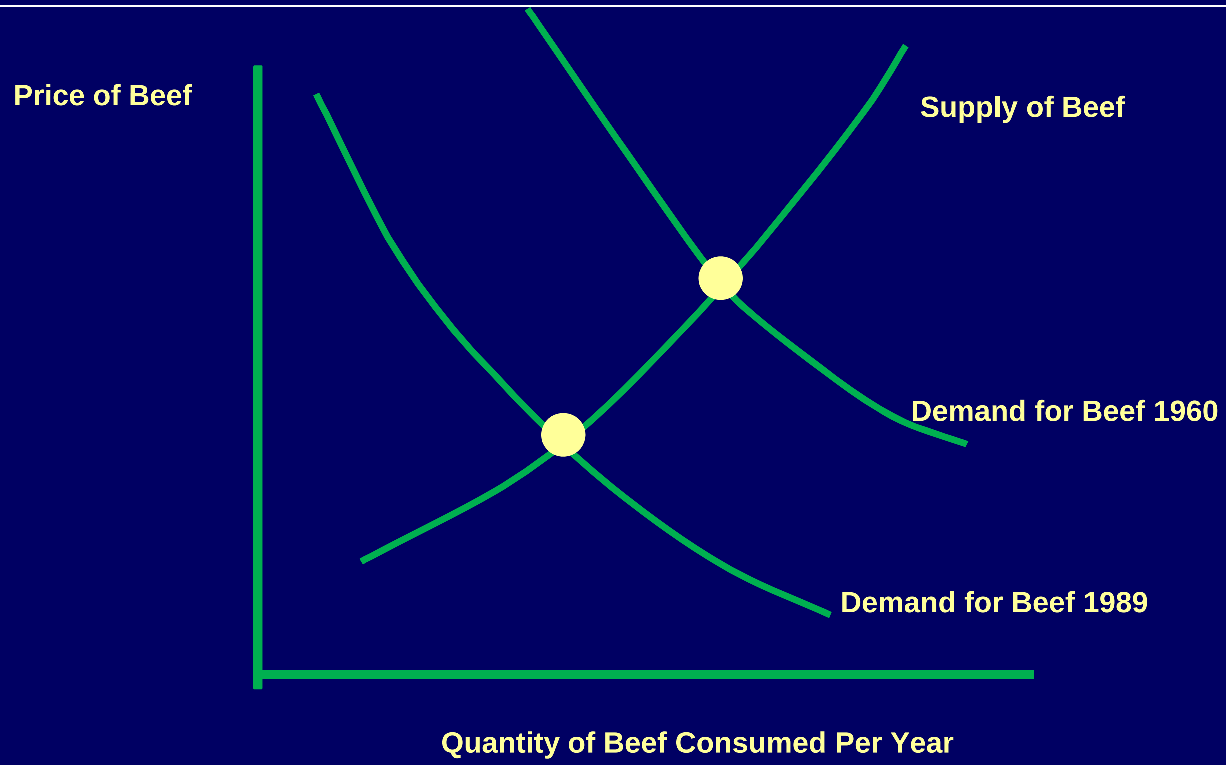


Total Wheeled Tractor Sales, US and Canada. 2003-2012

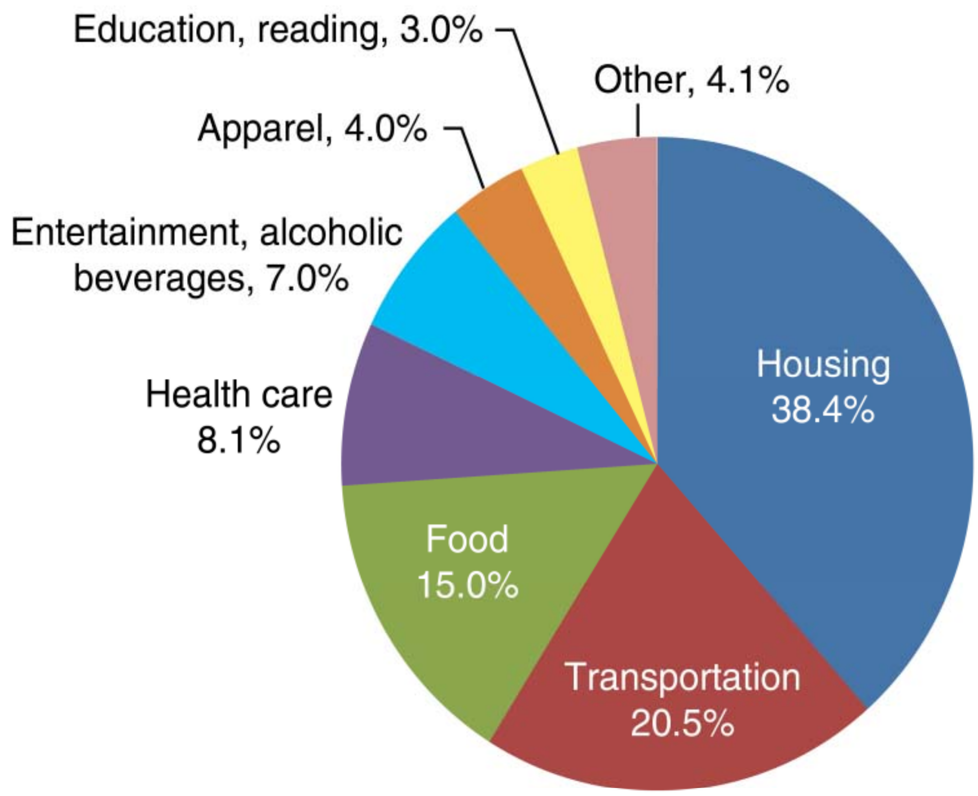


Source: Deere publication

Consumption patterns for agricultural commodities are changing

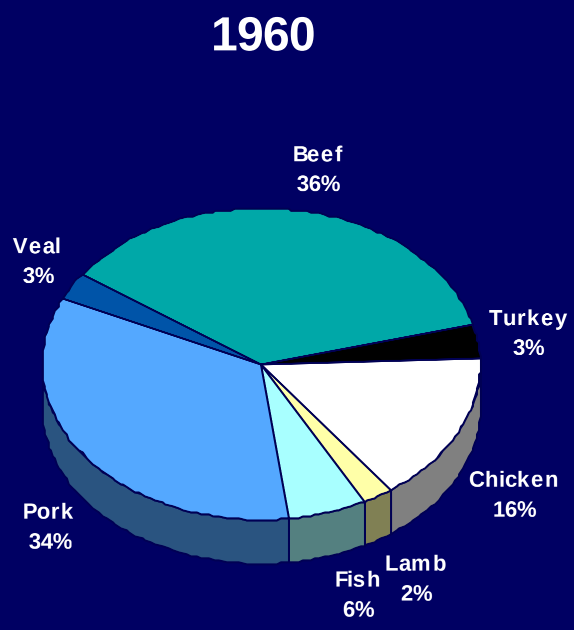


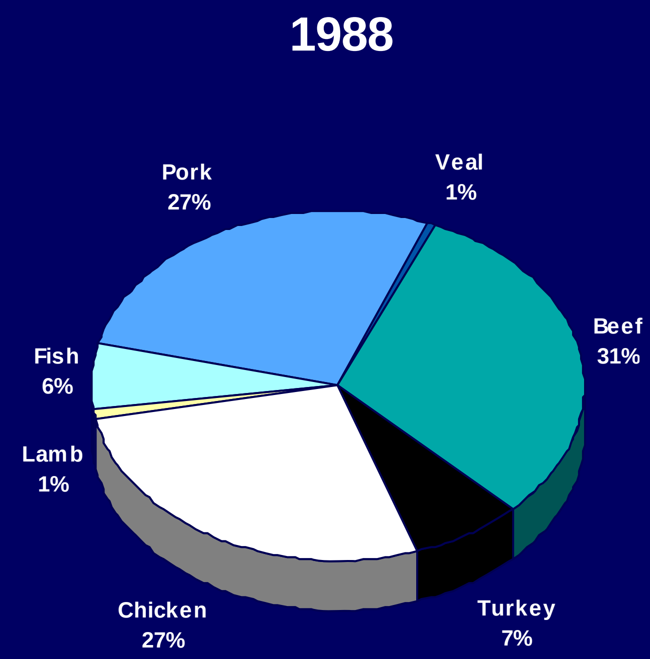
Food Accounted for 15% of Household Expenditures in 2011



Note: Other includes personal care products, tobacco, and miscellaneous expenditures.
Source: U.S. Bureau of Labor Statistics, Consumer Expenditure Survey, 2012.

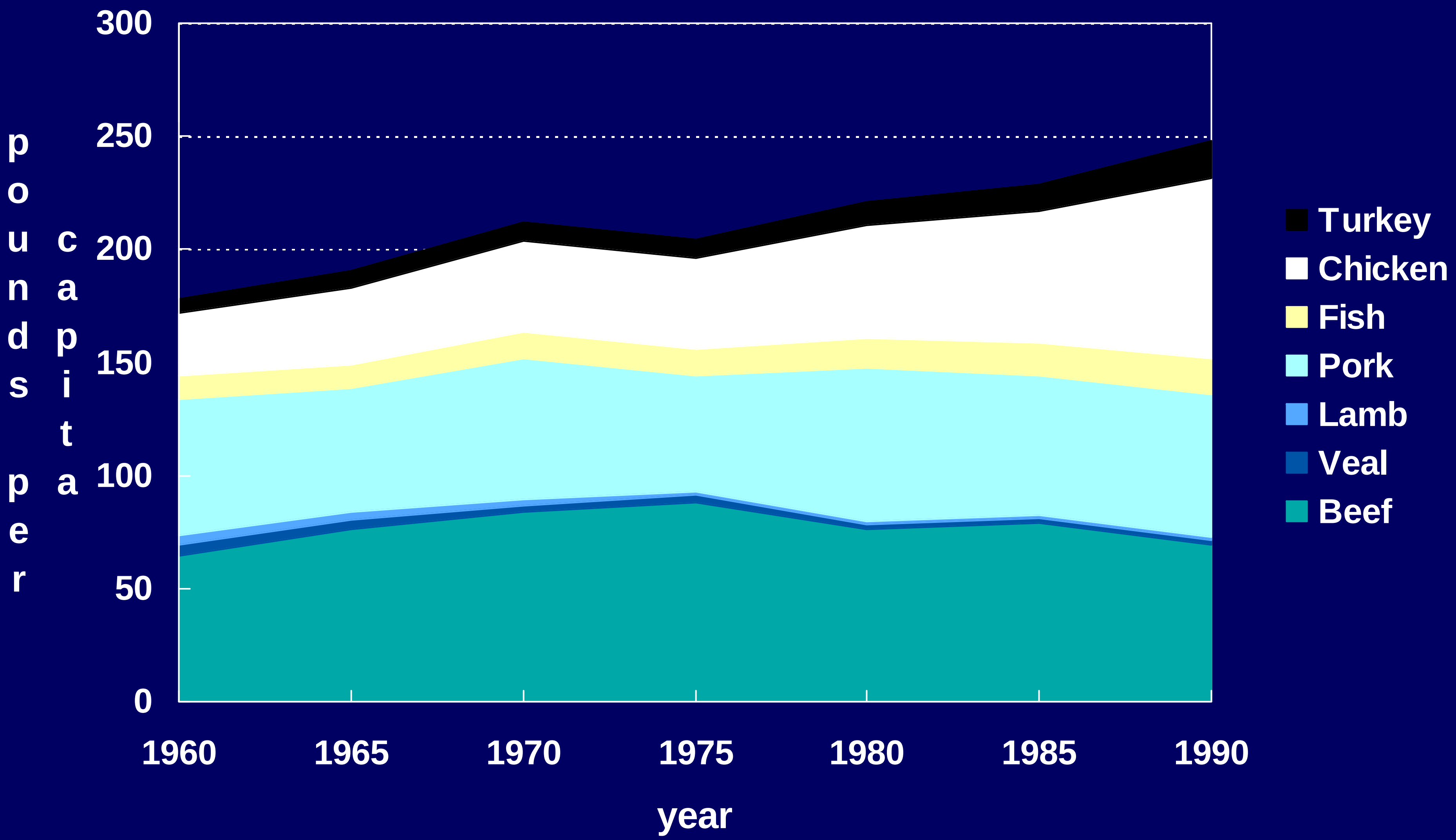
Per Capita Meat Consumption
1960 and 1988





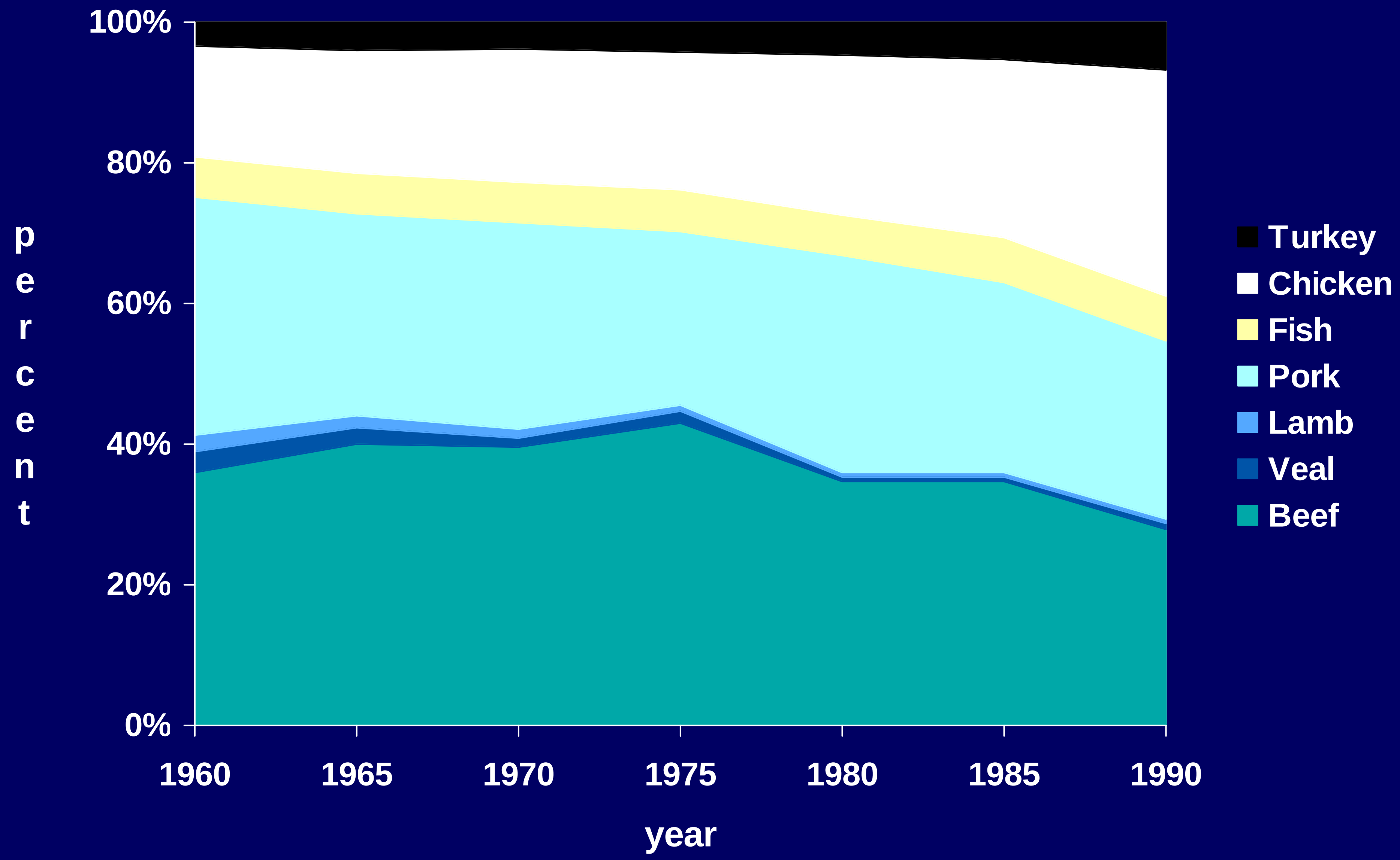
Pounds per capita

Per Capita Consumption of Meat 1960-90 (lbs.)

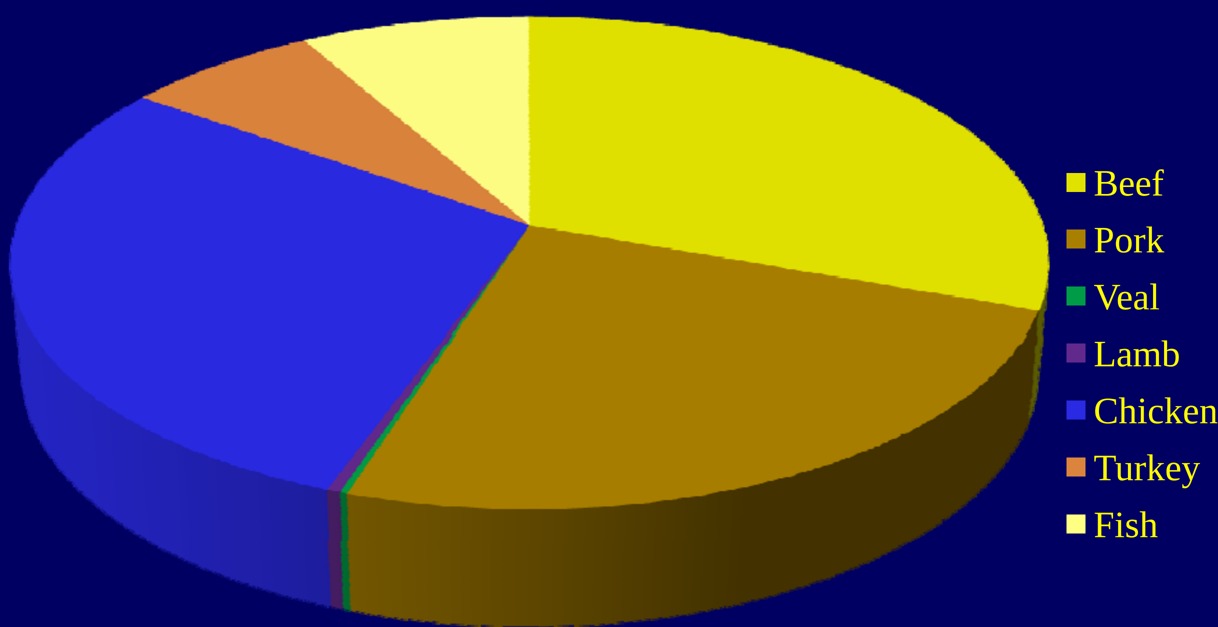


carcass weight basis

Per Capita Consumption of Meat 1960-90 (Percent of Total)



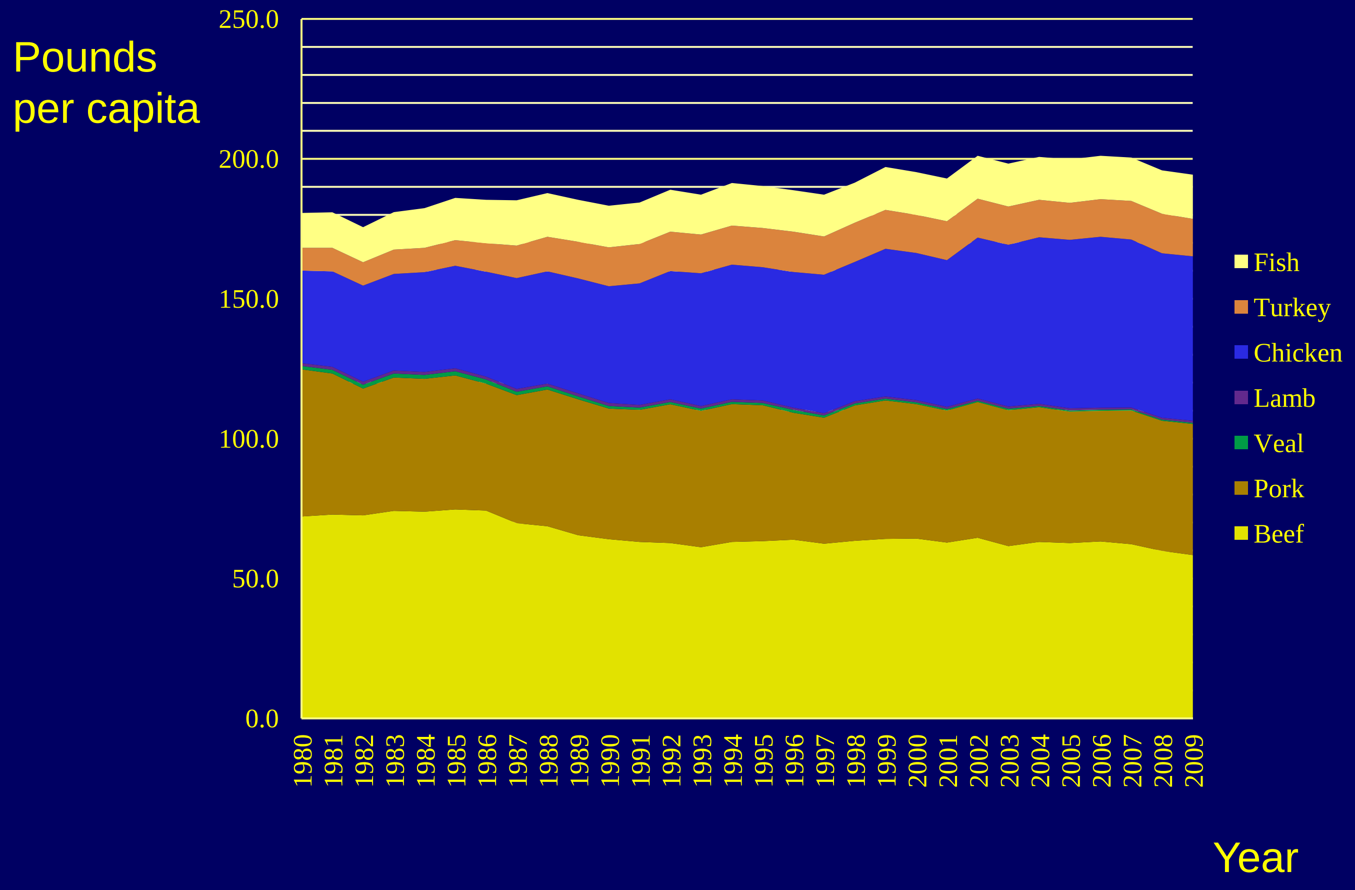
Per Capita Meat Consumption, 2009



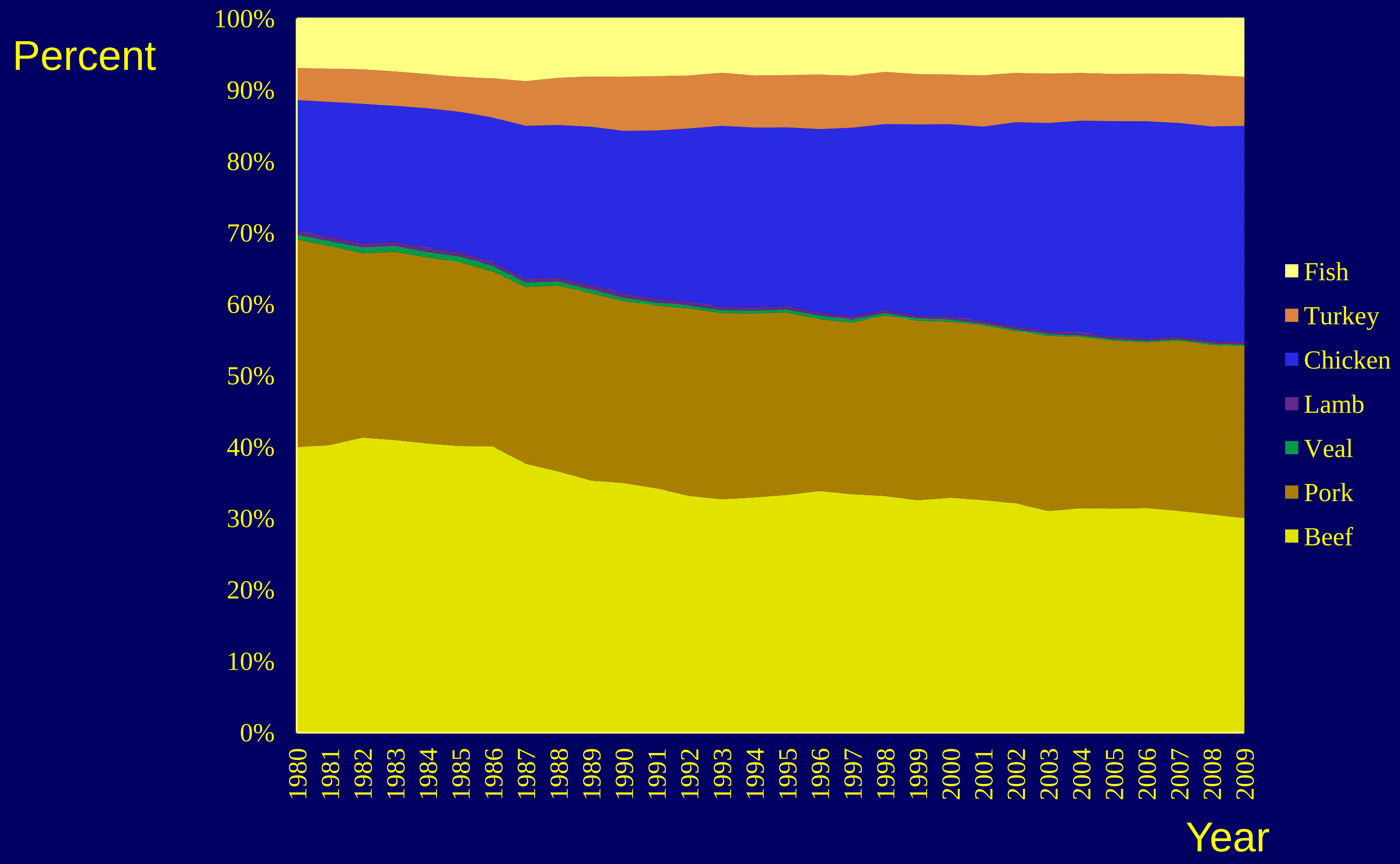
	2009	Percent
Beef	58.4	30.5%
Pork	46.9	24.5%
Veal	0.4	0.2%
Lamb	0.7	0.4%
Chicken	56.1	29.3%
Turkey	13.4	7.0%
Fish	15.8	8.2%
Total	191.7 lbs.	

Source: Compiled from USDA data

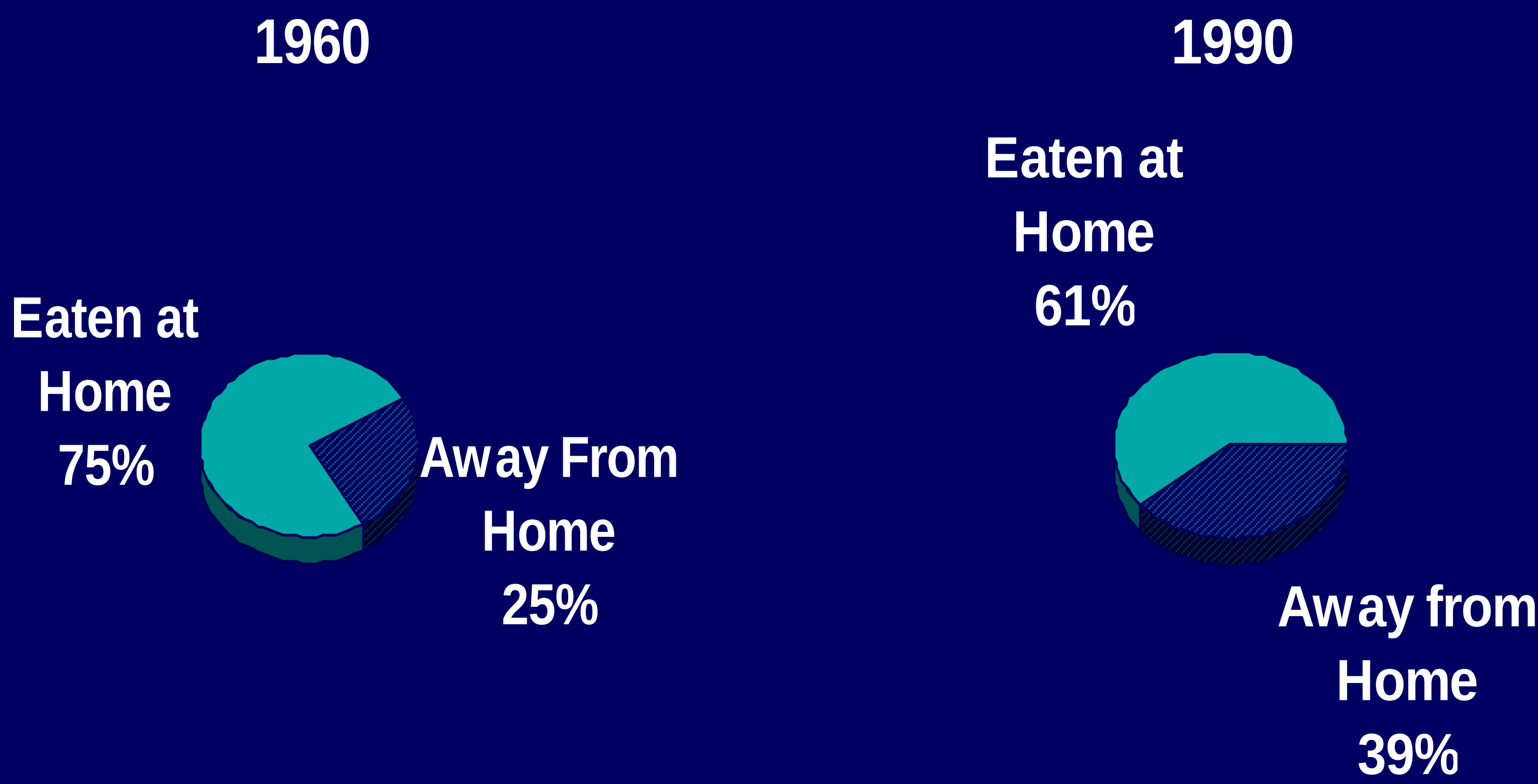
Per Capita Consumption of Meat, Pounds per Capita, 1980-2009



Per Capita Consumption of Meat, as a Percent of the Total, 1980-2009

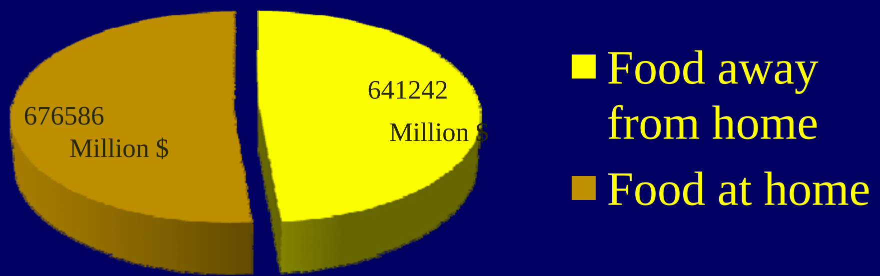


Food Eaten At Home And Away From Home



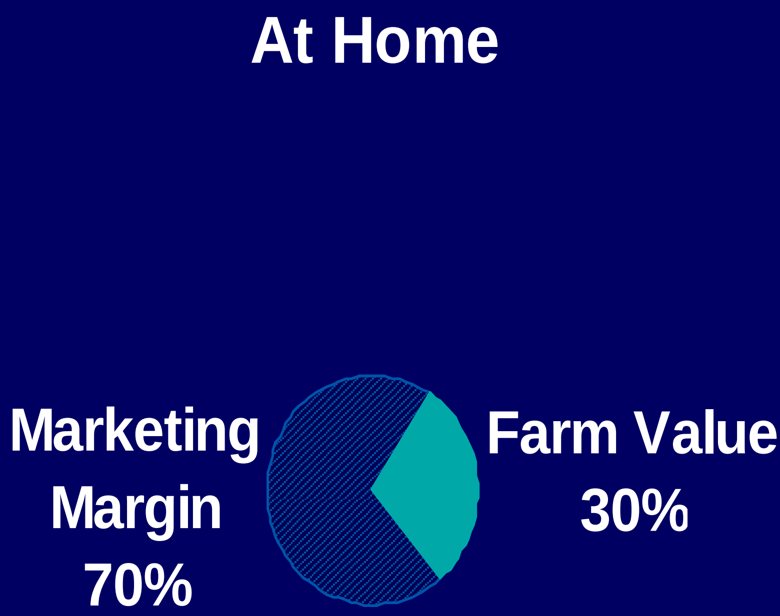
(billions of current dollars)

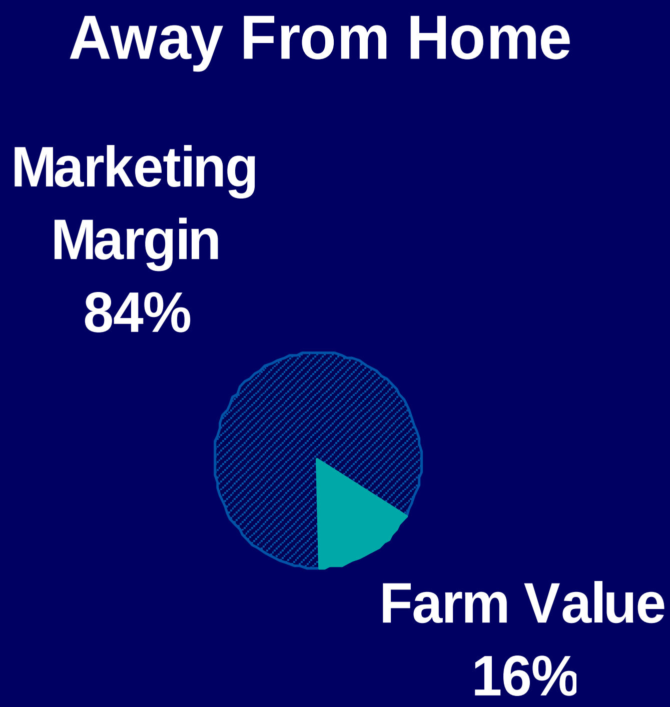
Expenditures on Food Eaten at Home vs Away-From-Home, 2011



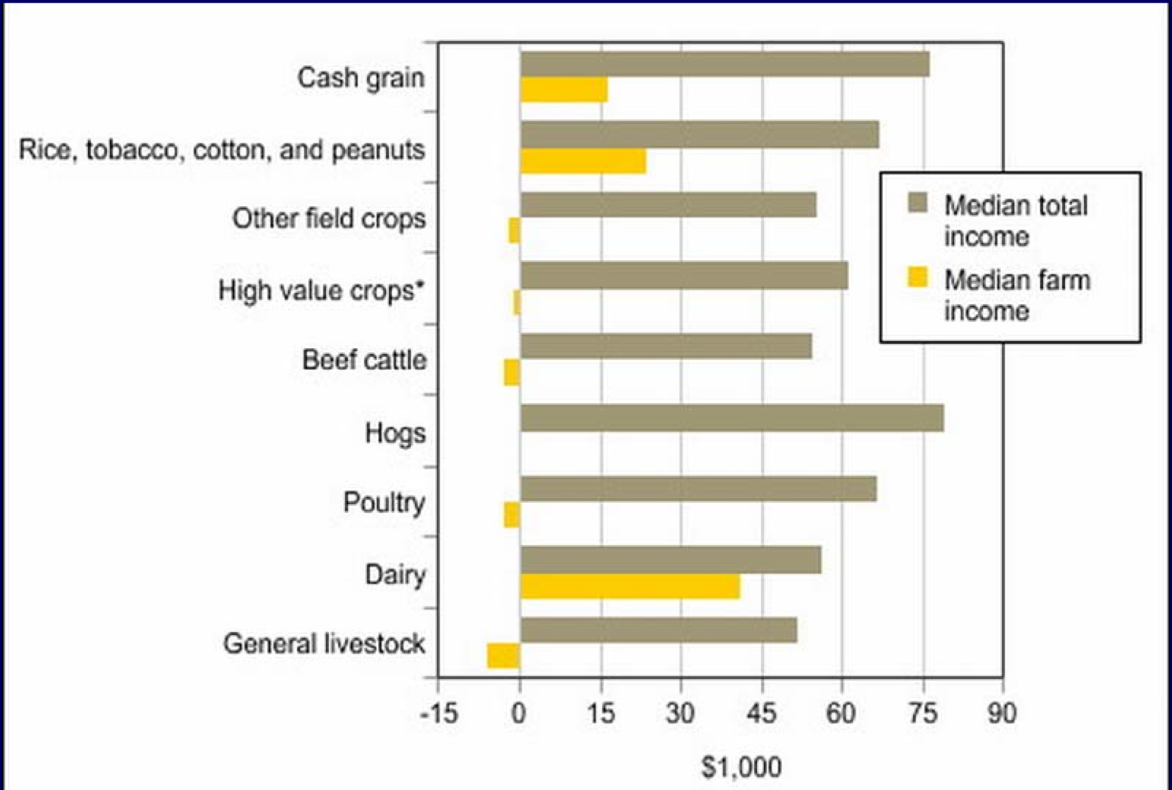
By 2011, expenditures on food eaten at home was 51 % of the total, and expenditures on food eaten away from home was 49 % of total expenditures!

Farmers Share of Food Dollar At Home and Away From Home





Household income varies by commodity specialization, 2011



*Includes fruit, nuts, vegetables, greenhouse and nursery.
Source: Agricultural Resource Management Survey, ERS and NASS, USDA.

Dairy farmers get most of their household income from the cows:
Not true for beef producers!

90 years of Structural Change in U.S. Agriculture

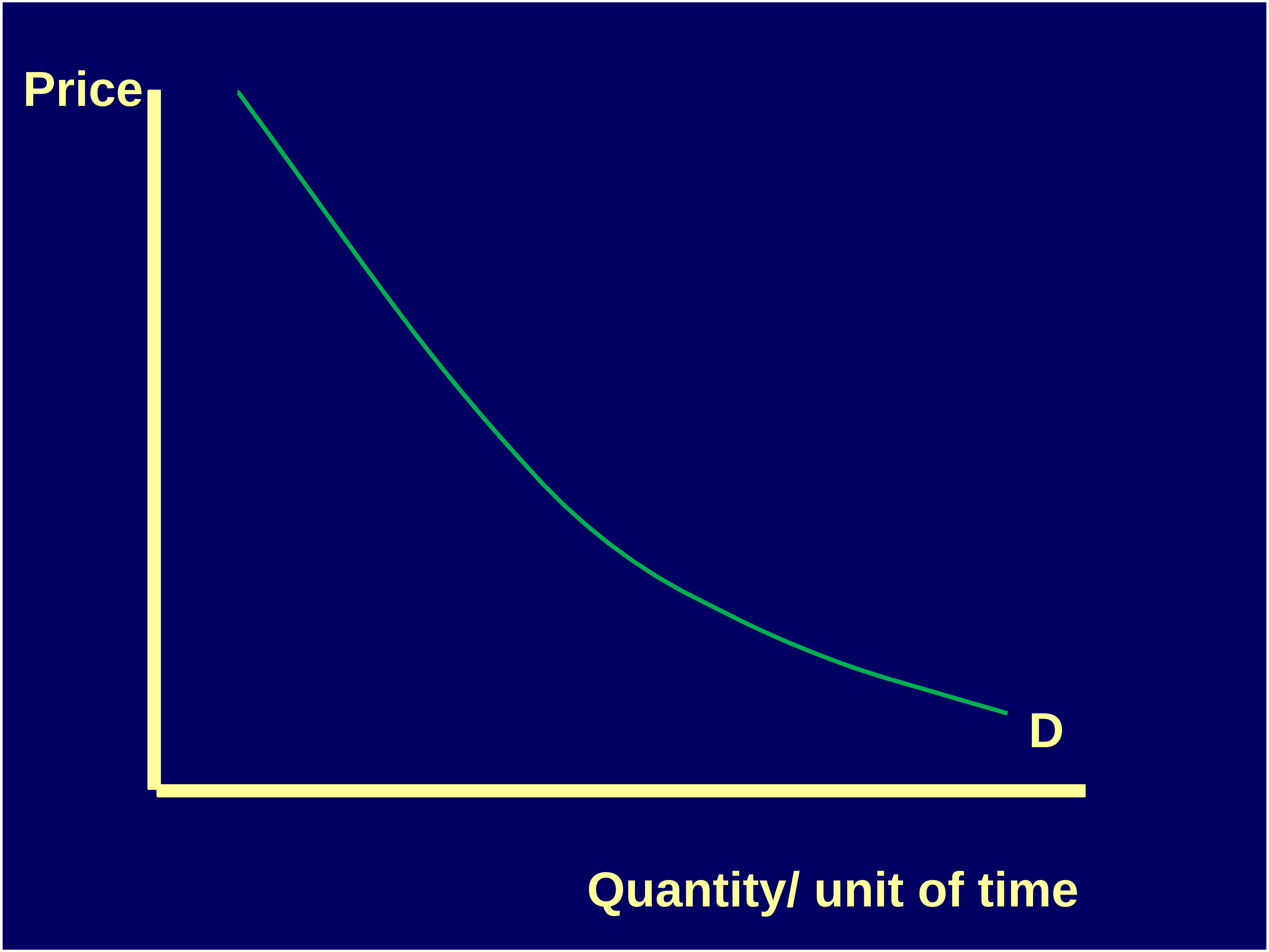
Year	1920	1950	1980	2000	2010
Number of farms (thousands)	6,518	5,648	2,440	2,167	2,192
Average farm size (acres)	147	213	426	436	419
Rural share of population (percent)	48.8	36.0	26.3	21.0	19.3
Farm share of workforce (percent)	25.4	12.1	3.4	1.8	1.6
Farm share of GDP (percent)	7.7	6.8	2.2	1.0	0.9

Note: 1920 data for farm share of GDP not available. Value reported is for 1930, as calculated by the Department of Agriculture, Economic Research Service.
Source: Department of Agriculture, National Agricultural Statistics Service, Farms, Land in Farms, and Livestock Operations; Bureau of Economic Analysis, GDP by Industry; Sobek (2006); CEA calculations.

Source: 2013 Economic Report of the President

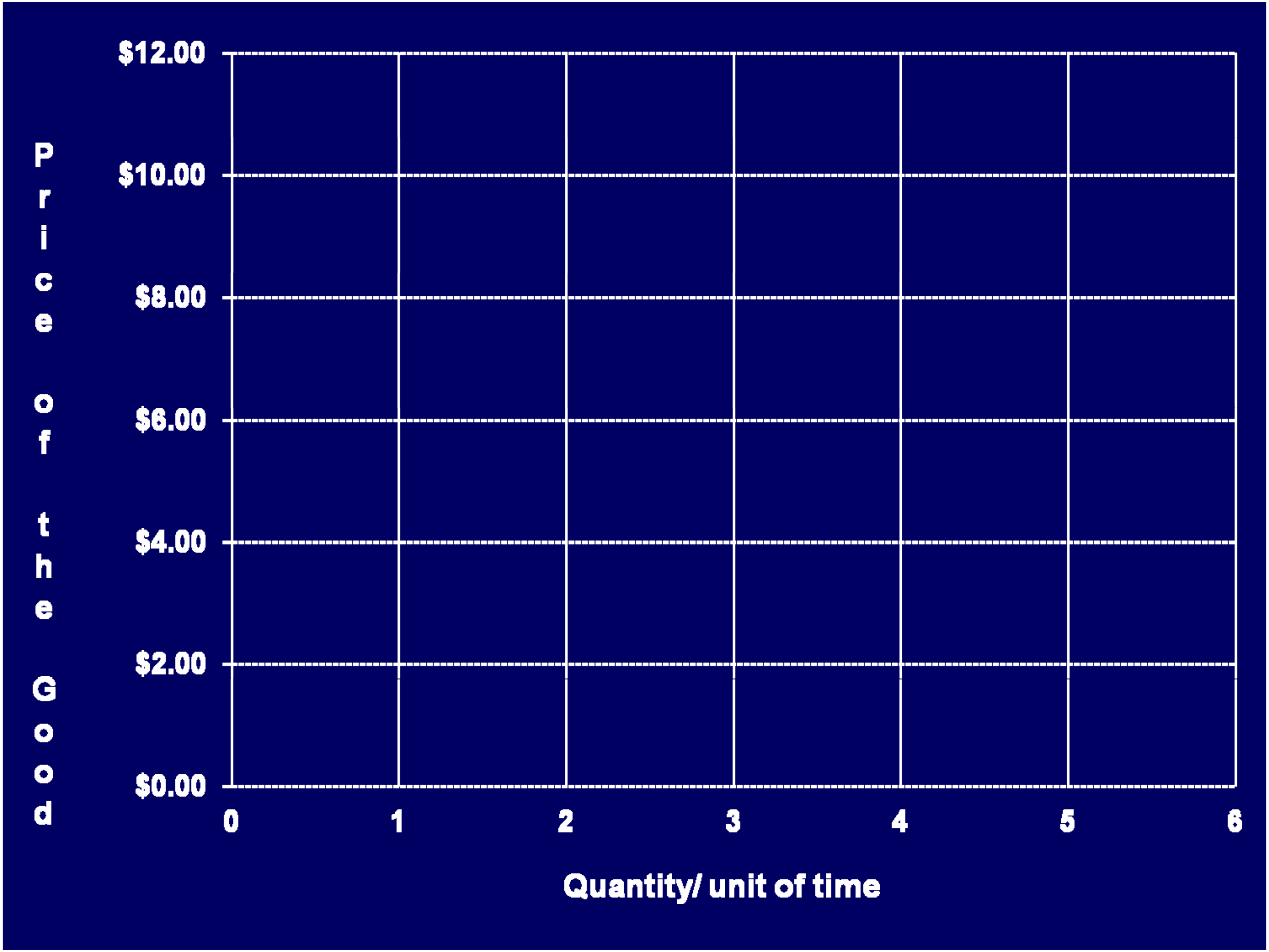
Demand

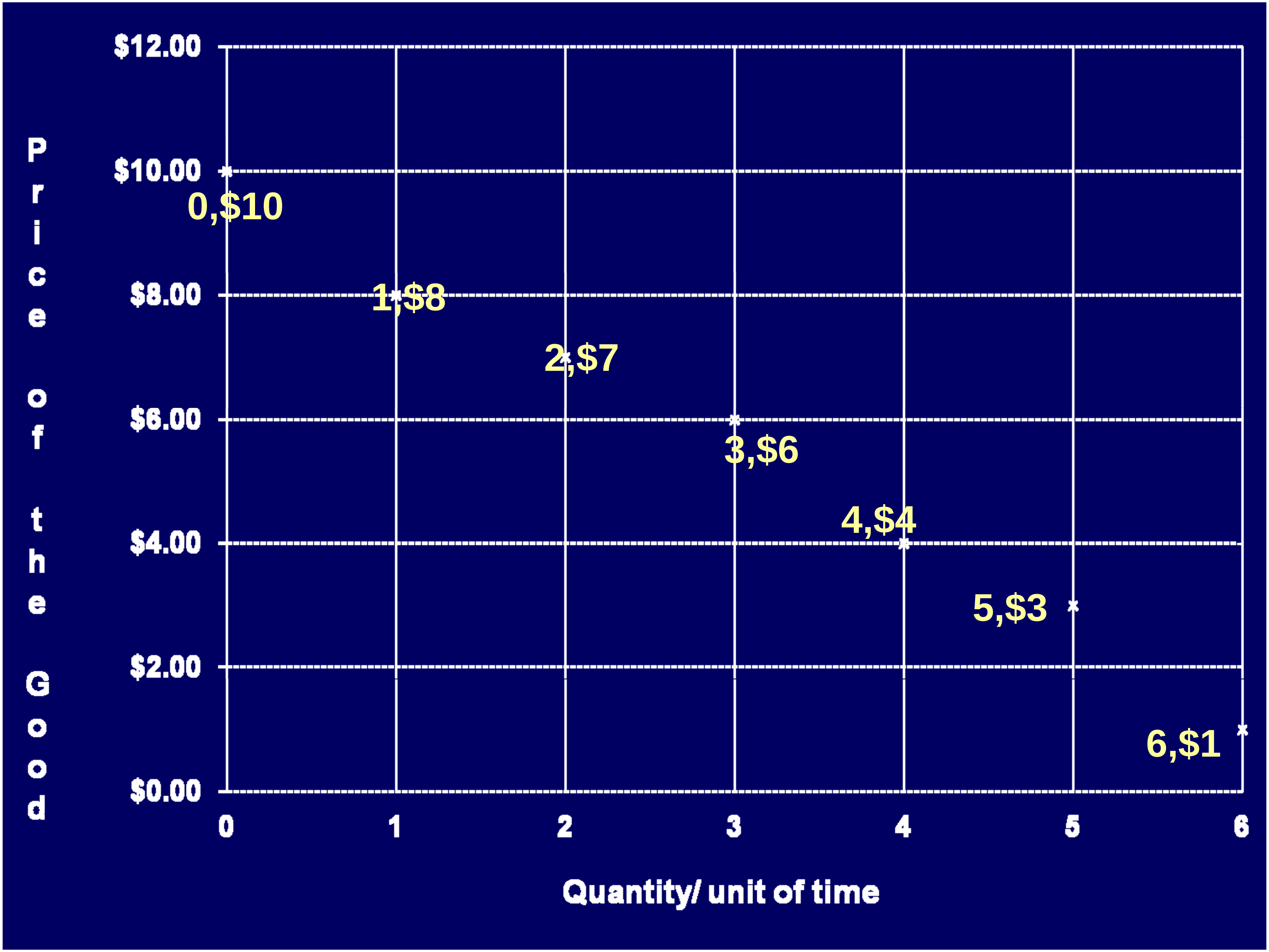
A Schedule Showing the
Amounts of a Good
Consumers are
Willing and Able to Purchase
At a Specified Set of Prices
During A Specified Period of Time

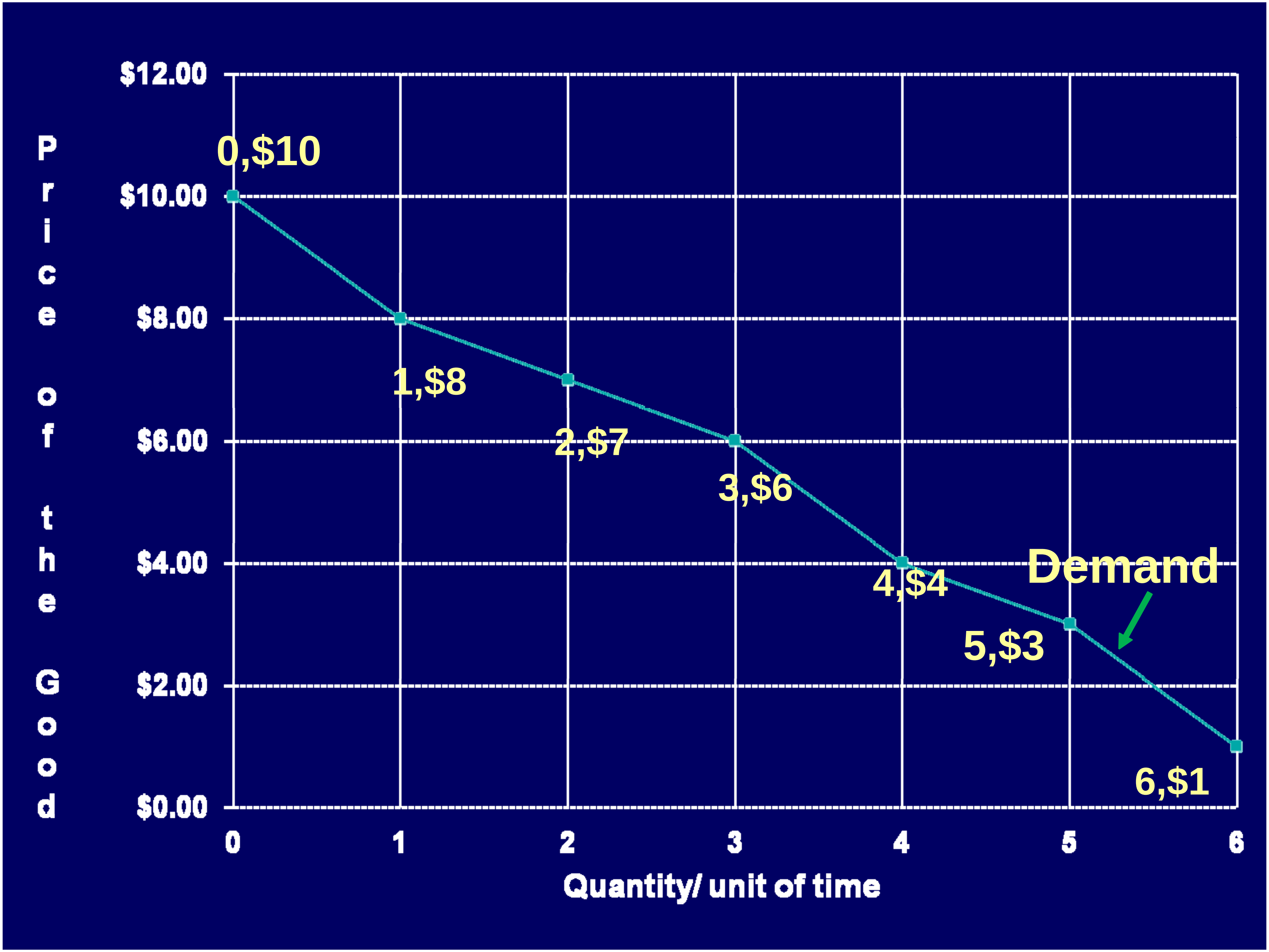

Price
D
Quantity/ unit of time

A Demand Schedule

Price $	Quantity Demanded Per Unit of Time
10	0
8	1
7	2
6	3
4	4
3	5
1	6


$12.00
$10.00
$8.00
$6.00
$4.00
$2.00
$0.00
0
1
2
3
4
5
6
Quantity/ unit of time
Price of the Good


Price of the Good
$12.00
$10.00
$8.00
$6.00
$4.00
$2.00
$0.00
0
1
2
3
4
5
6
Quantity/ unit of time
0,$10
1,$8
2,$7
3,$6
4,$4
5,$3
6,$1



$12.00
$10.00
$8.00
$6.00
$4.00
$2.00
$0.00
0,$10
1,$8
2,$7
3,$6
4,$4
5,$3
6,$1
Demand
0
1
2
3
4
5
6
Quantity/ unit of time
Price of the Good

Supply

A Schedule Showing the

Amounts of a Good

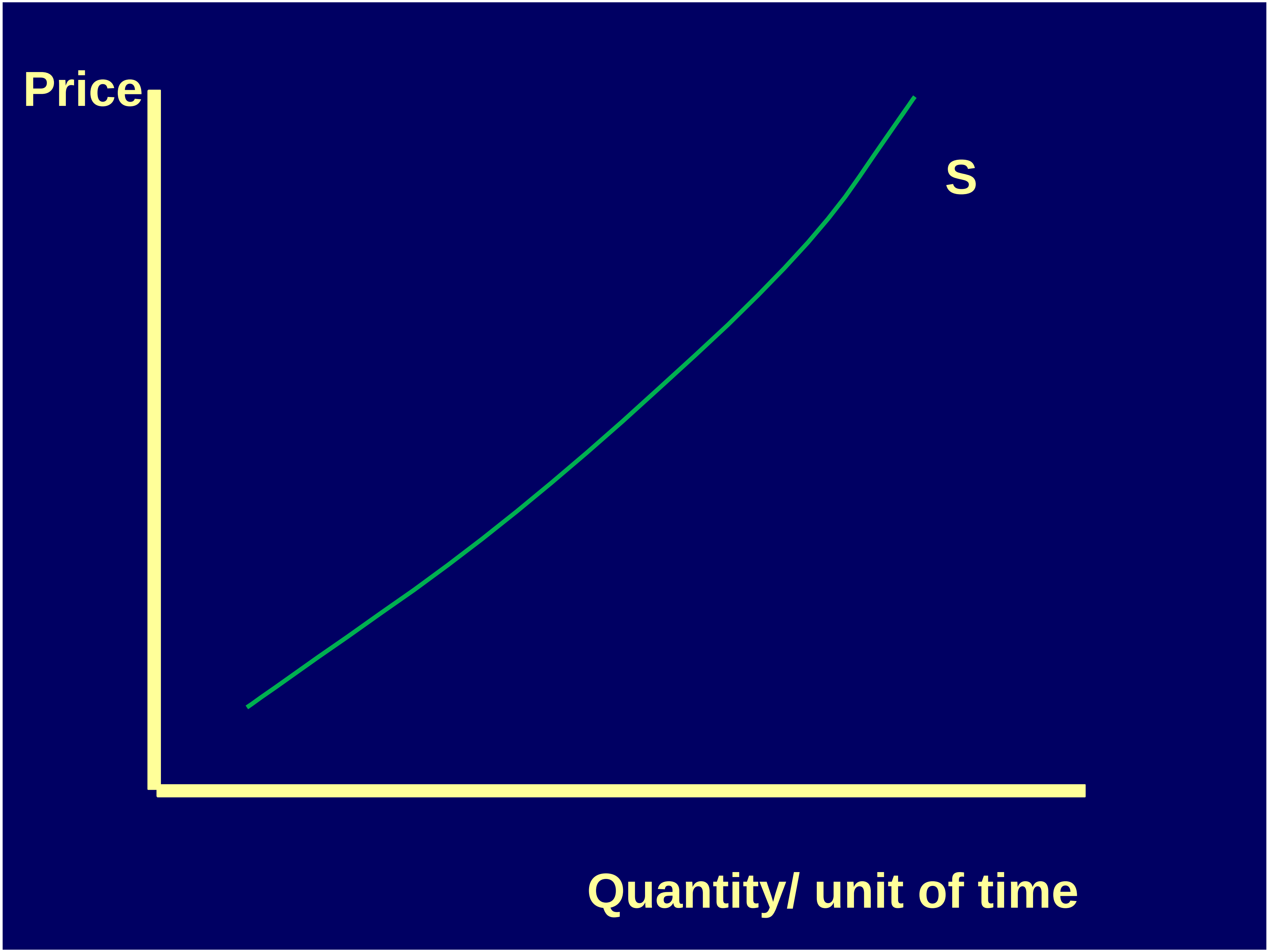
Producers Are

Willing and Able to

Place on the Market

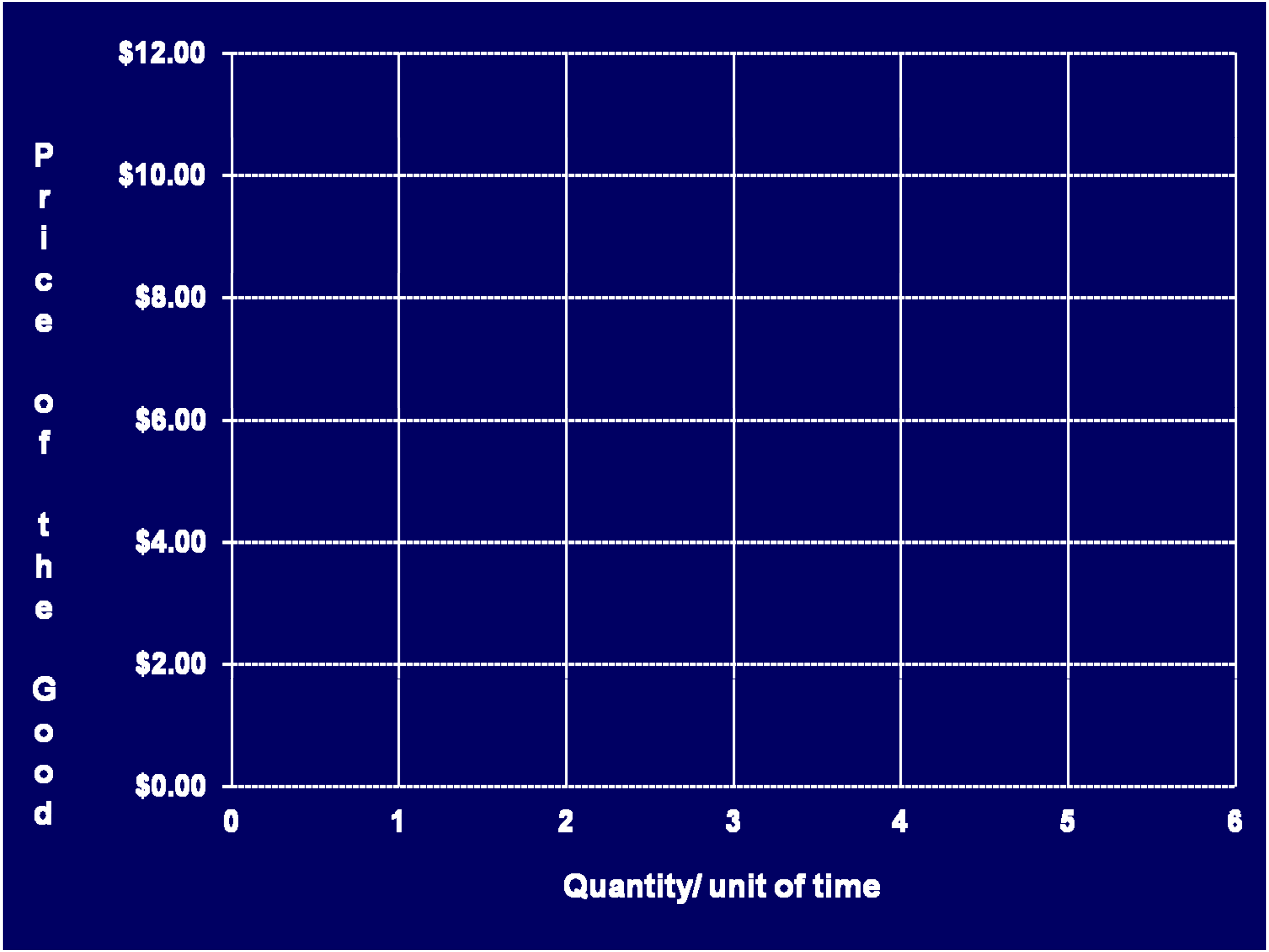
At a Specified Set of Prices

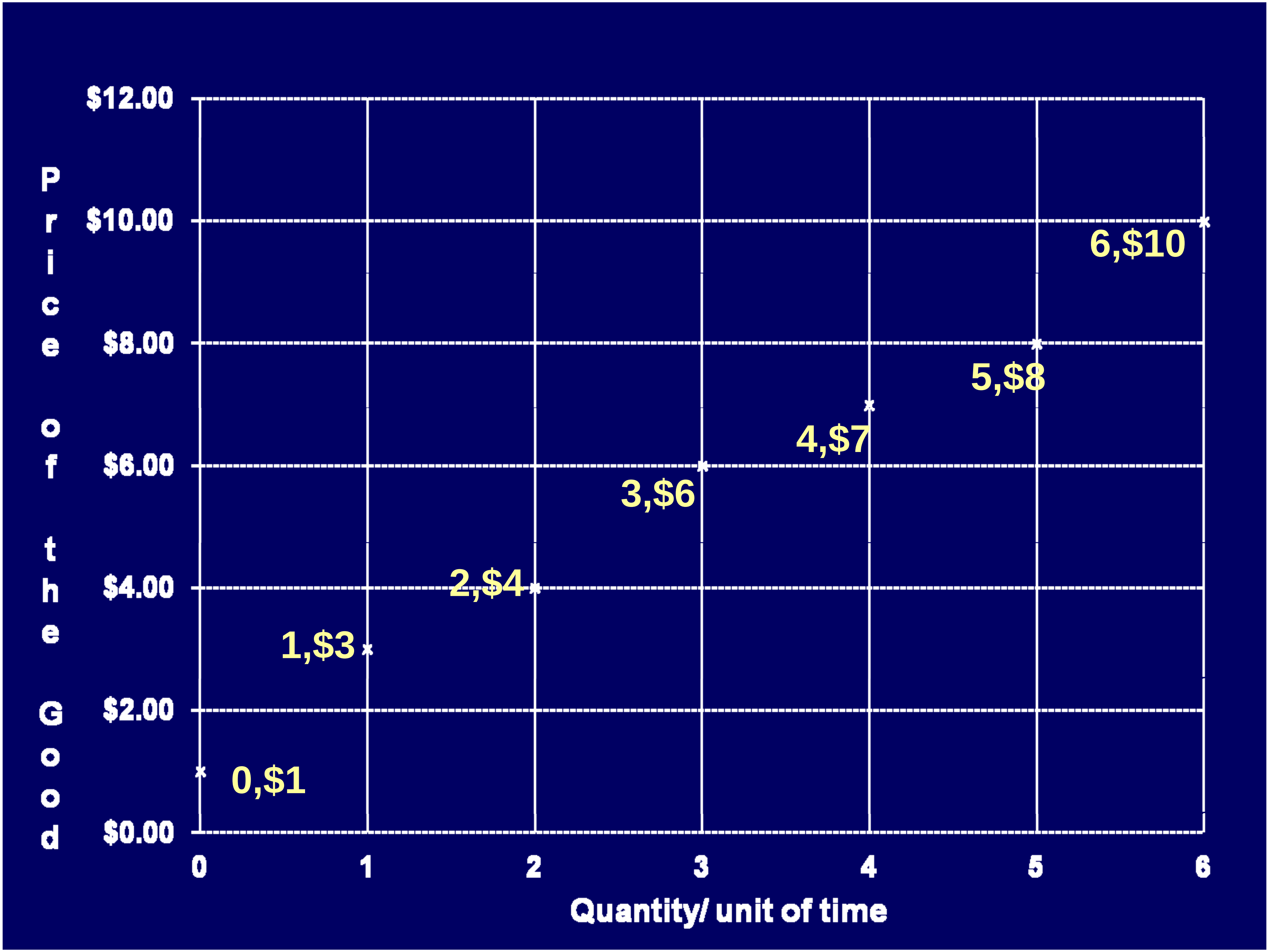
During A Specified Period of Time


Price
S
Quantity/ unit of time

A Supply Schedule

Price $	Quantity Supplied Per Unit of Time
10	6
8	5
7	4
6	3
4	2
3	1
1	0


$12.00
$10.00
$8.00
$6.00
$4.00
$2.00
$0.00
0
1
2
3
4
5
6
Price of the Good
Quantity/ unit of time

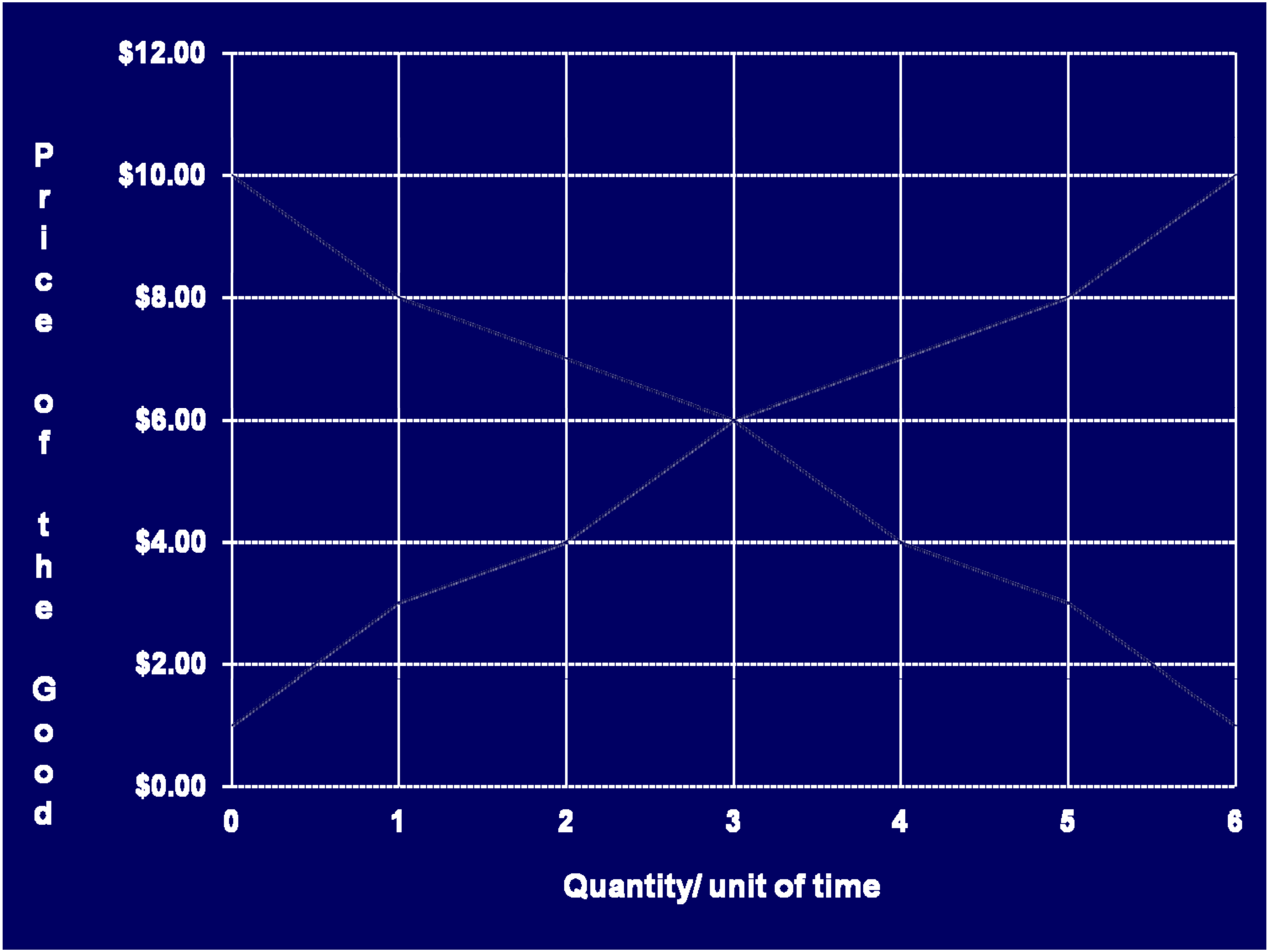

$12.00
$10.00
$8.00
$6.00
$4.00
$2.00
$0.00
Price of the Good
0
1
2
3
4
5
6
Quantity/ unit of time
0,$1
1,$3
2,$4
3,$6
4,$7
5,$8
6,$10


$12.00
$10.00
$8.00
$6.00
$4.00
$2.00
$0.00
0
1
2
3
4
5
6
Price of the Good
Quantity/ unit of time
0,$1
1,$3
2,$4
3,$6
4,$7
5,$8
6,$10
Supply

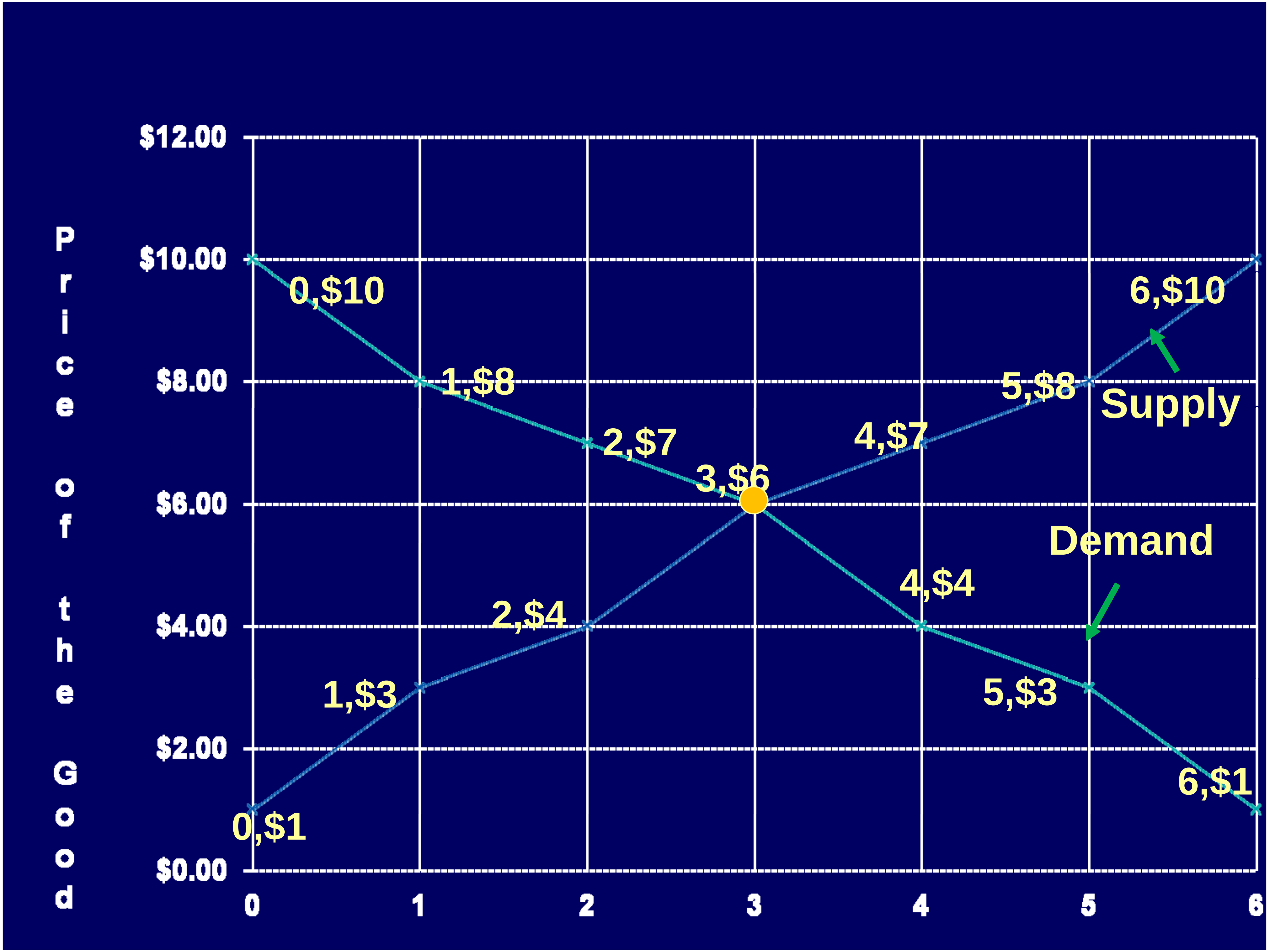
Equilibrium Demand and Supply Conditions

Equilibrium Conditions

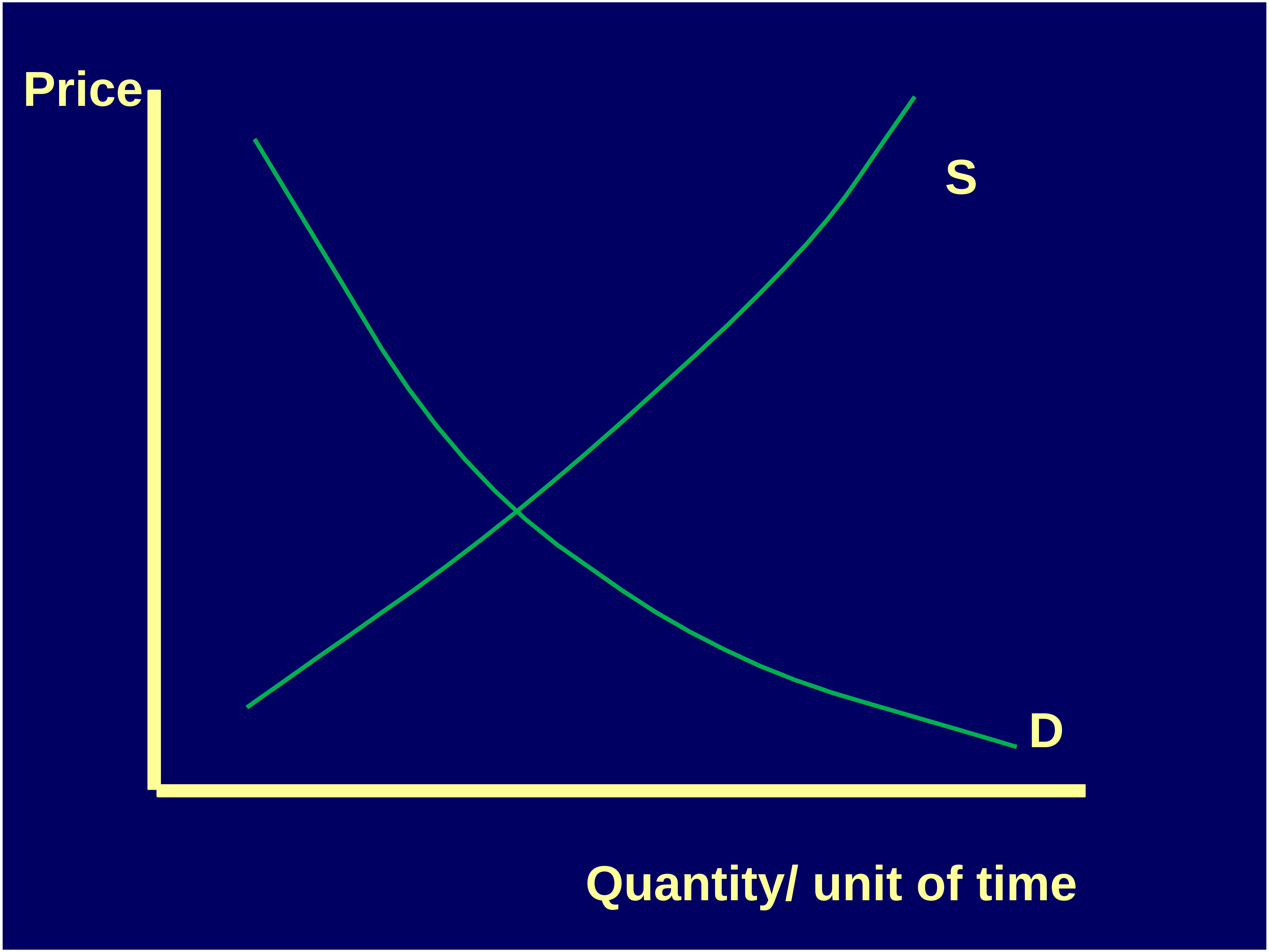
Price $	Quantity Demanded	Quantity Supplied	
10	0	6	
8	1	5	
7	2	4	
6	3	3	Equilibrium
4	4	2	
3	5	1	
1	6	0	

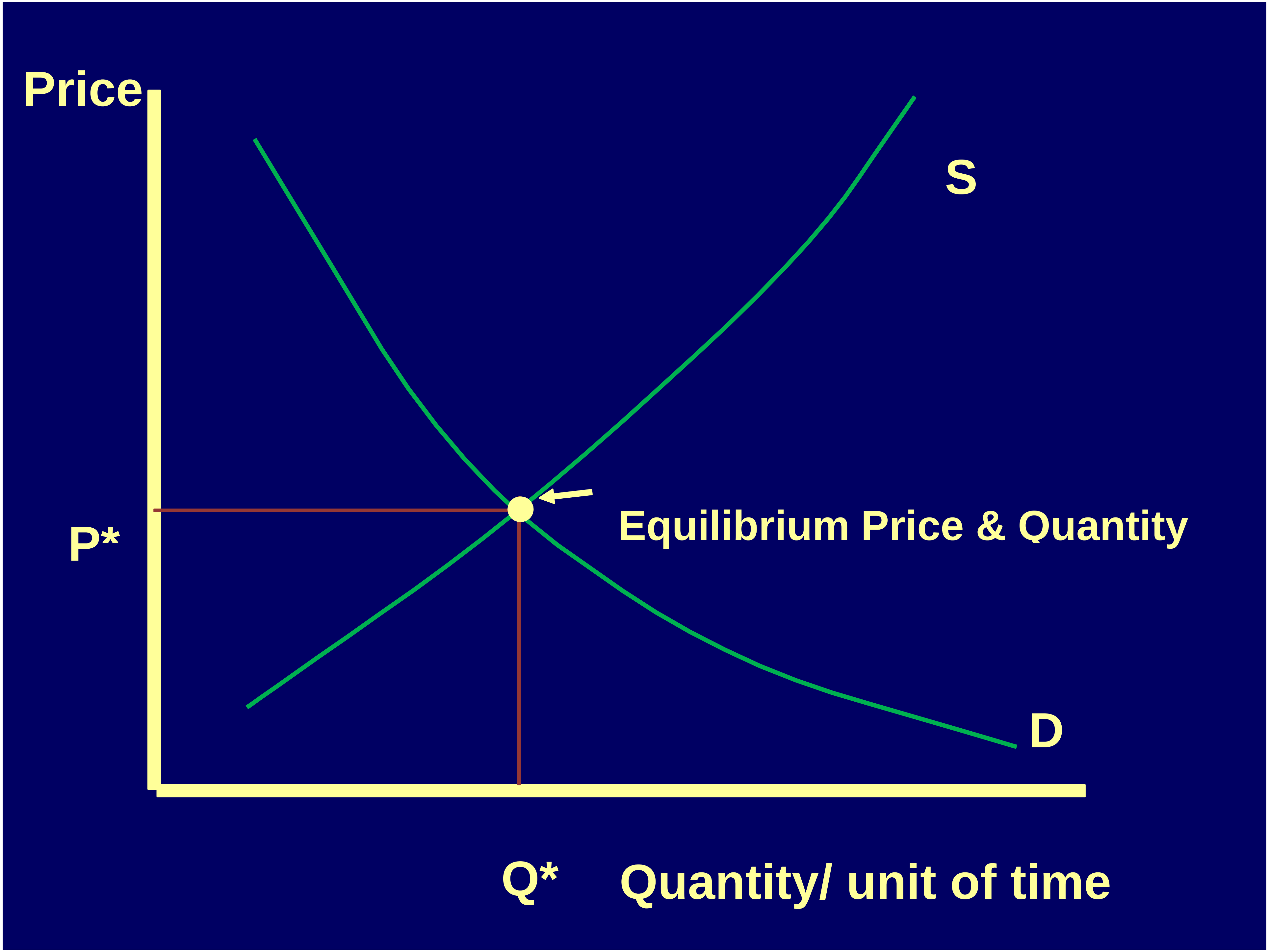


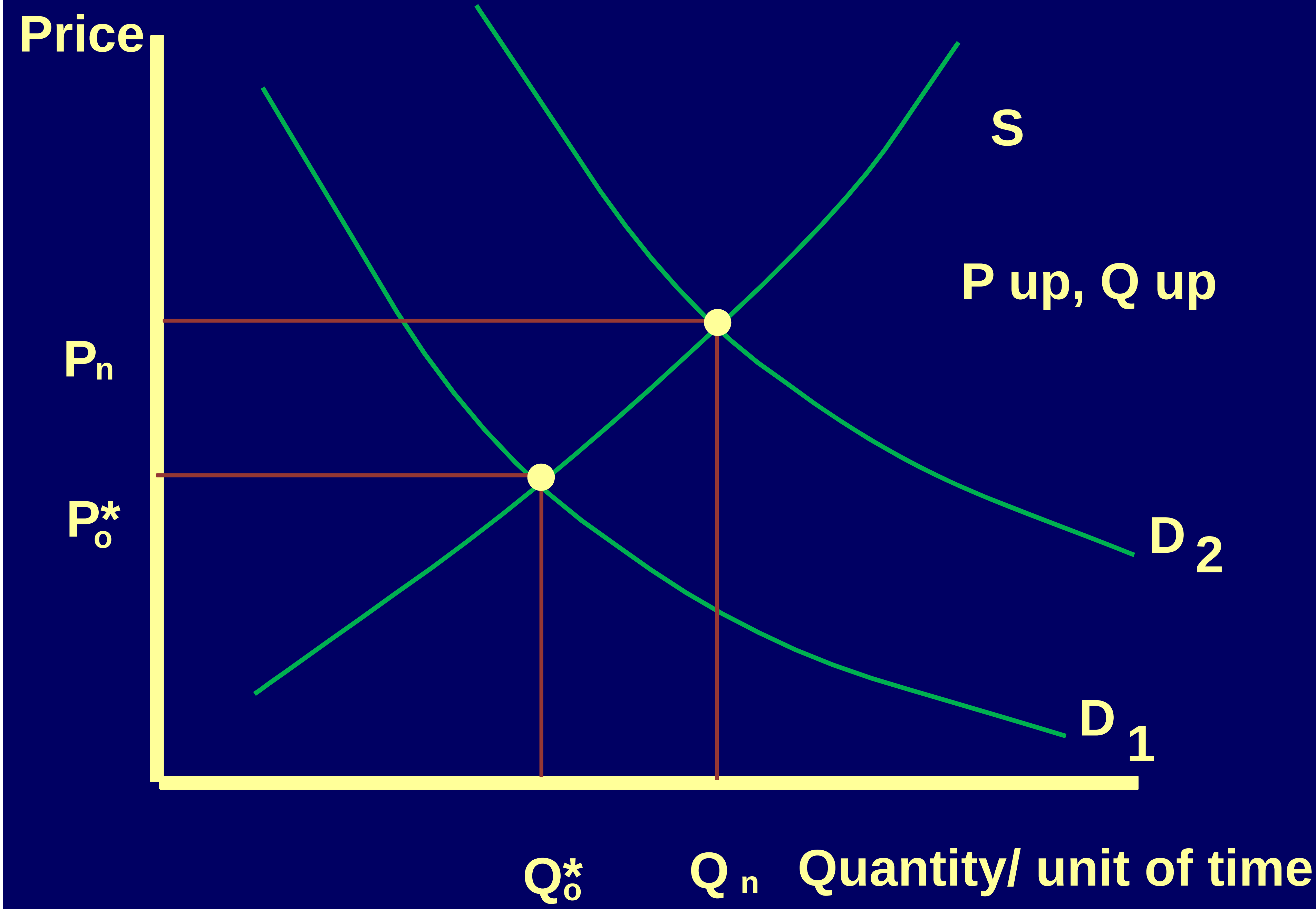
$12.00
$10.00
$8.00
$6.00
$4.00
$2.00
$0.00
Price of the Good
0
1
2
3
4
5
6
Quantity/ unit of time



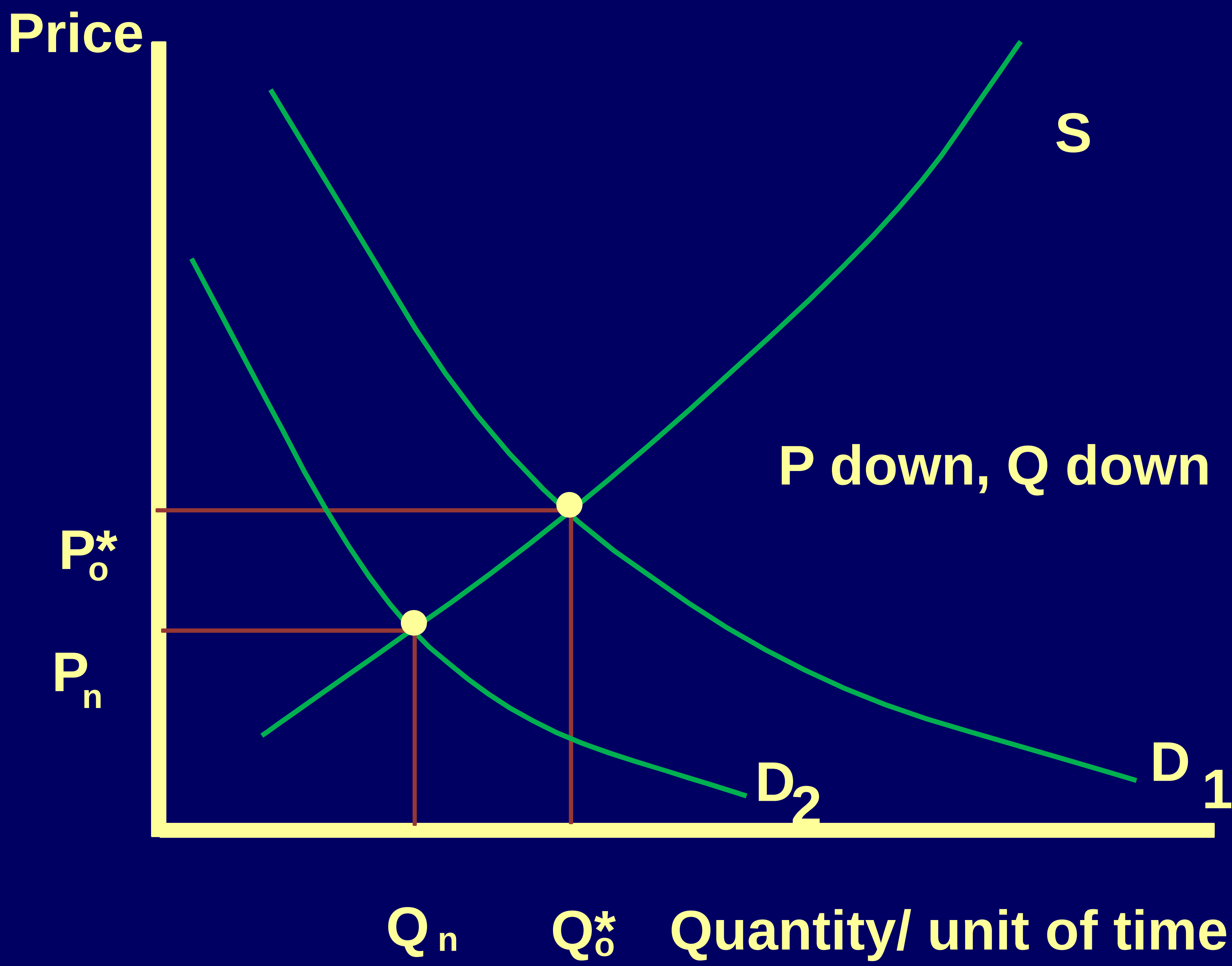
Price of the Good
$12.00
$10.00
$8.00
$6.00
$4.00
$2.00
$0.00
0
1
2
3
4
5
6
0,$10
1,$8
2,$7
3,$6
4,$4
5,$3
6,$1
0,$1
1,$3
2,$4
4,$7
5,$8
6,$10
Supply
Demand


Price
S
D
Quantity/ unit of time


Price
S
Equilibrium Price & Quantity
P*
D
Q*
Quantity/ unit of time



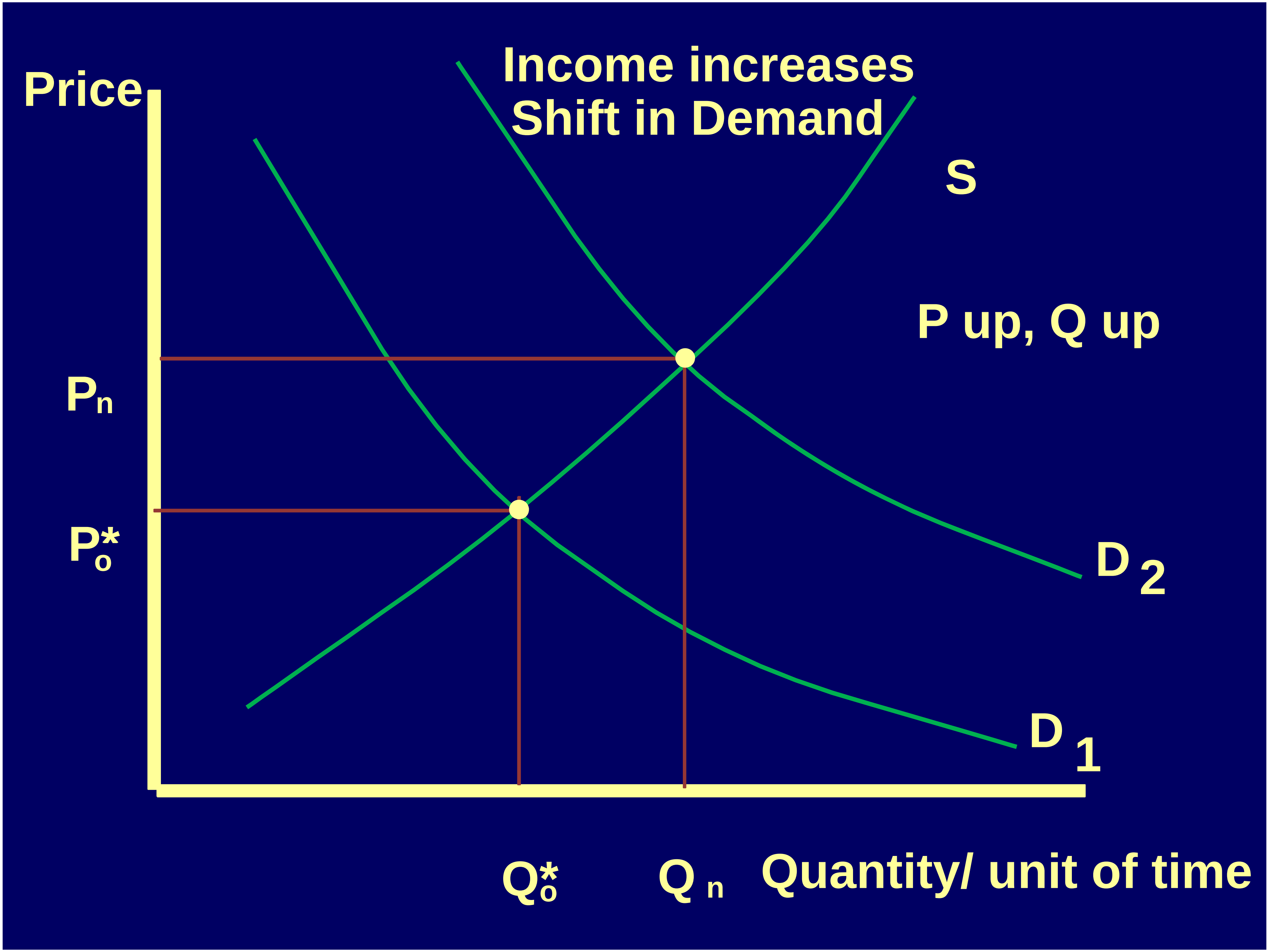
Shift in Demand

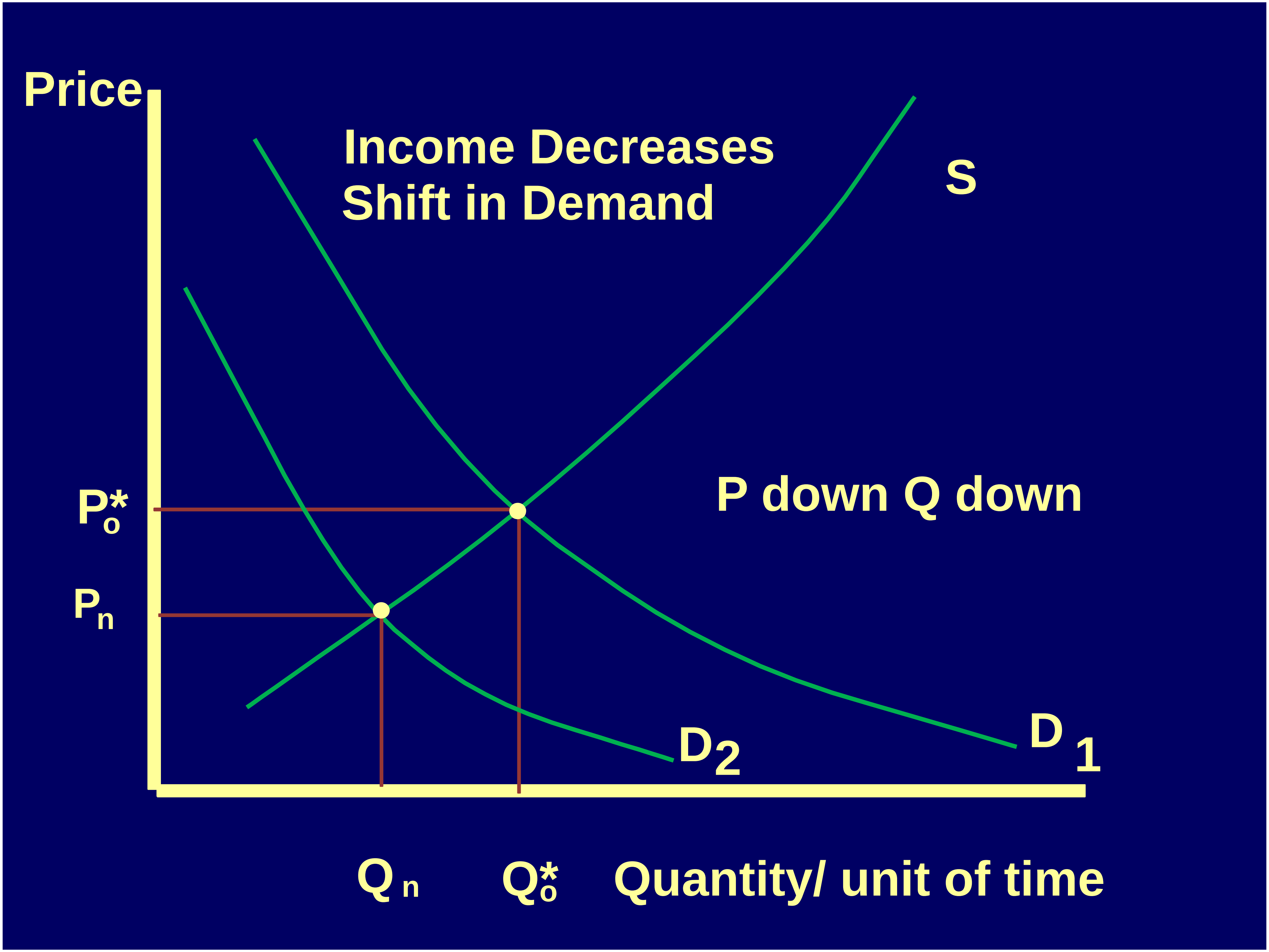


Shift in Demand

Shifters of the Demand Curve

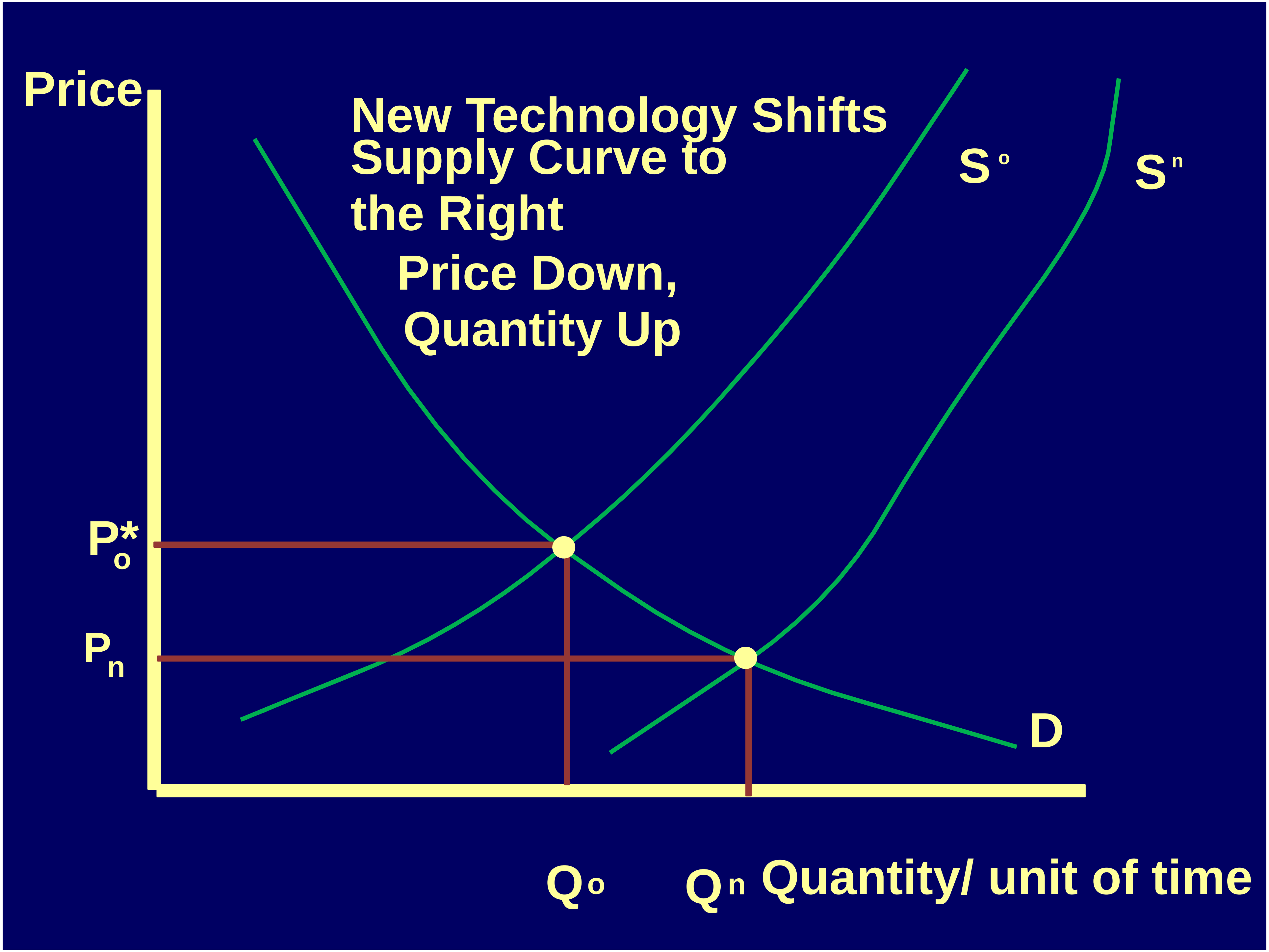
1. Number of Consumers
2. Consumer Income
3. Consumer Tastes and Preferences
4. Consumer Expectations
5. Prices of Substitute
   And Complementary Goods


Income increases
Shift in Demand
Price
S
P up, Q up
P_n
P_o^*
D_2
D_1
Q_o^*
Q_n
Quantity/ unit of time


Price
Income Decreases
Shift in Demand
S
P down Q down
P*o
Pn
D2
D1
Qn
Q*o
Quantity/ unit of time

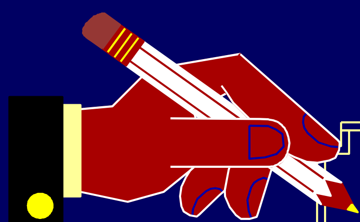
Shifters of the Supply Curve

1. Number of Producers
2. Costs of Production
3. Producer Expectations
4. Prices of Related Goods
5. Technology


Price
New Technology Shifts Supply Curve to the Right
Price Down, Quantity Up
S o
S n
P*o
Pn
D
Qo
Qn
Quantity/ unit of time

Elasticities

An Elasticity measures the responsiveness of one economic variable to changes in another economic variable



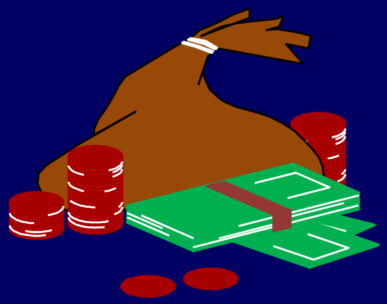
Price

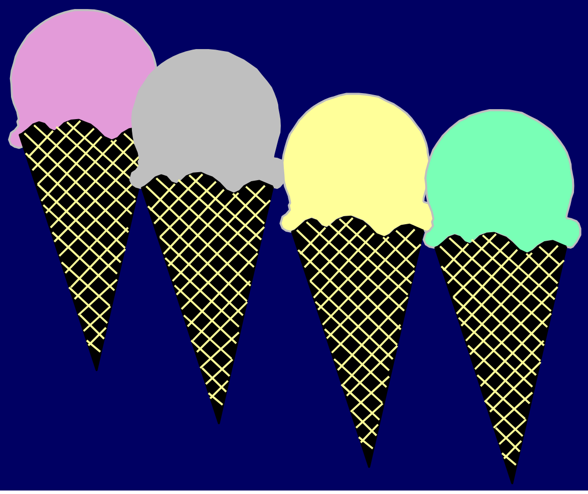
Quantity
Demanded

For example,

How responsive is quantity supplied to changes in the price of a good?

How responsive is quantity demanded to changes in the price of a good?





Any Elasticity is a Pure number...

That is,

Elasticities have no units such as $, lbs. or bushels

3

0.05 -1.2 4.6 -0.06

Any elasticity is a

ratio of two

percentage changes

in two different

economic variables

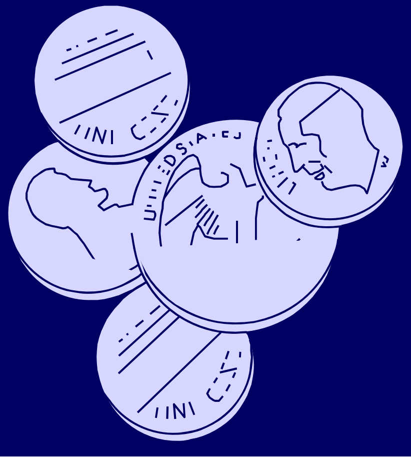
$$\frac{\text{Percent change in quantity demanded}}{\text{Percent change in price}}$$

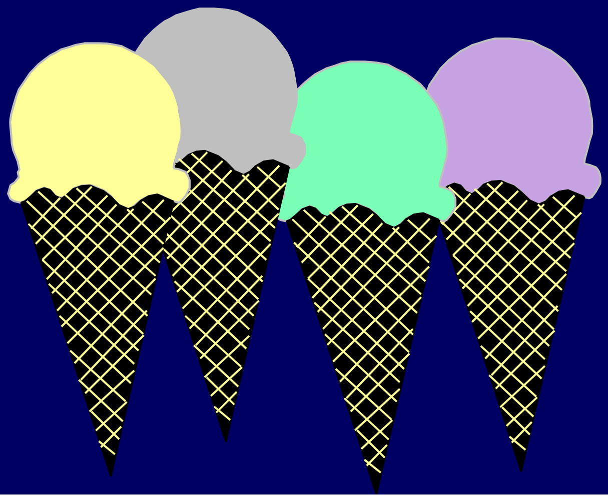
For example,

Suppose the two economic variables are

Quantity Demanded (Qd)

and Price (P)





The Elasticity of Demand is defined as

The percentage change in Quantity Demanded

divided by

the percentage change in Price

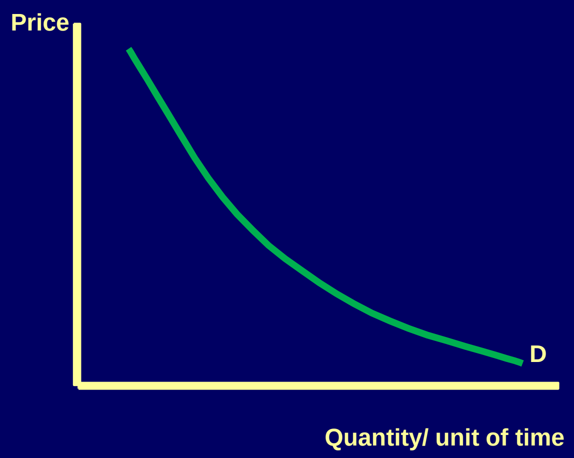
or as

$$\frac{\%\Delta Qd}{\%\Delta P}$$

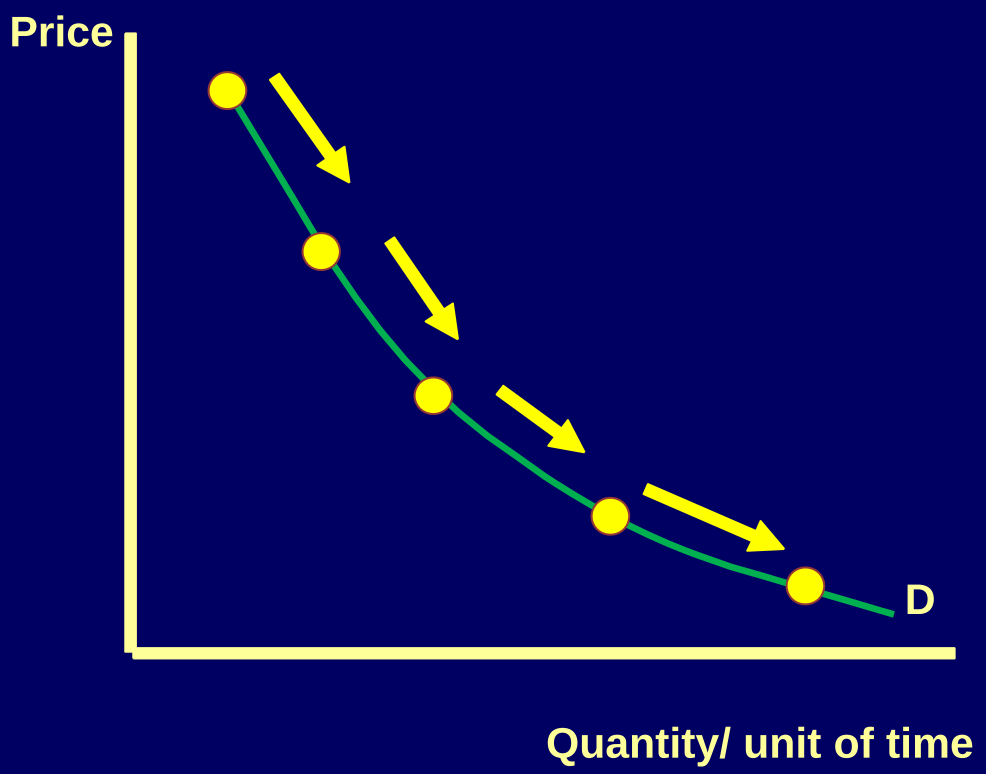
where Δ denotes change

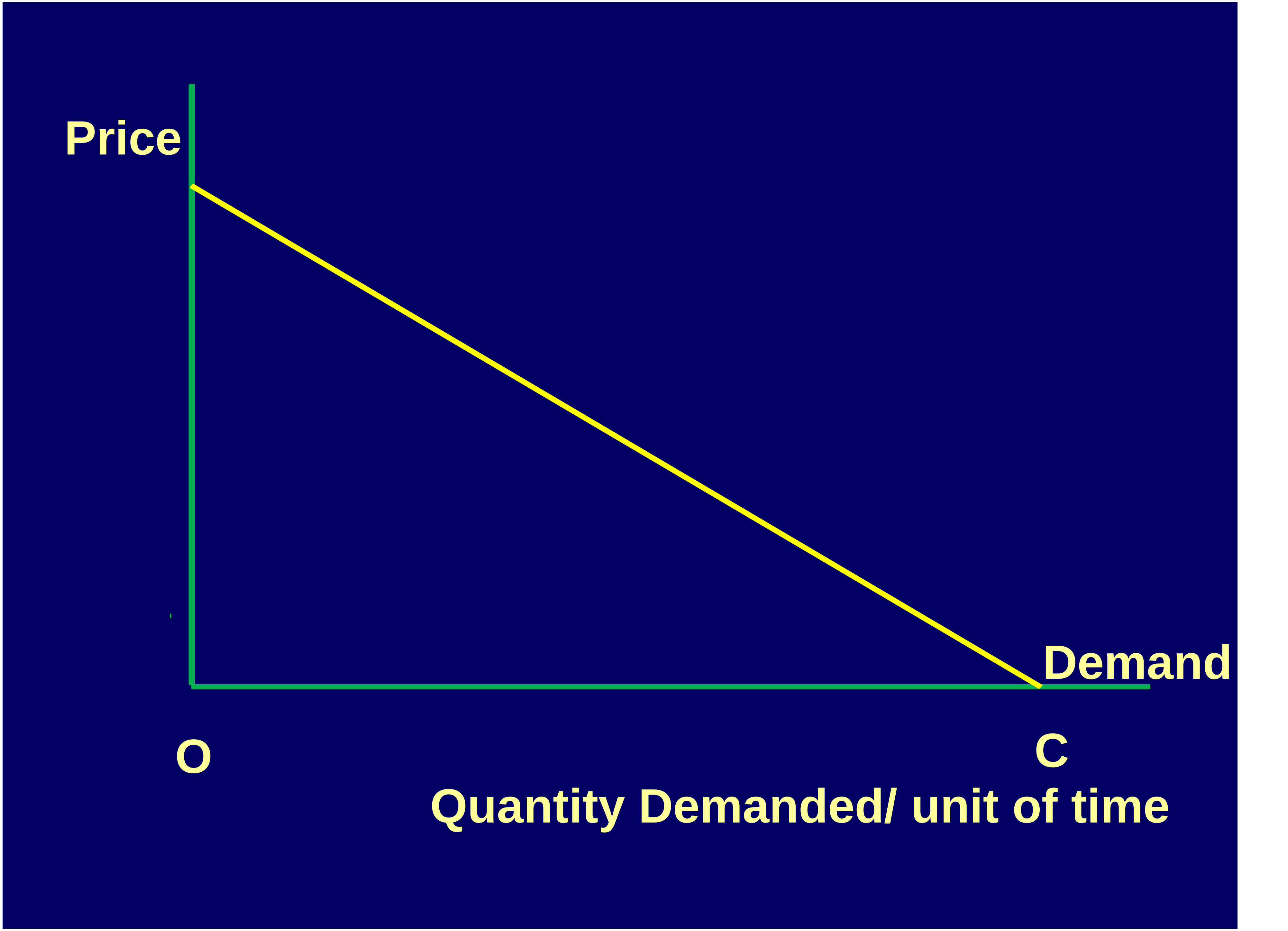
Greek Delta

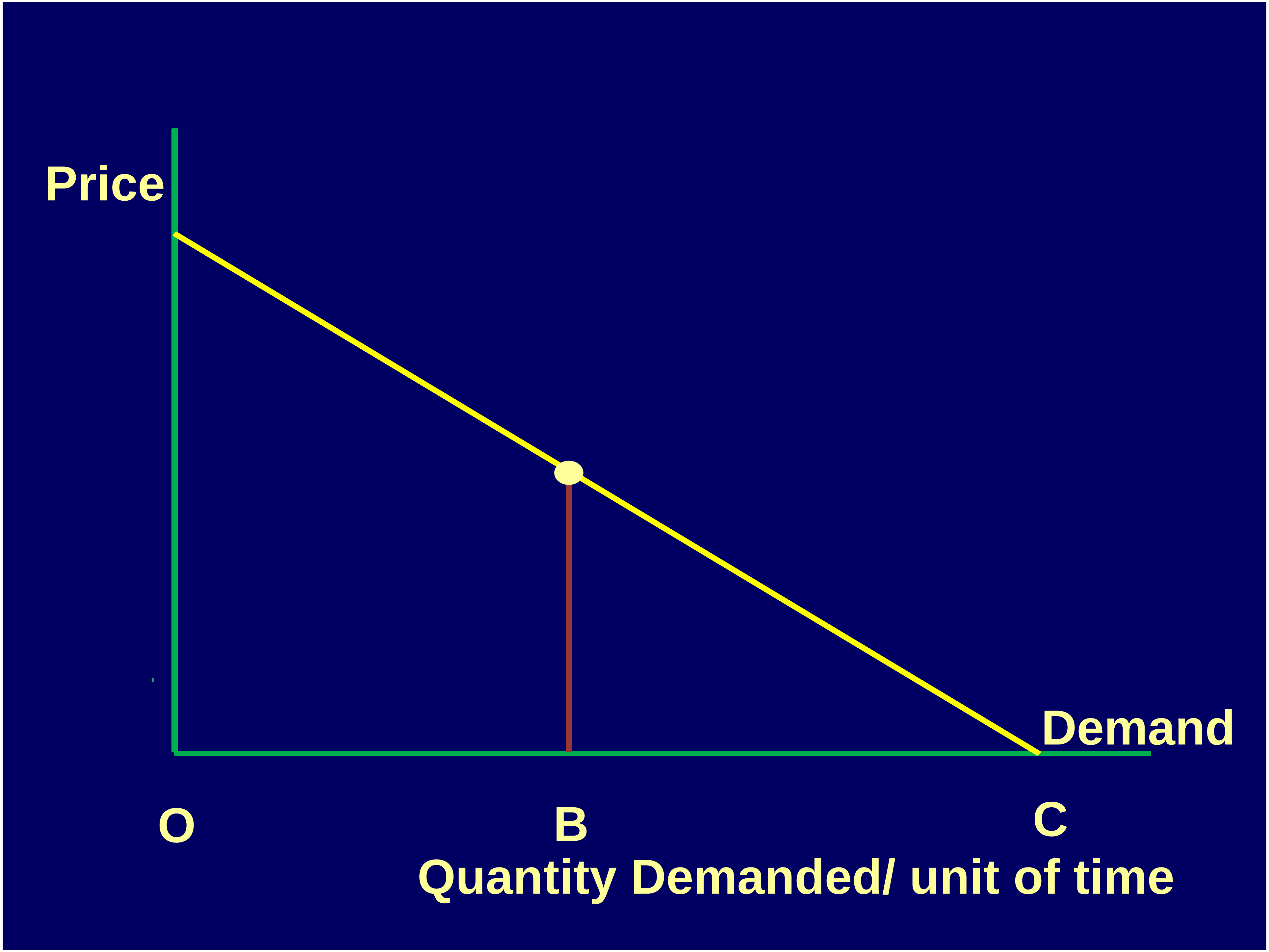
An elasticity of demand is not the slope of the demand curve but is linked to the slope

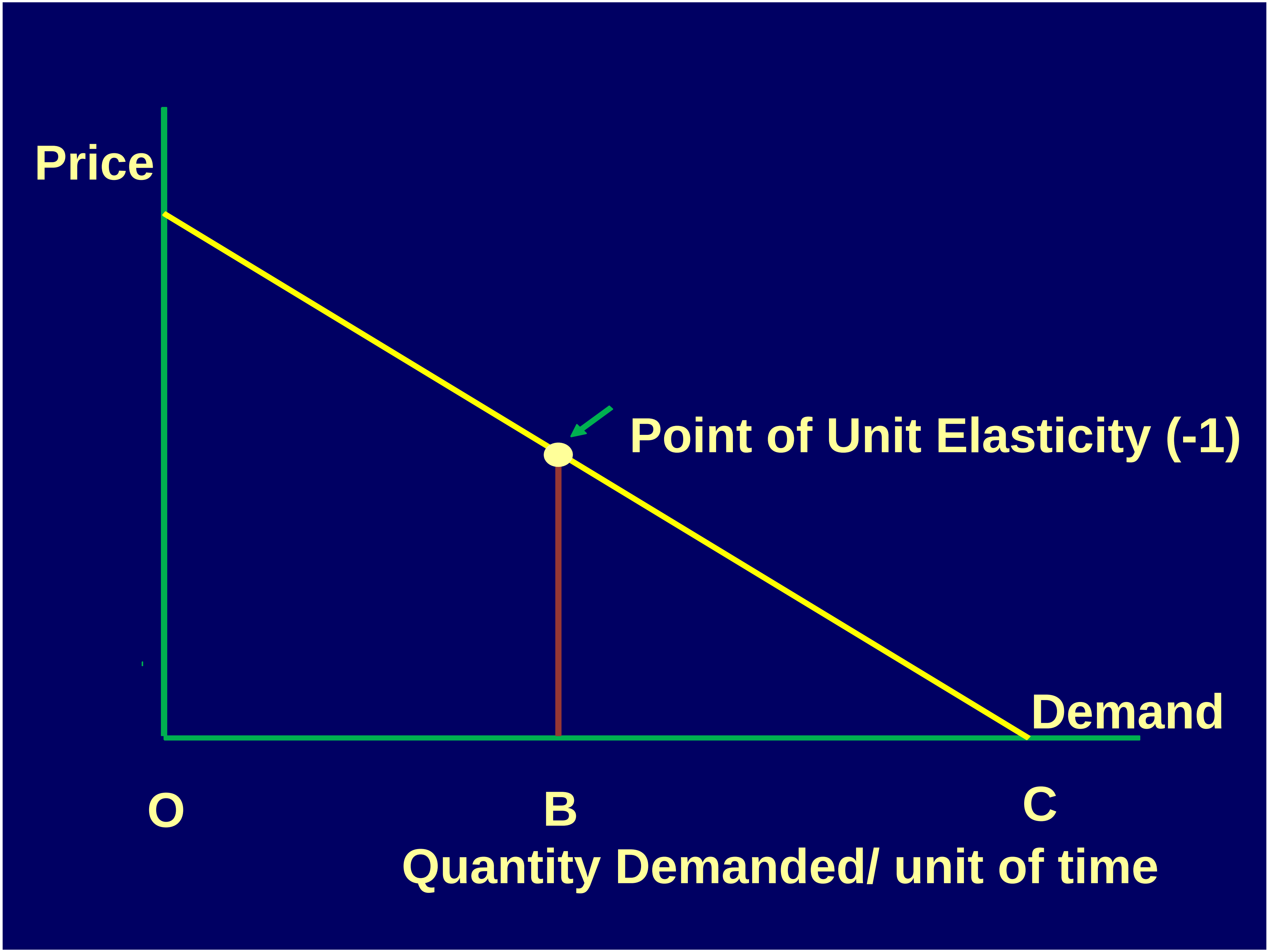


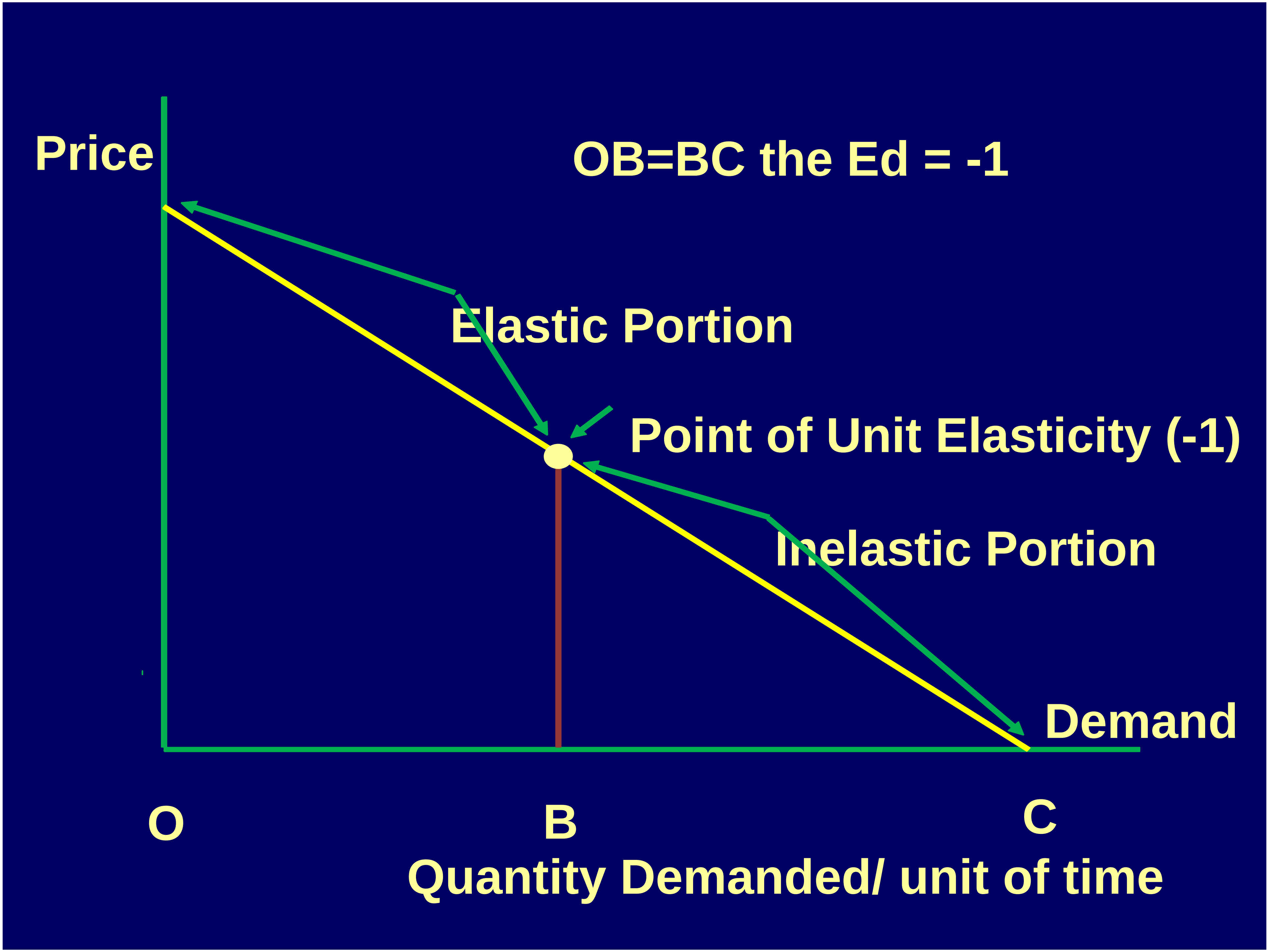
For most (but not all!) demand curves the elasticity of demand varies as you move along the demand curve



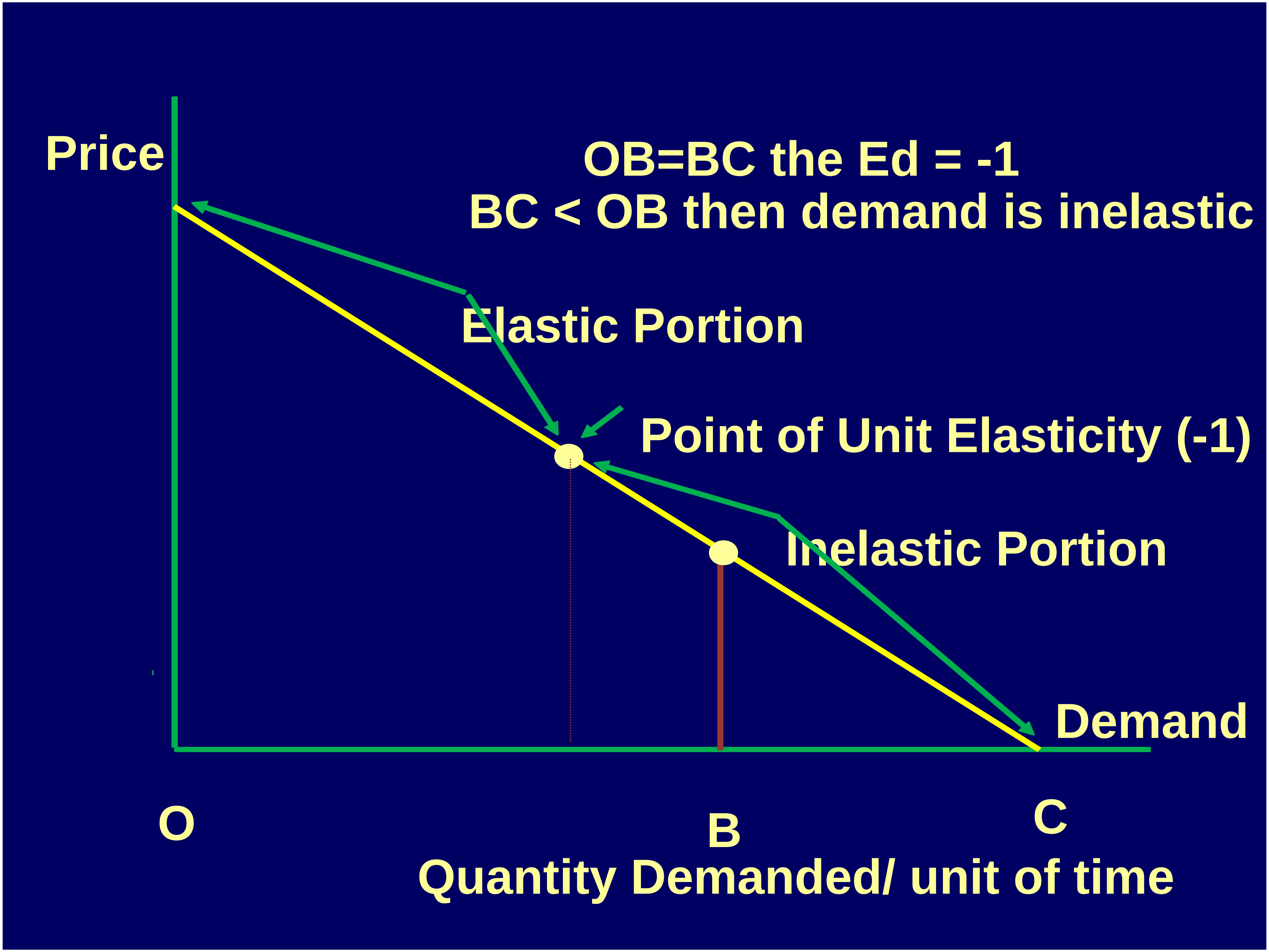

Price
Demand
O
C
Quantity Demanded/ unit of time

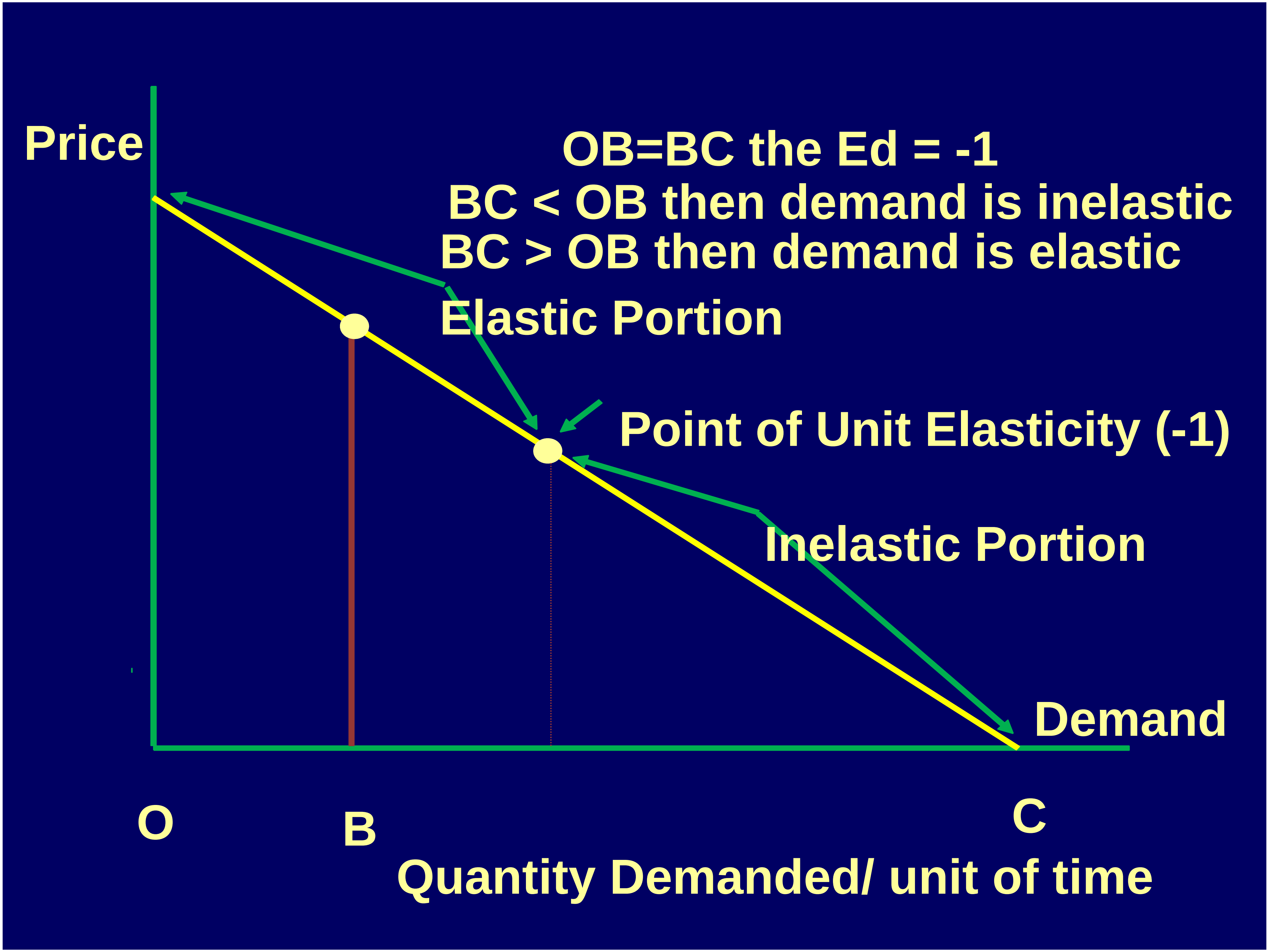

Price
Demand
O
B
C
Quantity Demanded/ unit of time


Price
Point of Unit Elasticity (-1)
Demand
O
B
C
Quantity Demanded/ unit of time



Price
OB=BC the Ed = -1
Elastic Portion
Point of Unit Elasticity (-1)
Inelastic Portion
Demand
O
B
C
Quantity Demanded/ unit of time


Price
OB=BC the Ed = -1
BC < OB then demand is inelastic
Elastic Portion
Point of Unit Elasticity (-1)
Inelastic Portion
Demand
O
B
C
Quantity Demanded/ unit of time


Price
OB=BC the Ed = -1
BC < OB then demand is inelastic
BC > OB then demand is elastic
Elastic Portion
Point of Unit Elasticity (-1)
Inelastic Portion
Demand
O
B
C
Quantity Demanded/ unit of time

Demand elasticities are negative
because price and quantity demanded
move in opposite directions.

Price up; Quantity Demanded down.

Elastic demand: a number more negative than -1

-2, -3, -6.5

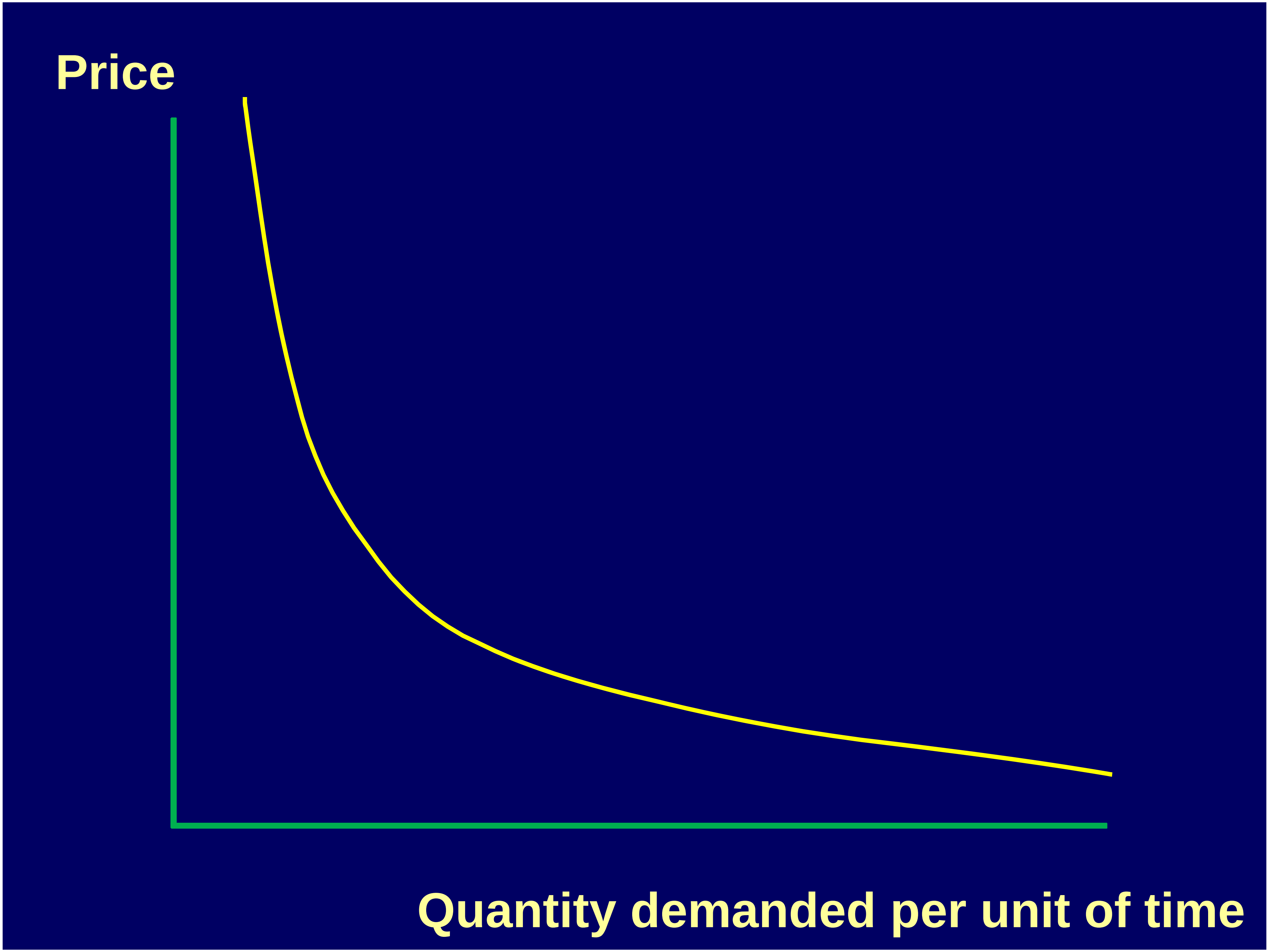
Inelastic demand: A number between 0 and -1

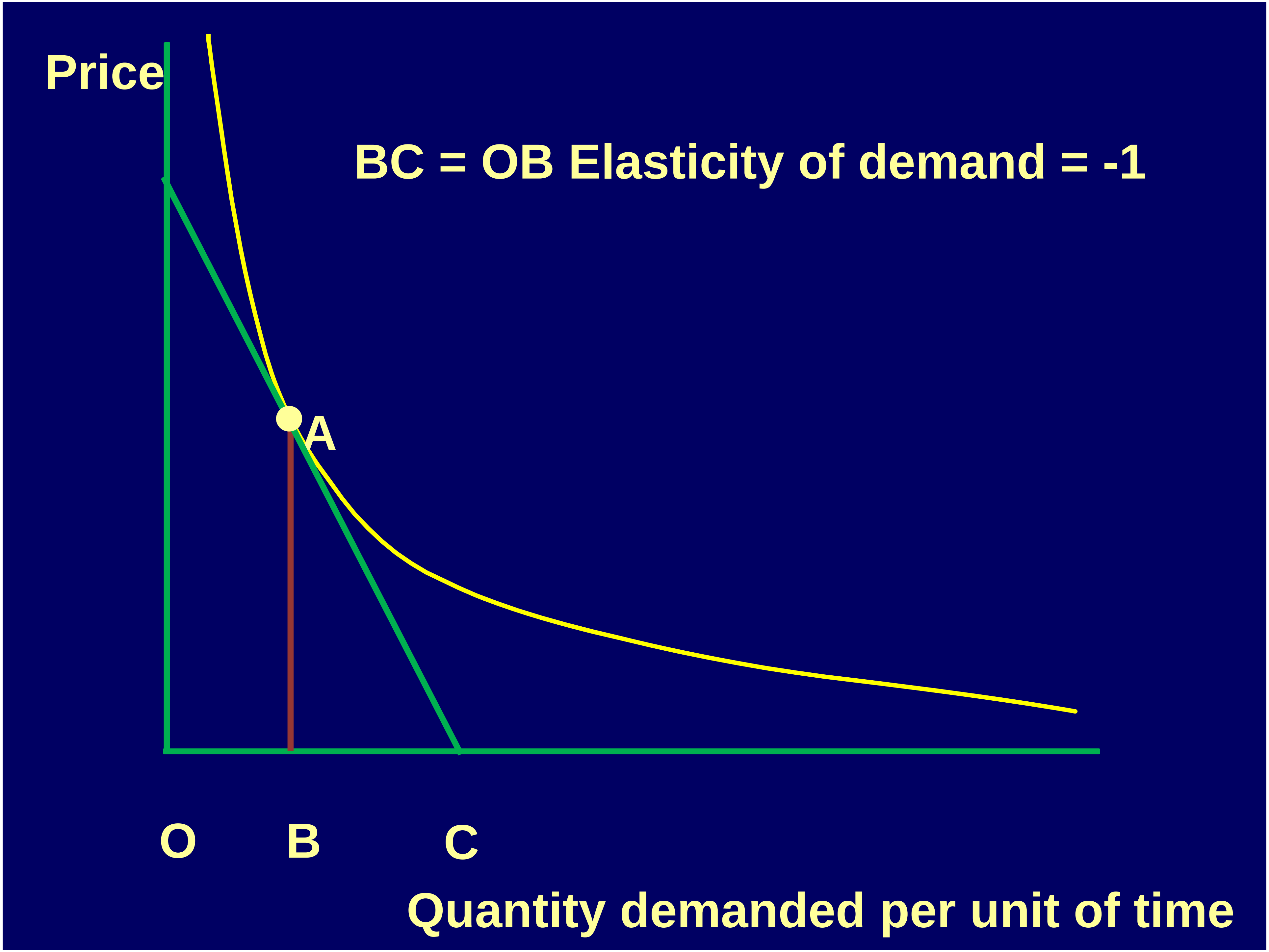
-0.2, -0.3, -0.73

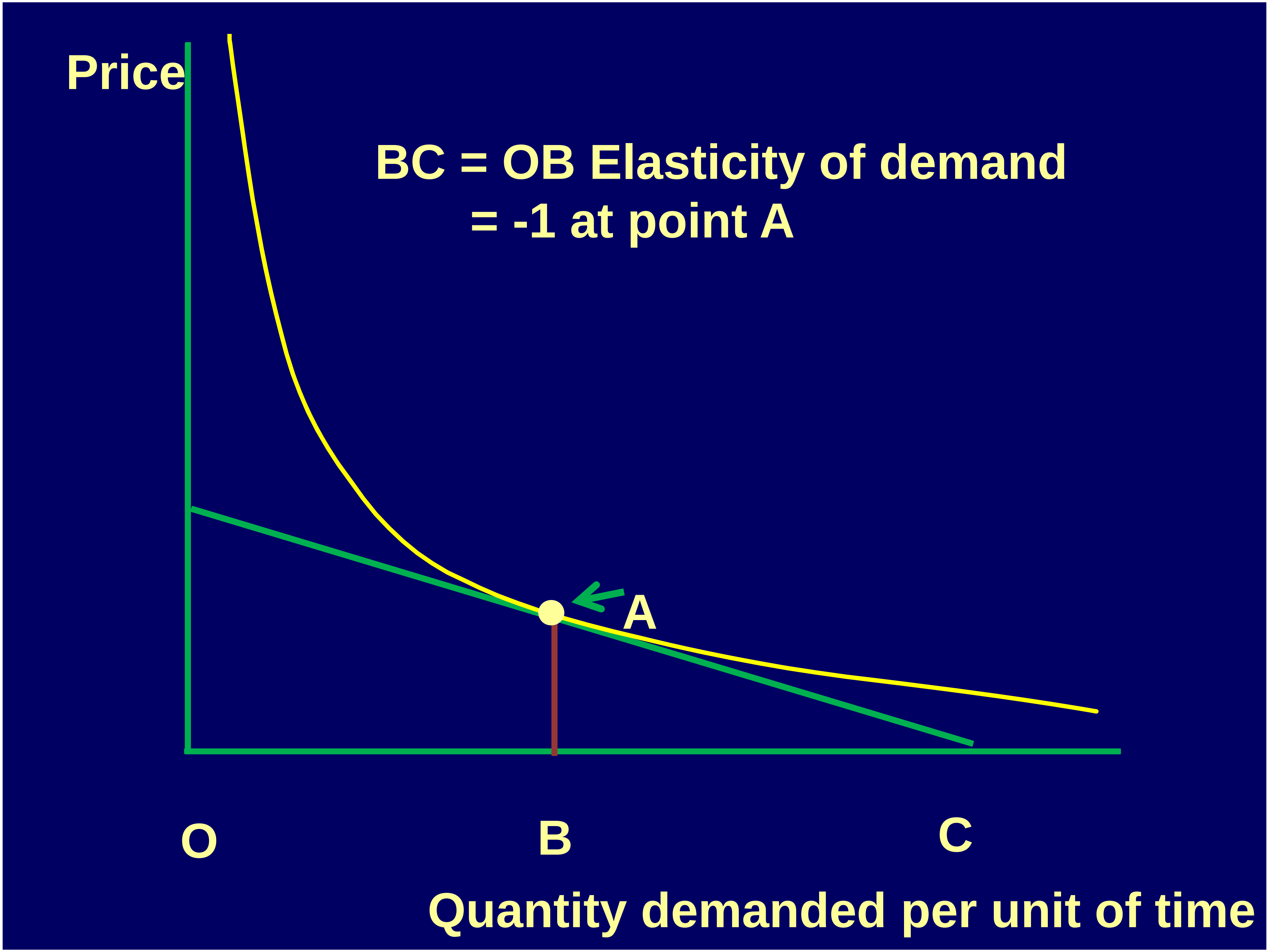
Unitary elasticity of demand: exactly -1

A Curve with Unitary Elasticity Everywhere

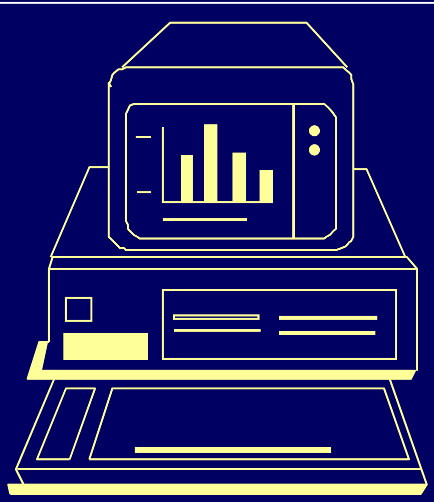
-1 elasticity of demand everywhere


Price
Quantity demanded per unit of time


Price
BC = OB Elasticity of demand = -1
A
O
B
C
Quantity demanded per unit of time


Price
BC = OB Elasticity of demand
= -1 at point A
A
O
B
C
Quantity demanded per unit of time

Calculating Demand Elasticities



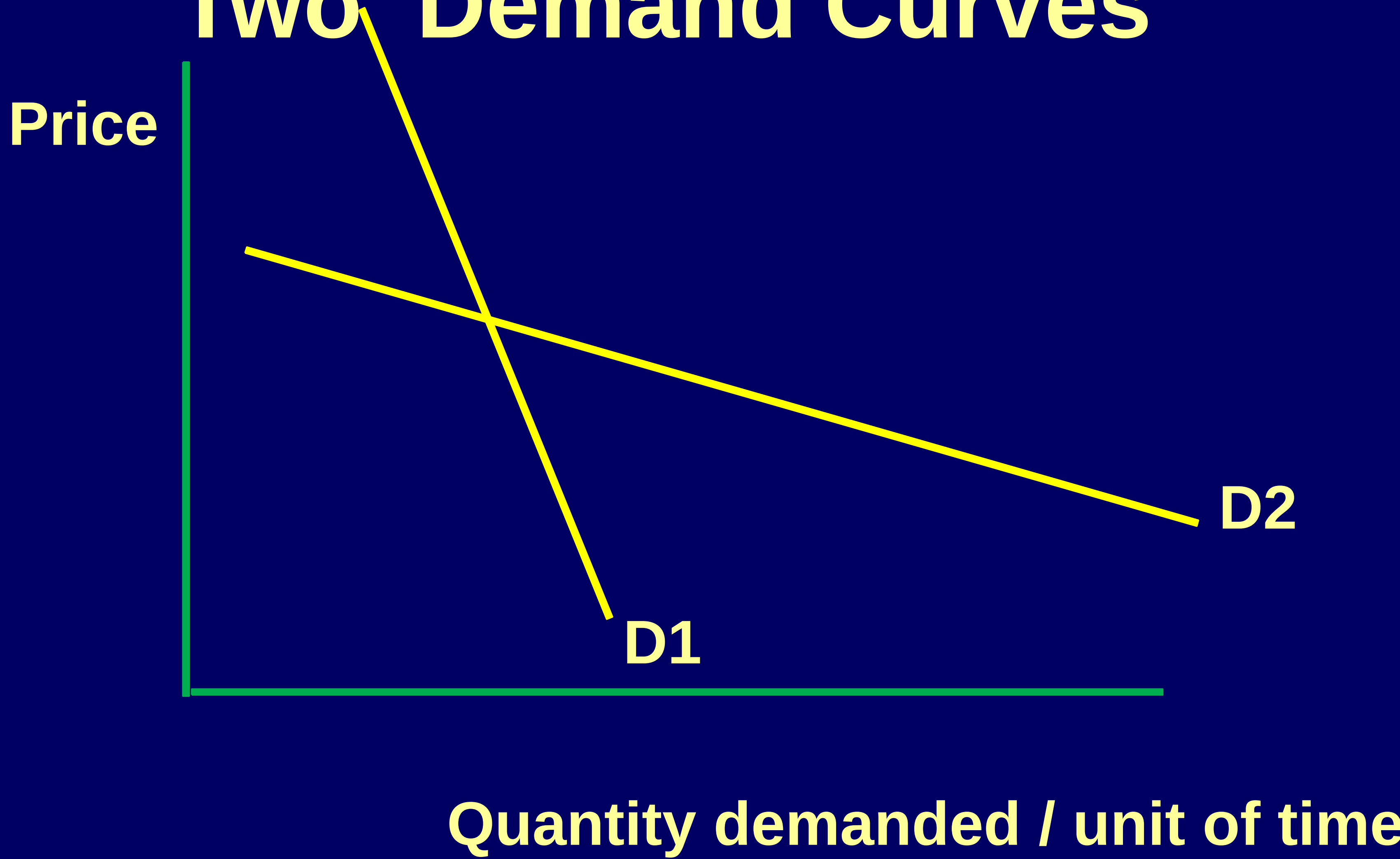
Suppose that

Price *INCREASES*
from $6 to $8
and Quantity Demanded
DECREASES
from 12 units to 8 units

$$\frac{\%\triangle \text{ in Qd}}{\%\triangle \text{ in Price}} = \frac{\dfrac{8-12}{10}}{\dfrac{\$8-\$6}{\$7}} = \frac{7 \times -4}{10 \times 2}$$

$= -28/20 = -1.4 = \text{Ed}$ Elastic!

Two Demand Curves



D2 is more ELASTIC than D1
Qd is *more responsive* to Price change for D2 than D1

But, certain points on D2 are *less elastic* than certain points on D1

This is because *elasticities change* as you move along the demand curve

Other Elasticities

Price Elasticity of Supply

$$E_s = \frac{\% \triangle \text{ in } Q_s}{\% \triangle \text{ in } P}$$

Usually Positive

Income Elasticity of Demand

$$E_i = \frac{\% \triangle \text{ in } Q_d}{\% \triangle \text{ in Income}}$$

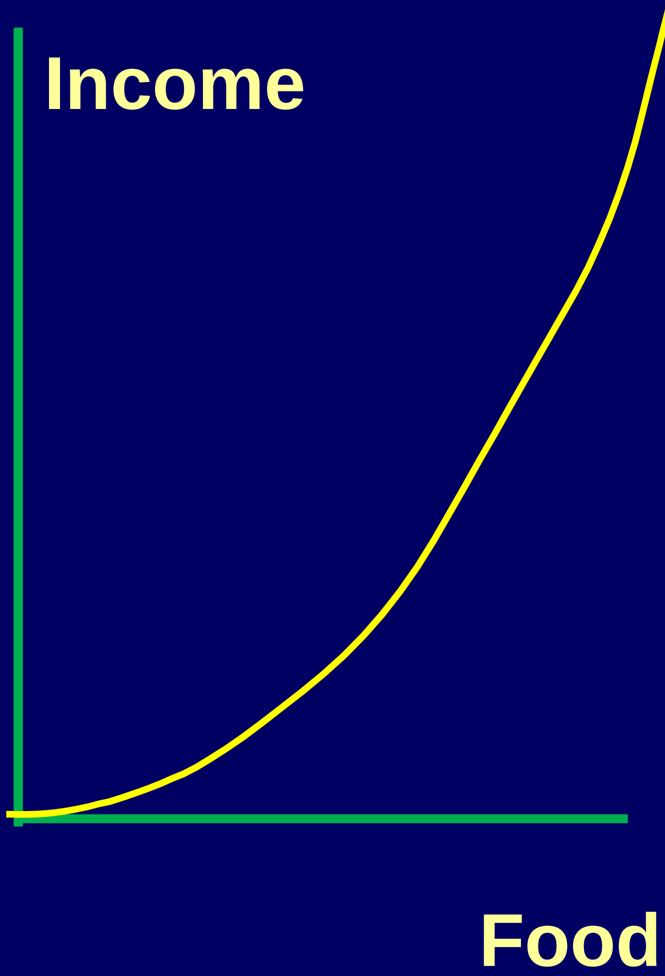
Usually Positive

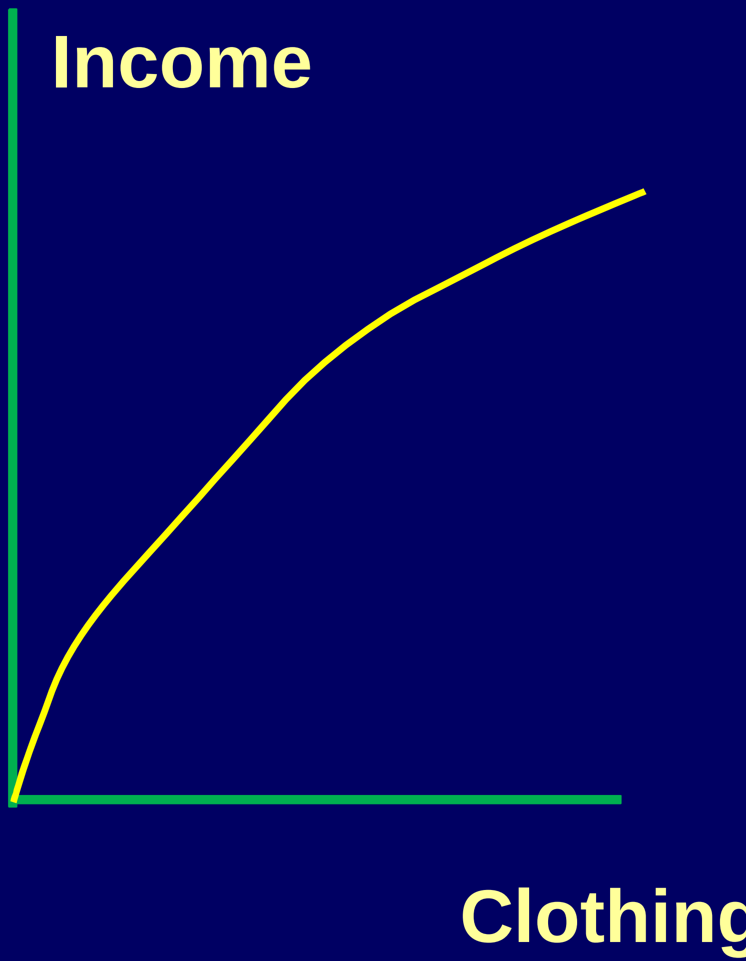
Occasionally negative

Income Elasticity of Demand for hamburger

Engel Curve

Links Income and Quantity Demanded





Utility:

A Measure of the Amount of

SATISFACTION

A Consumer Derives from Units of a Good

Utility as a basis for Demand

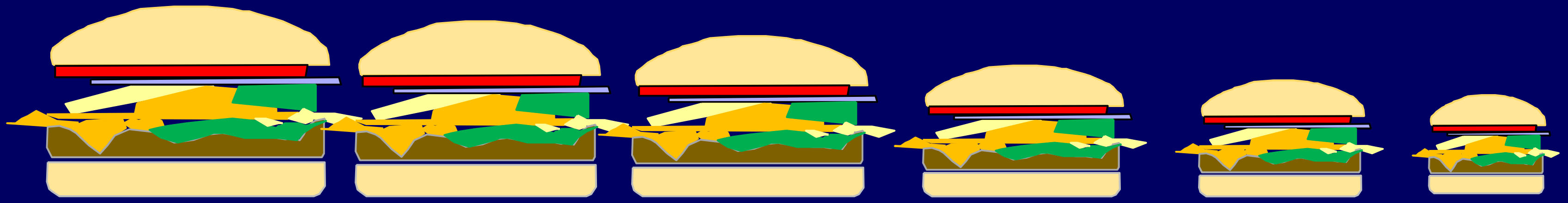
David's Utility Schedule for Hamburgers

Number	Total Utility
0	0
1	6
2	11
3	15
4	18
5	20
6	21
7	21.1

Diminishing Marginal Utility:

Each *ADDITIONAL* hamburger
Produces *Less and Less*

ADDITIONAL SATISFACTION



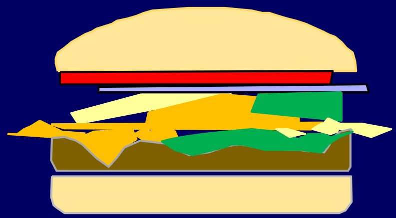
David's Utility Schedule for Hamburgers

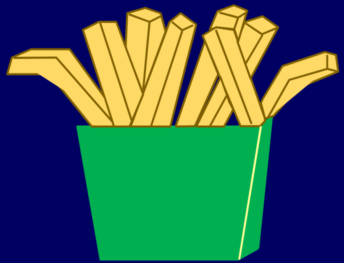
Number	Total Utility	Marginal Utility
0	0	
		(6-0)/1 = 6
1	6	
		(11-6)/1 = 5
2	11	
		(15-11)/1 = 4
3	15	
		(18-15)/1 = 3
4	18	
		(20-18)/1 = 2
5	20	
		(21-20)/1 = 1
6	21	
		(21.1-21)/1 = 0.1
7	21.1	

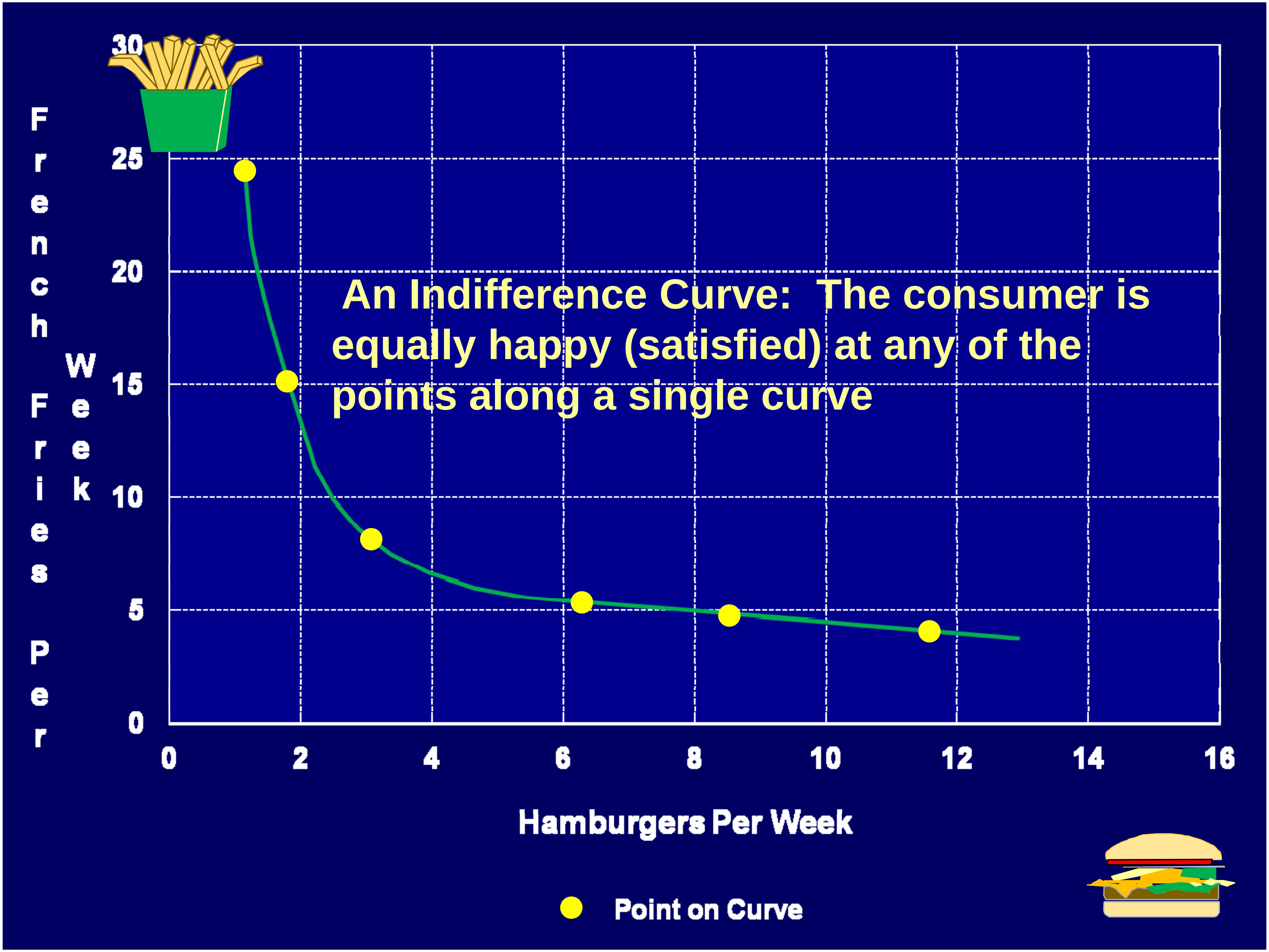
Each additional hamburger produces less and less additional utility

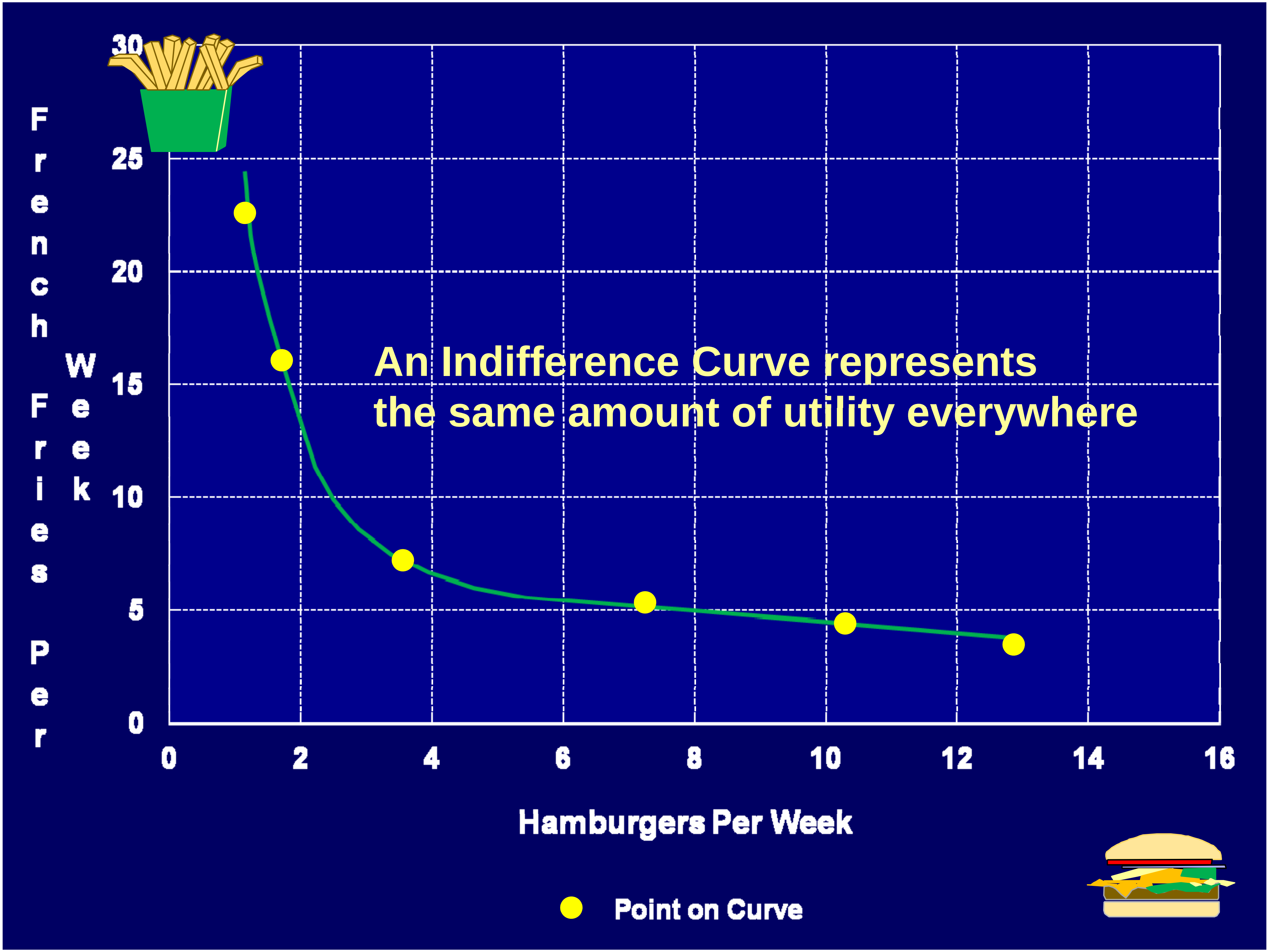
Indifference Curve:

All Possible Combinations of Two Goods that Produce the Same Amount of Total Utility

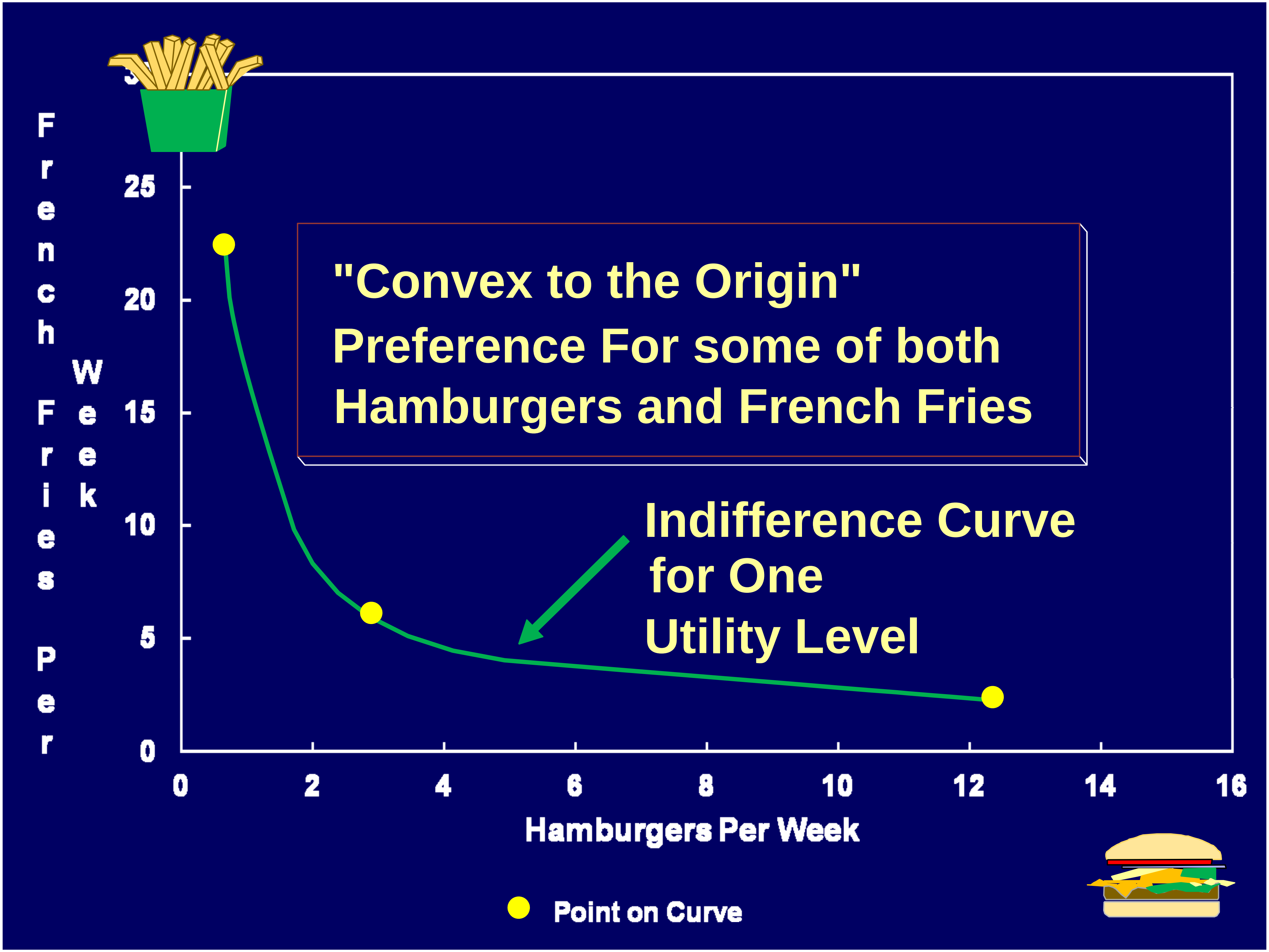




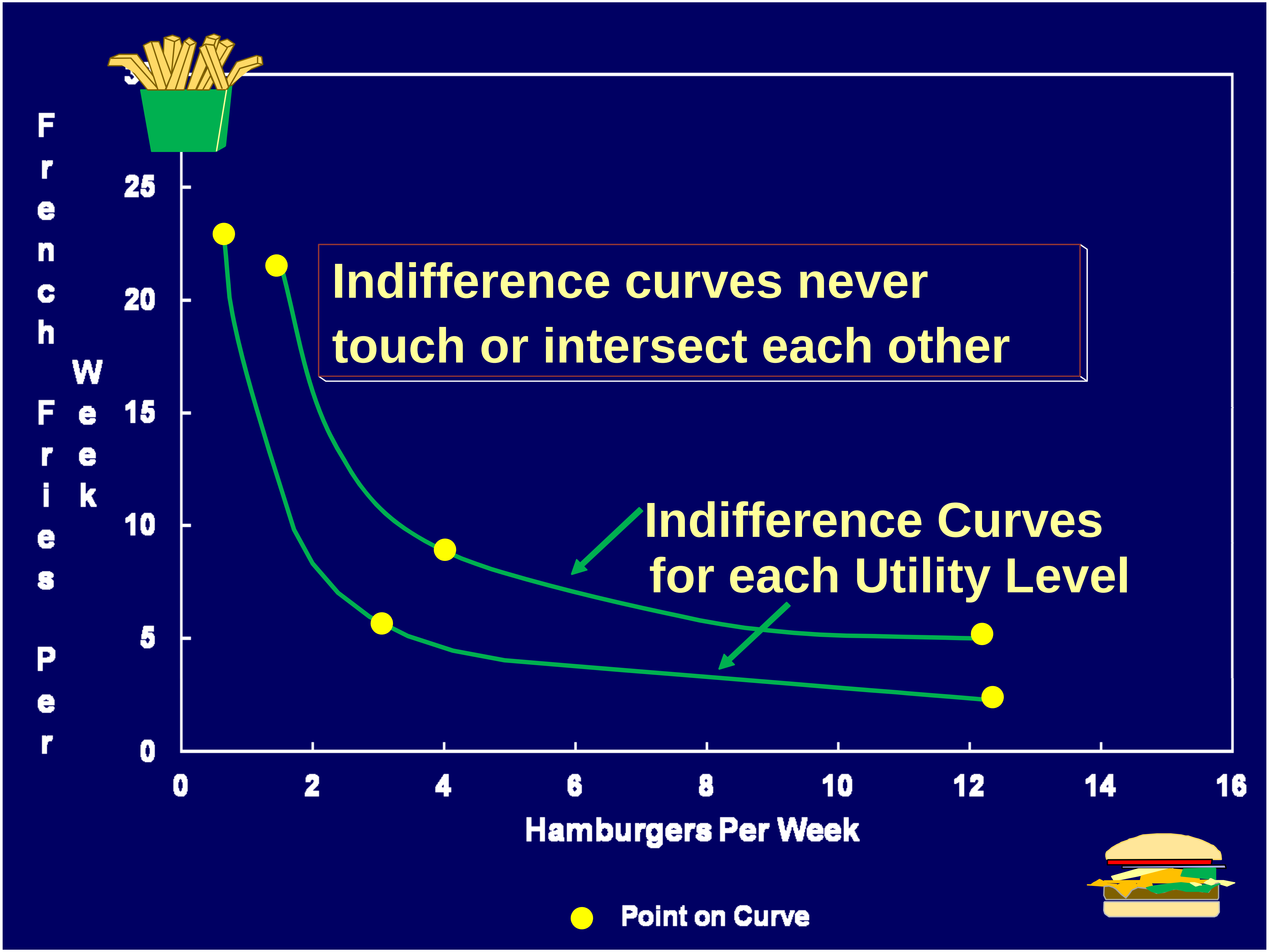

An Indifference Curve: The consumer is equally happy (satisfied) at any of the points along a single curve
French Fries Per Week
0
5
10
15
20
25
30
0
2
4
6
8
10
12
14
16
Hamburgers Per Week
Point on Curve

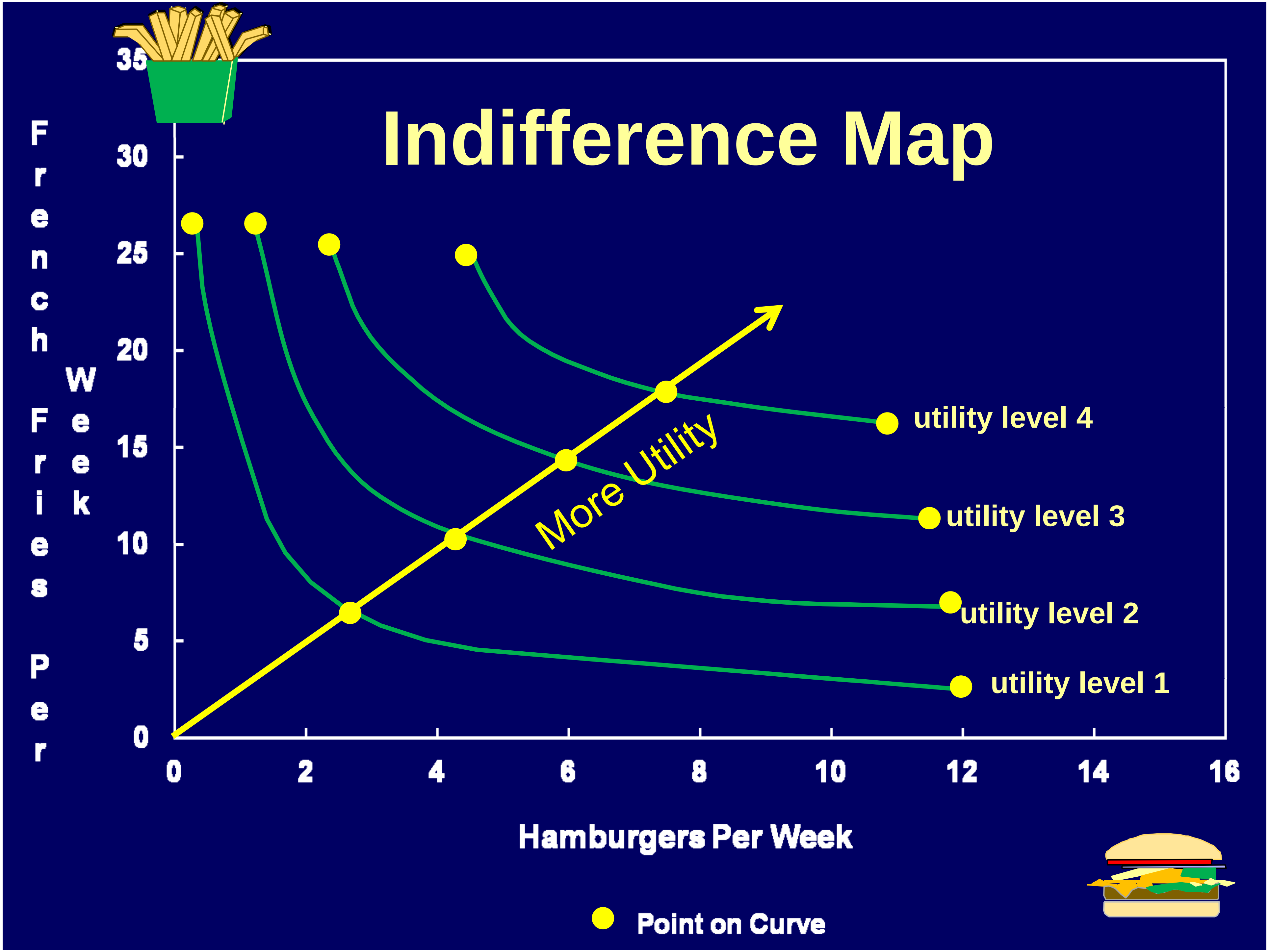


French Fries Per Week
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
An Indifference Curve represents the same amount of utility everywhere
Hamburgers Per Week
Point on Curve



"Convex to the Origin"
Preference For some of both
Hamburgers and French Fries
Indifference Curve
for One
Utility Level
French Fries Per Week
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
Hamburgers Per Week
Point on Curve


Indifference curves never touch or intersect each other
Indifference Curves for each Utility Level
French Fries Per Week
Hamburgers Per Week
Point on Curve
0
5
10
15
20
25
0
2
4
6
8
10
12
14
16



Indifference Map
French Fries Per Week
Hamburgers Per Week
0
5
10
15
20
25
30
35
0
2
4
6
8
10
12
14
16
More Utility
utility level 4
utility level 3
utility level 2
utility level 1
Point on Curve

Budget Line

Assume:

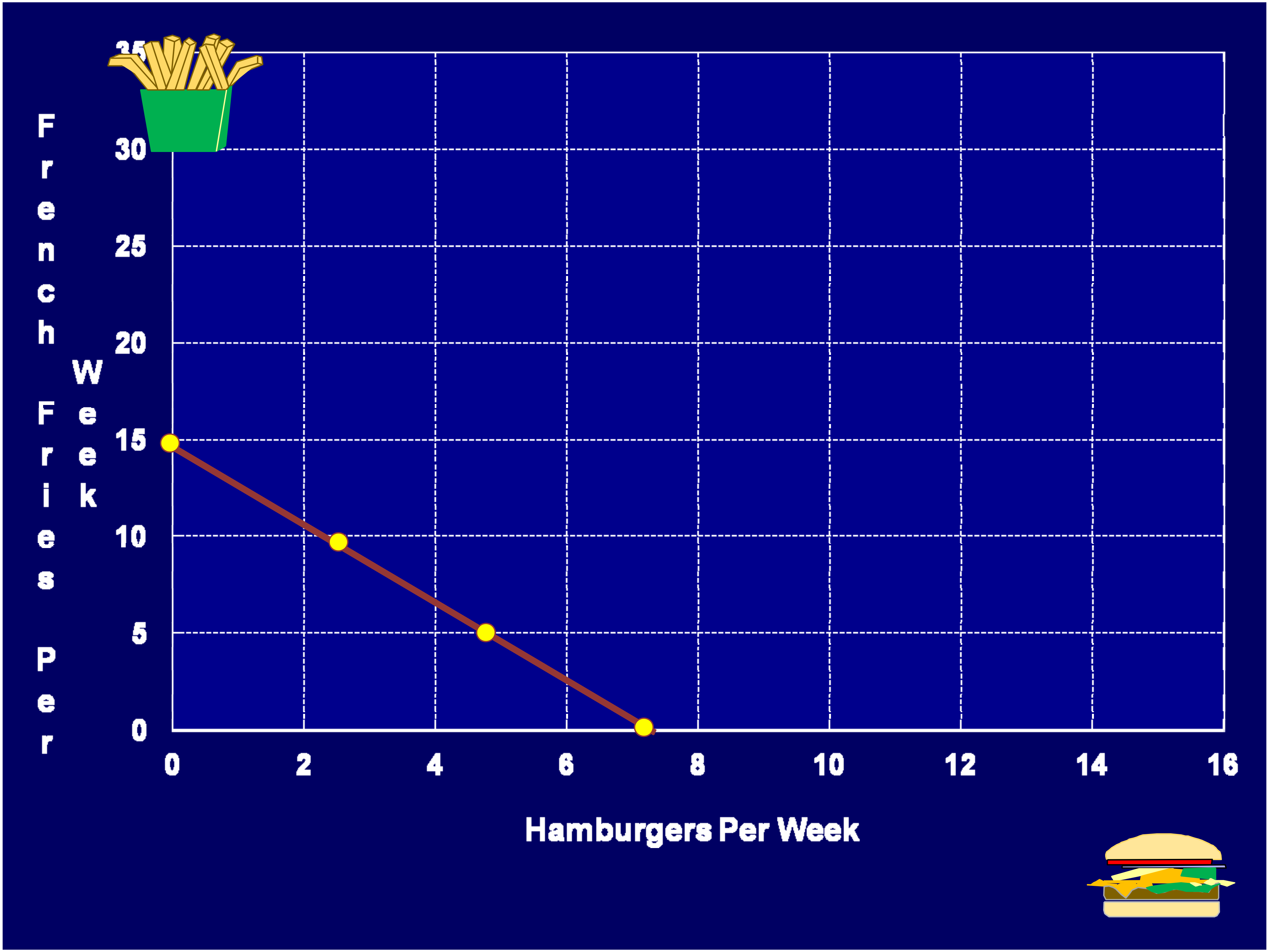
Price of Hamburger is $1.00

Price of French Fries is $.50

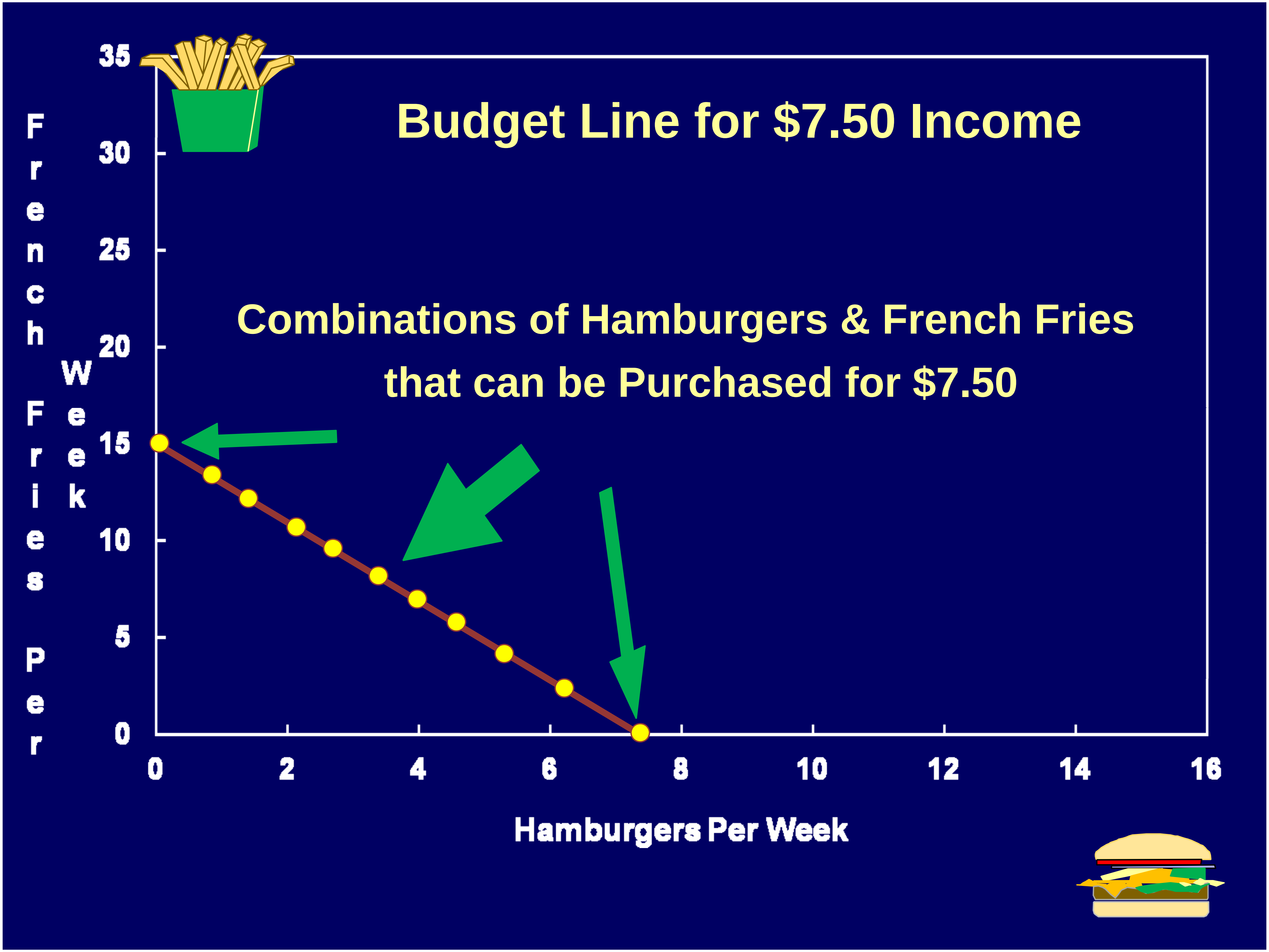
Income is 7.50

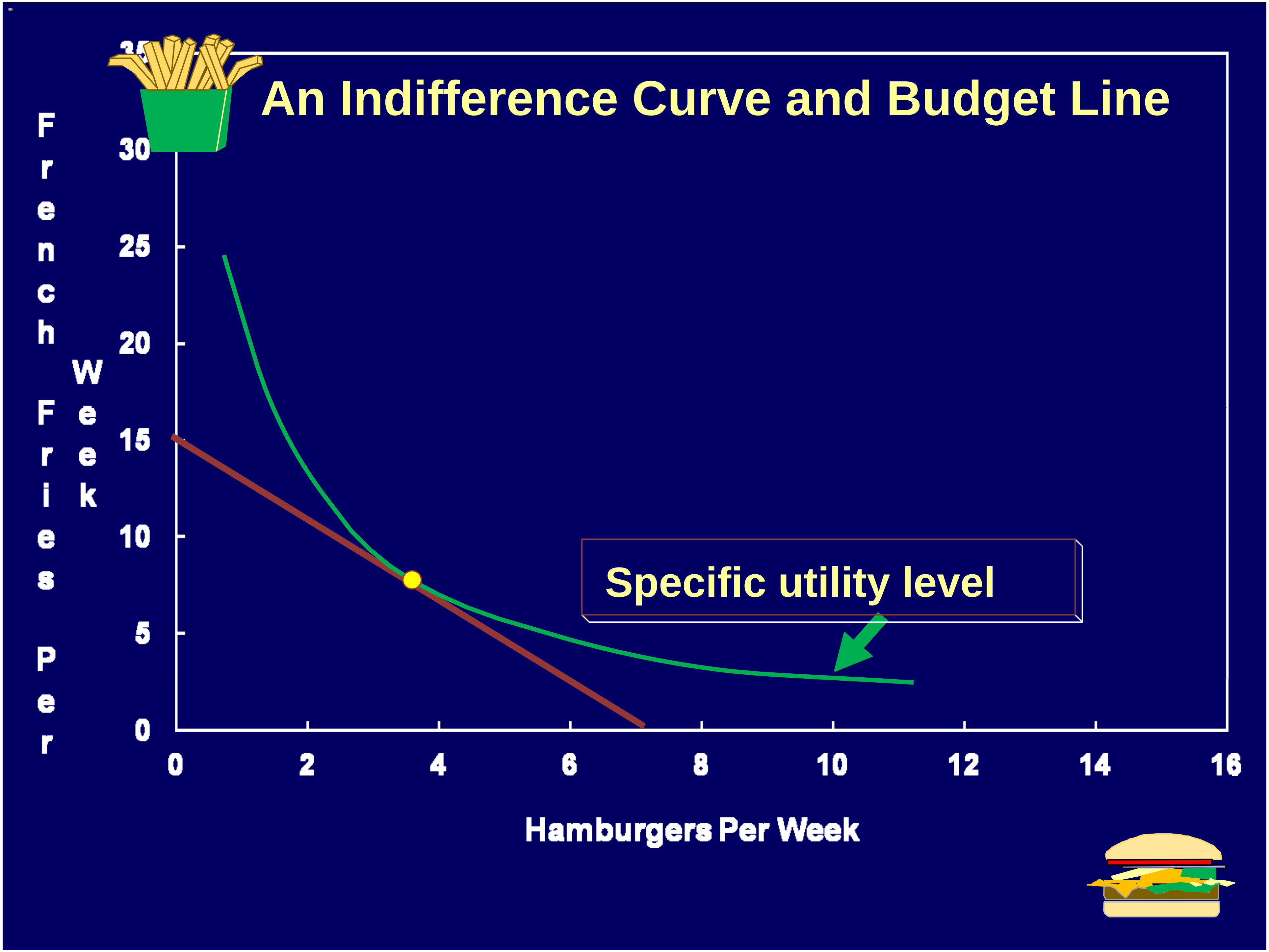
Could Purchase 7.5 Hamburgers
0 French Fries
or 15 French Fries, 0 Hamburgers
or 9 French Fries, 3 Hamburgers

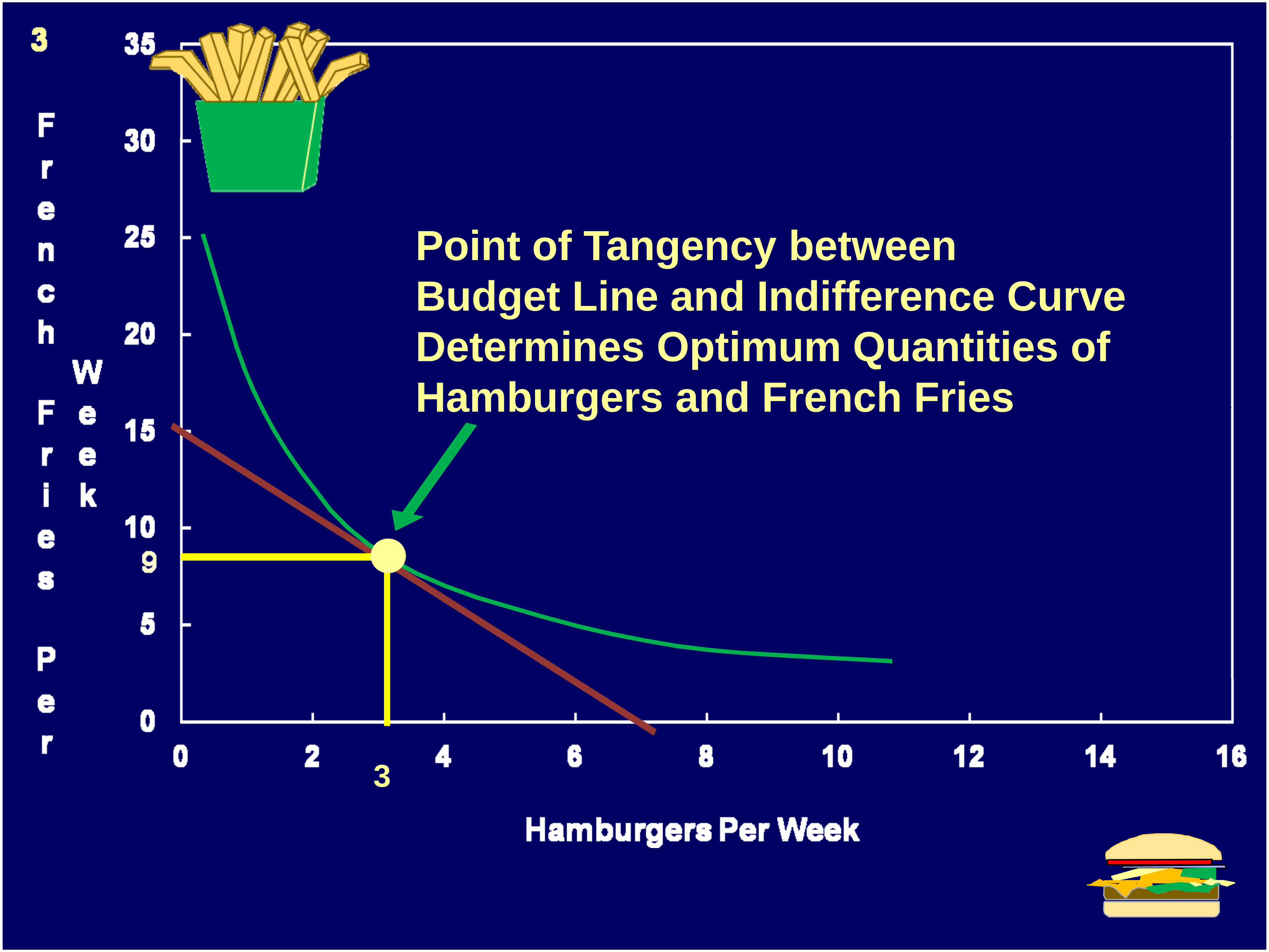
Many other feasible combinations with the $7.50 of income

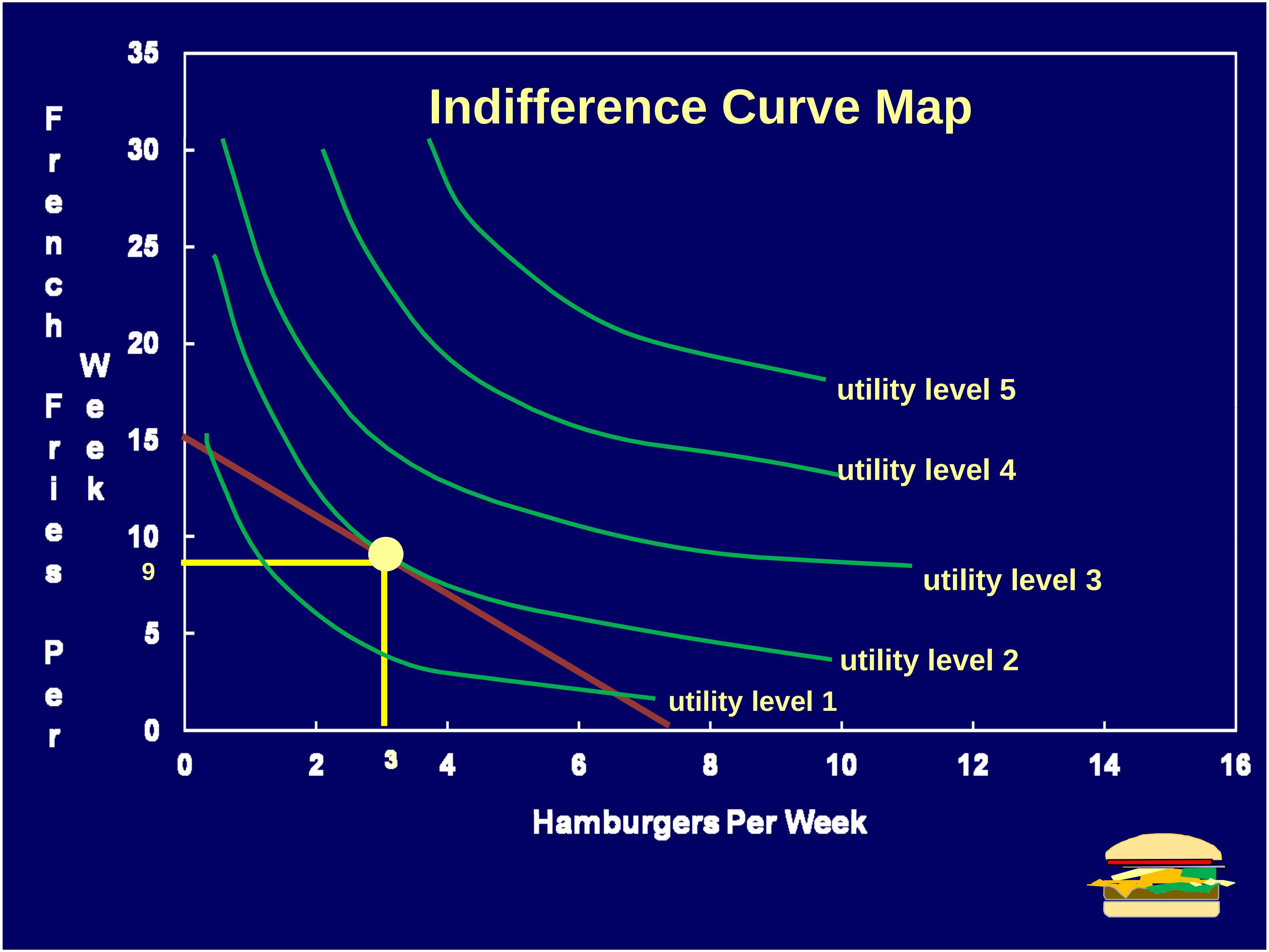


French Fries Per Week
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
Hamburgers Per Week

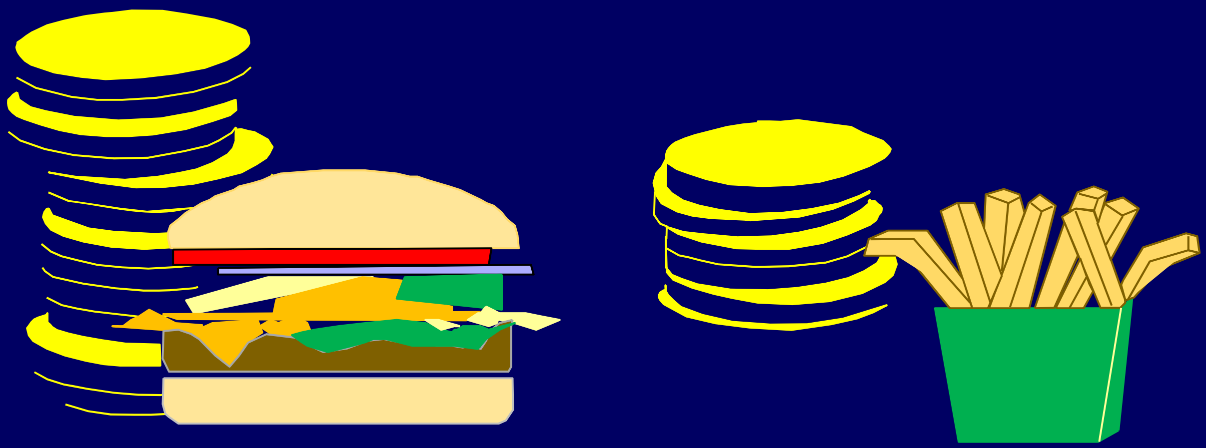

Budget Line for $7.50 Income
Combinations of Hamburgers & French Fries
that can be Purchased for $7.50
French Fries Per Week
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
Hamburgers Per Week


An Indifference Curve and Budget Line
French Fries Per Week
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
Hamburgers Per Week
Specific utility level


3
French Fries Per Week
35
30
25
20
15
10
9
5
0
0
2
3
4
6
8
10
12
14
16
Hamburgers Per Week
Point of Tangency between
Budget Line and Indifference Curve
Determines Optimum Quantities of
Hamburgers and French Fries



Indifference Curve Map
utility level 5
utility level 4
utility level 3
utility level 2
utility level 1
French Fries Per Week
Hamburgers Per Week
0
5
9
10
15
20
25
30
35
0
2
3
4
6
8
10
12
14
16



Price of Hamburgers /Price of French Fries
= Slope of Budget Line

Marginal Rate of Substitution
of Hamburgers for French Fries
= Slope of Indifference Curve

Optimum Combination:

3 Hamburgers, 9 French Fries

where

Price of Hamburgers/Price of French Fries =

Marginal Rate of Substitution

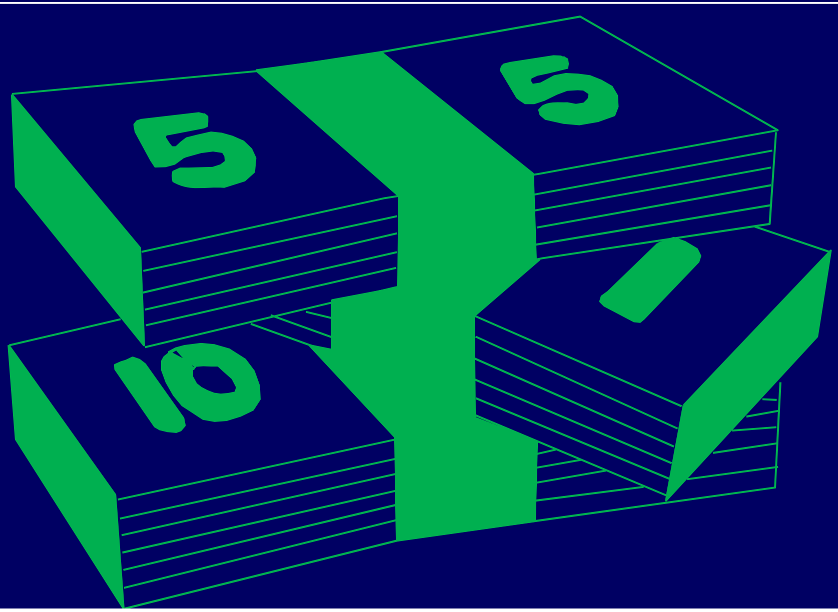
of Hamburgers for French Fries

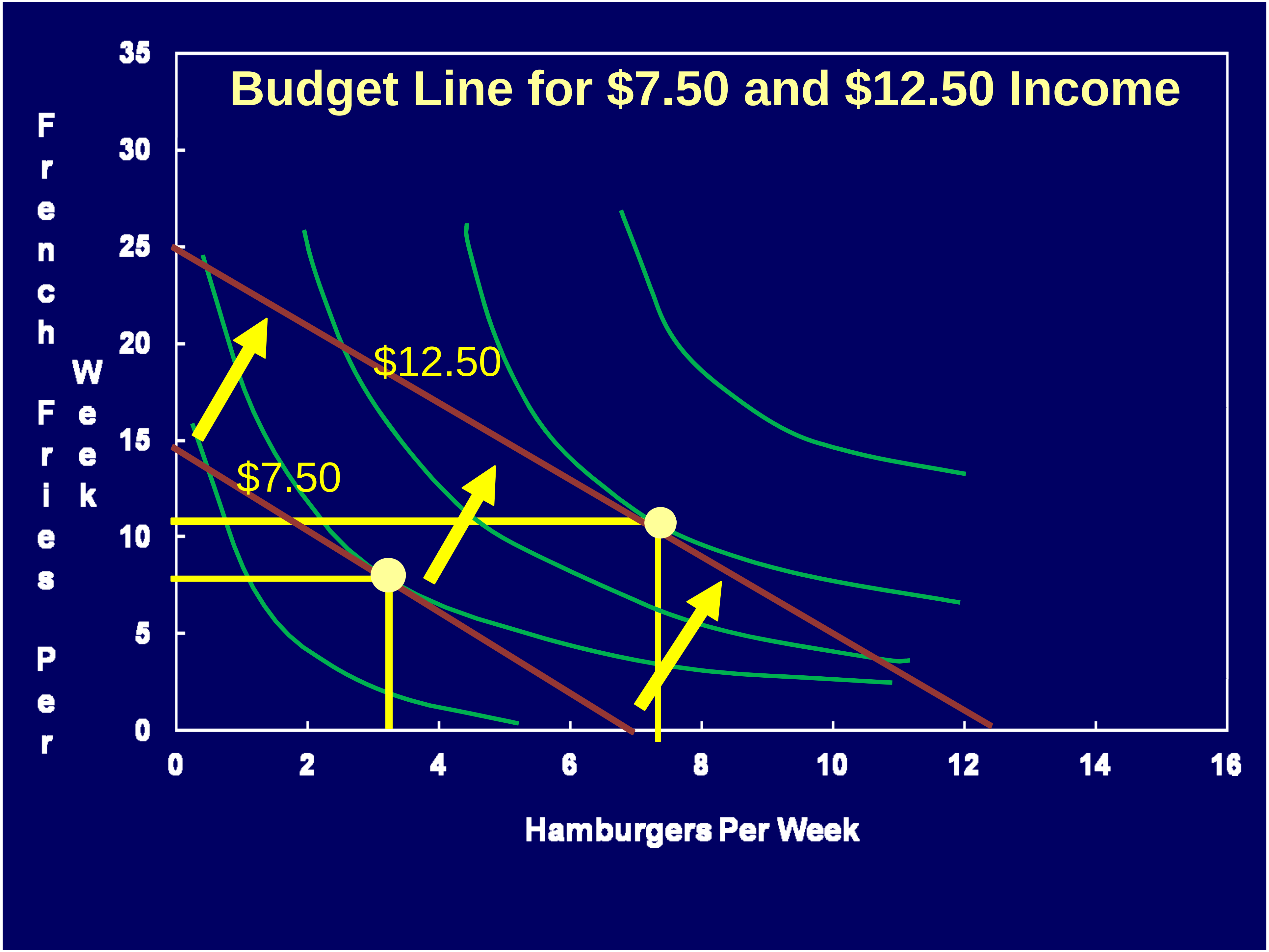
Impact of More Income

A new, higher budget line

with the same slope

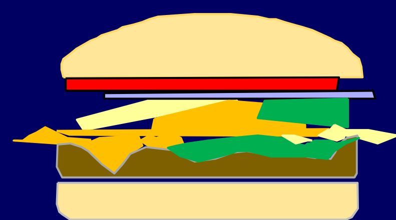
but reaches a higher indifference curve





Budget Line for $7.50 and $12.50 Income
$12.50
$7.50
French Fries Per Week
Hamburgers Per Week
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16

Impact of Price Change for Hamburgers



Hamburgers

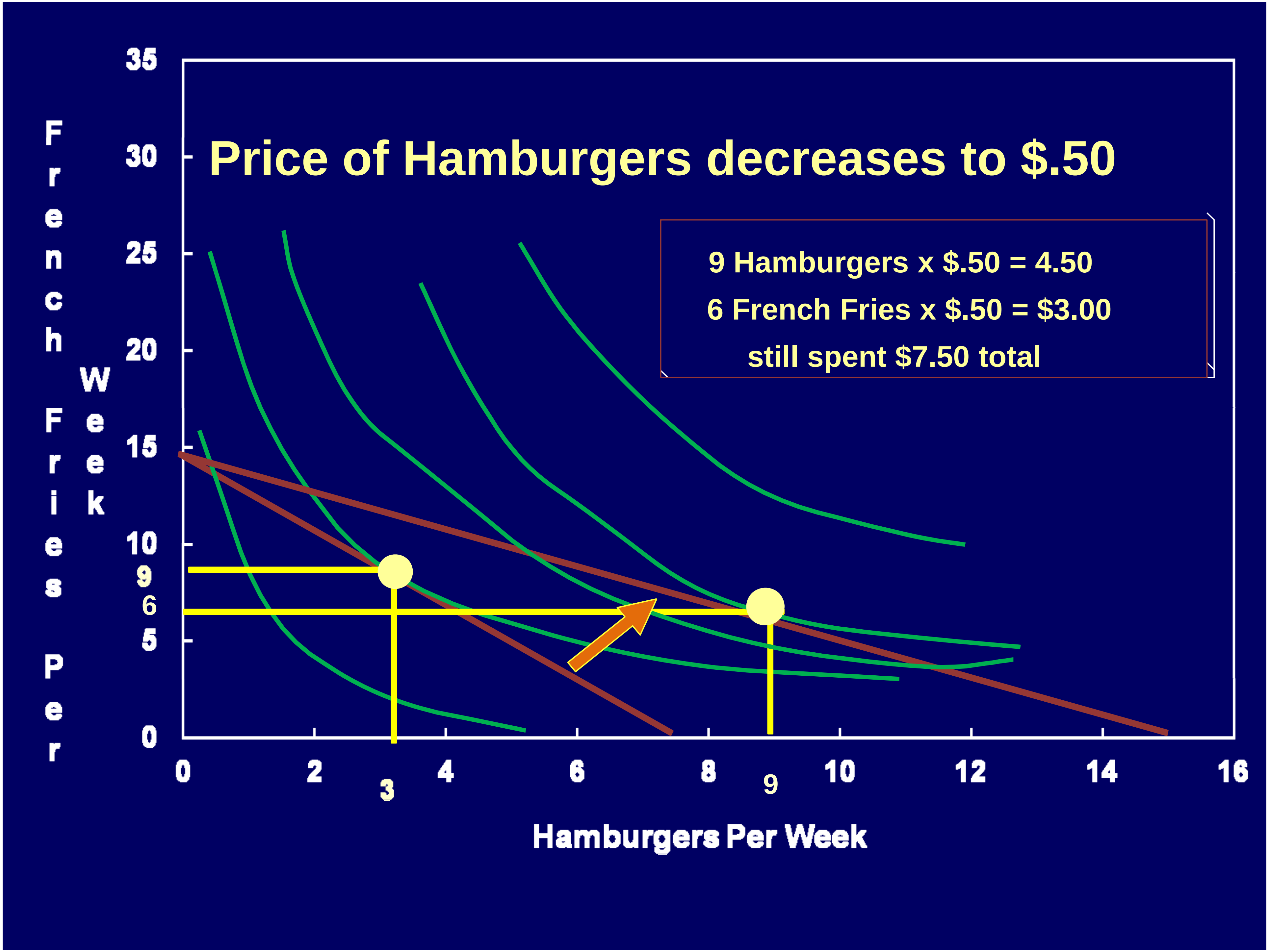
Special Today

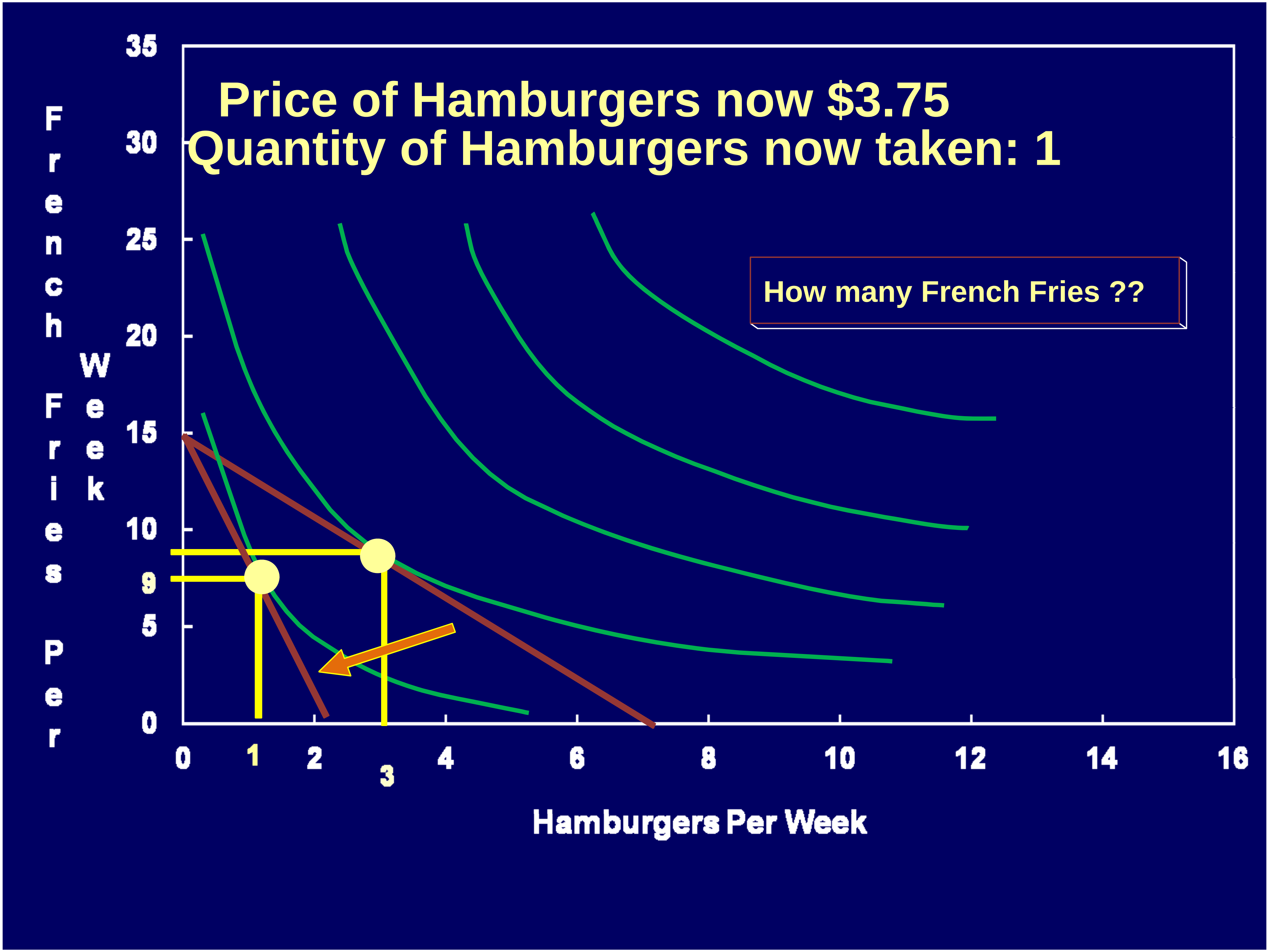
All you can eat

50 cents each

Hamburgers

$3.75 each


Price of Hamburgers decreases to $.50
9 Hamburgers x $.50 = 4.50
6 French Fries x $.50 = $3.00
still spent $7.50 total
French Fries Per Week
35
30
25
20
15
10
9
6
5
0
0
2
3
4
6
8
9
10
12
14
16
Hamburgers Per Week

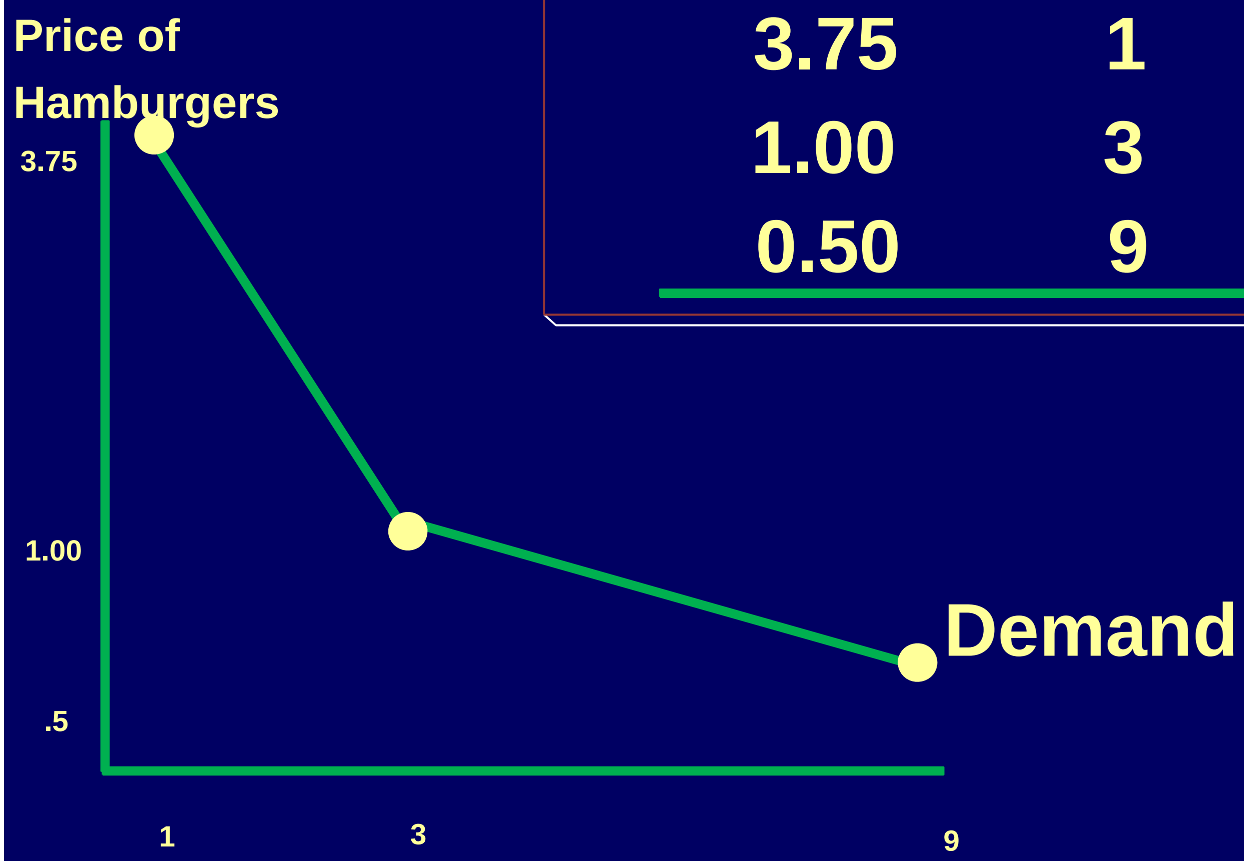


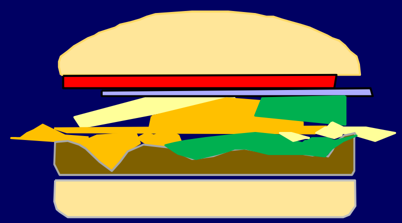
Price of Hamburgers now $3.75
Quantity of Hamburgers now taken: 1
How many French Fries ??
French Fries Per Week
35
30
25
20
15
10
9
5
0
0
1
2
3
4
6
8
10
12
14
16
Hamburgers Per Week

Tracing the Demand Curve for Hamburgers

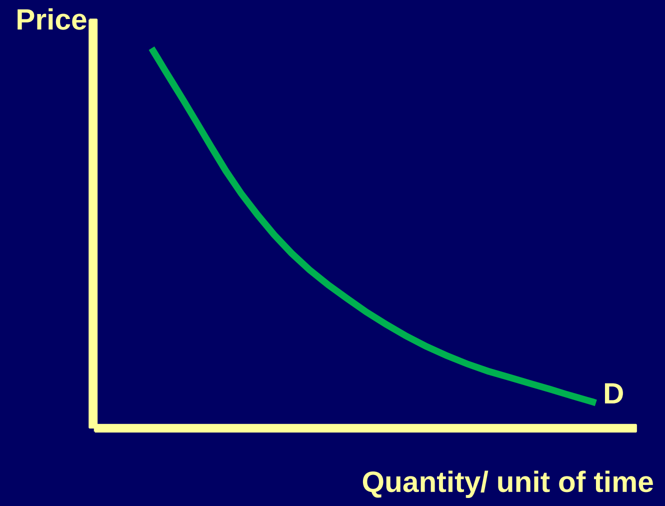
A Demand Schedule for Hamburgers

Price	Quantity Demanded
3.75	1
1.00	3
0.50	9





Consumer demand has its roots in consumer utility theory



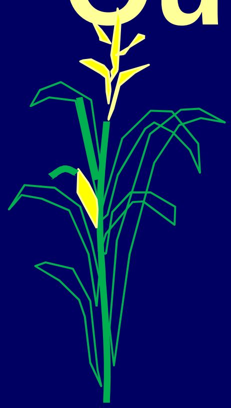
Production with One Input and One Output

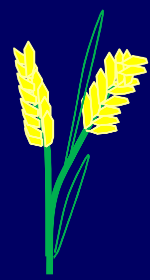
A Production Function:

Transformation of
input into output

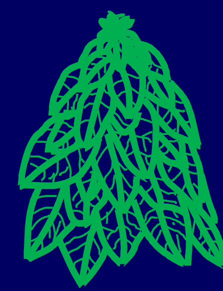
A *technical* relationship
(not *behavioral*)

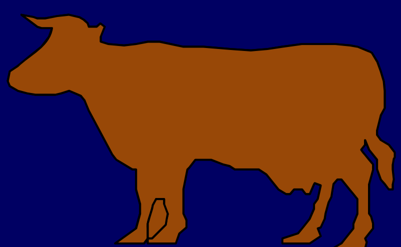
Output:



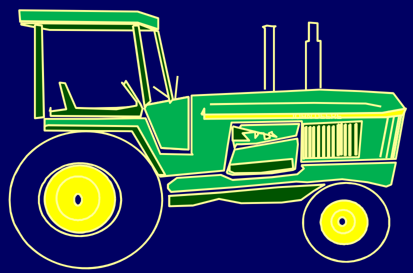


- Corn
- Tobacco
- Wheat
- Beef
- Milk

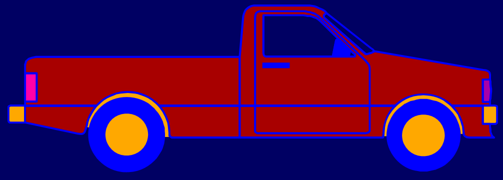




Input:



- Seed
- Fertilizer
- Feed
- Machinery



Fixed versus Variable Inputs

Fixed--

Farmer does not expect to vary

Over the planning horizon

Variable--

Farmer expects to vary

Over the planning horizon

? ? ? ? ? ?

Length of Planning Horizon:

in the mind of the farmer

6 months?

The Growing Season?

2 years?

10 years (for Christmas trees)?

Only the farmer knows for sure

Old idea--

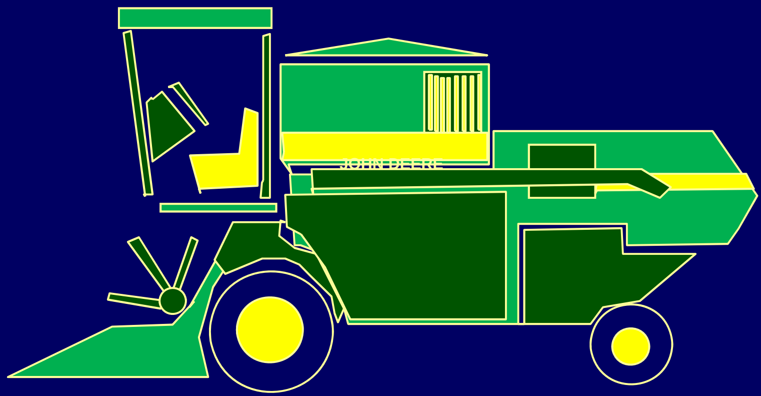
Inputs could be categorized

Land--fixed

Labor--variable

Machinery--fixed (sort of!)

Not a correct idea



Correct idea:

Planning horizon determines whether inputs are fixed or variable

Short Run--All inputs fixed

Intermediate Run--Some fixed, some variable

Long Run--All inputs variable

Inputs:

Traditional list

Land

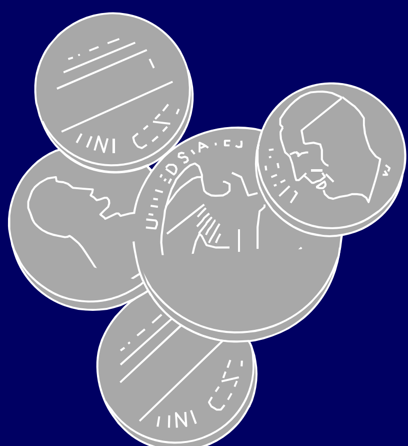
Labor

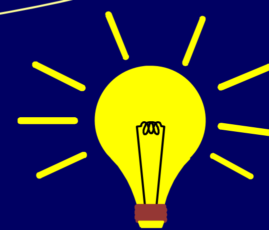
Capital

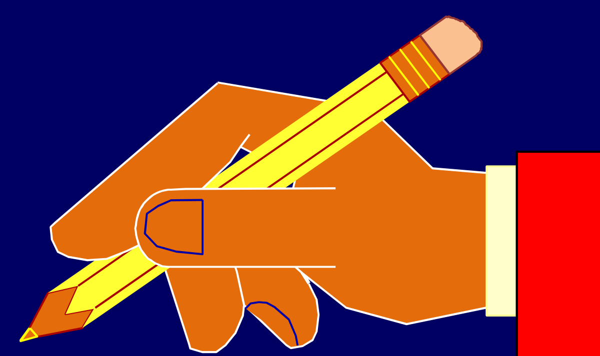
Management

With capital you can purchase land and labor

Is management an input??







A Production Function:

$Y = f(X)$

Y = output such as bu. of corn

X = input such as fertilizer

f(x) = rule for transforming X into Y

such as:

$$Y = 3X$$

$$Y = X^{0.5}$$

$$Y = .3X + .05X^2 - .002X^3$$

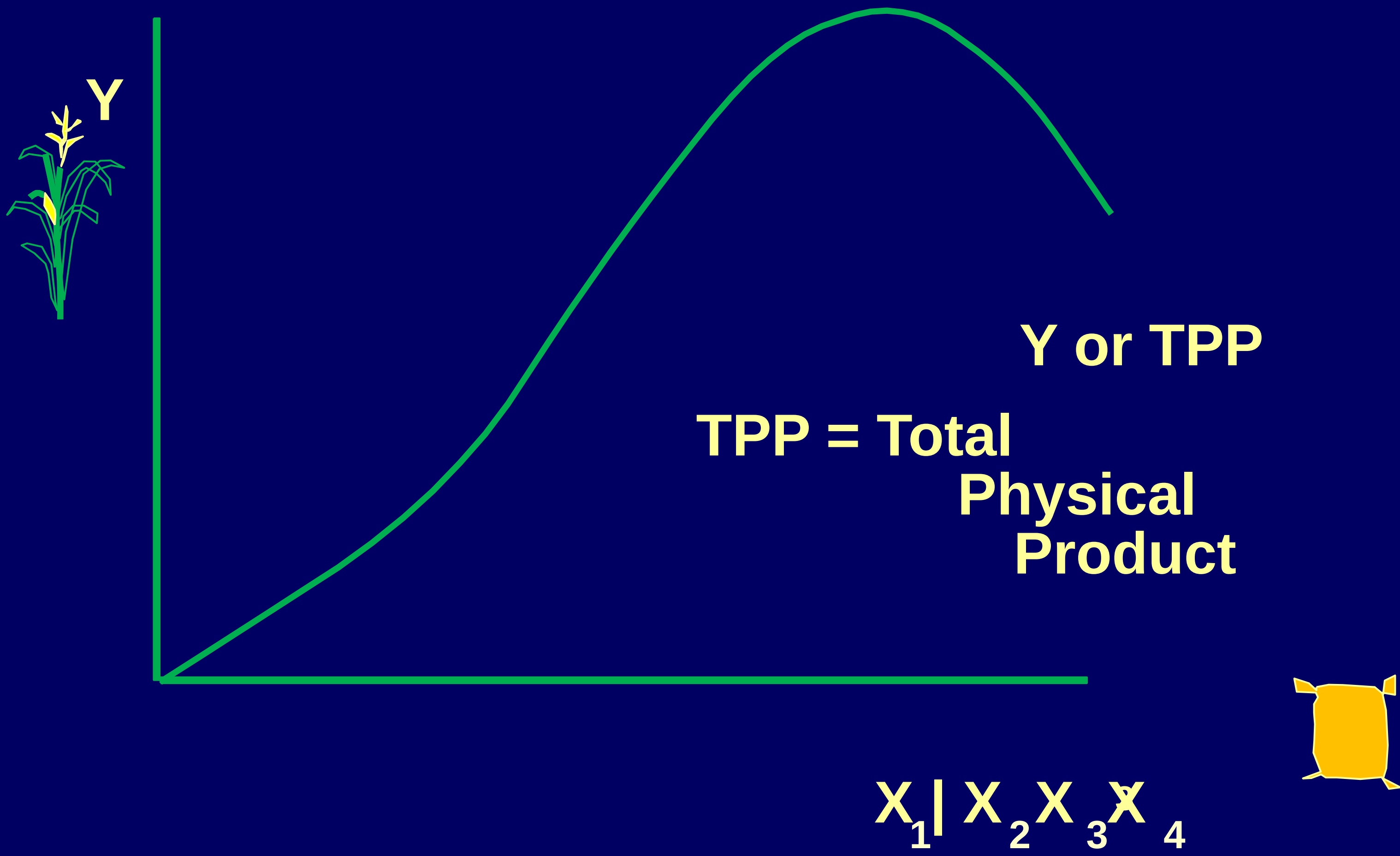
Each of these are production functions

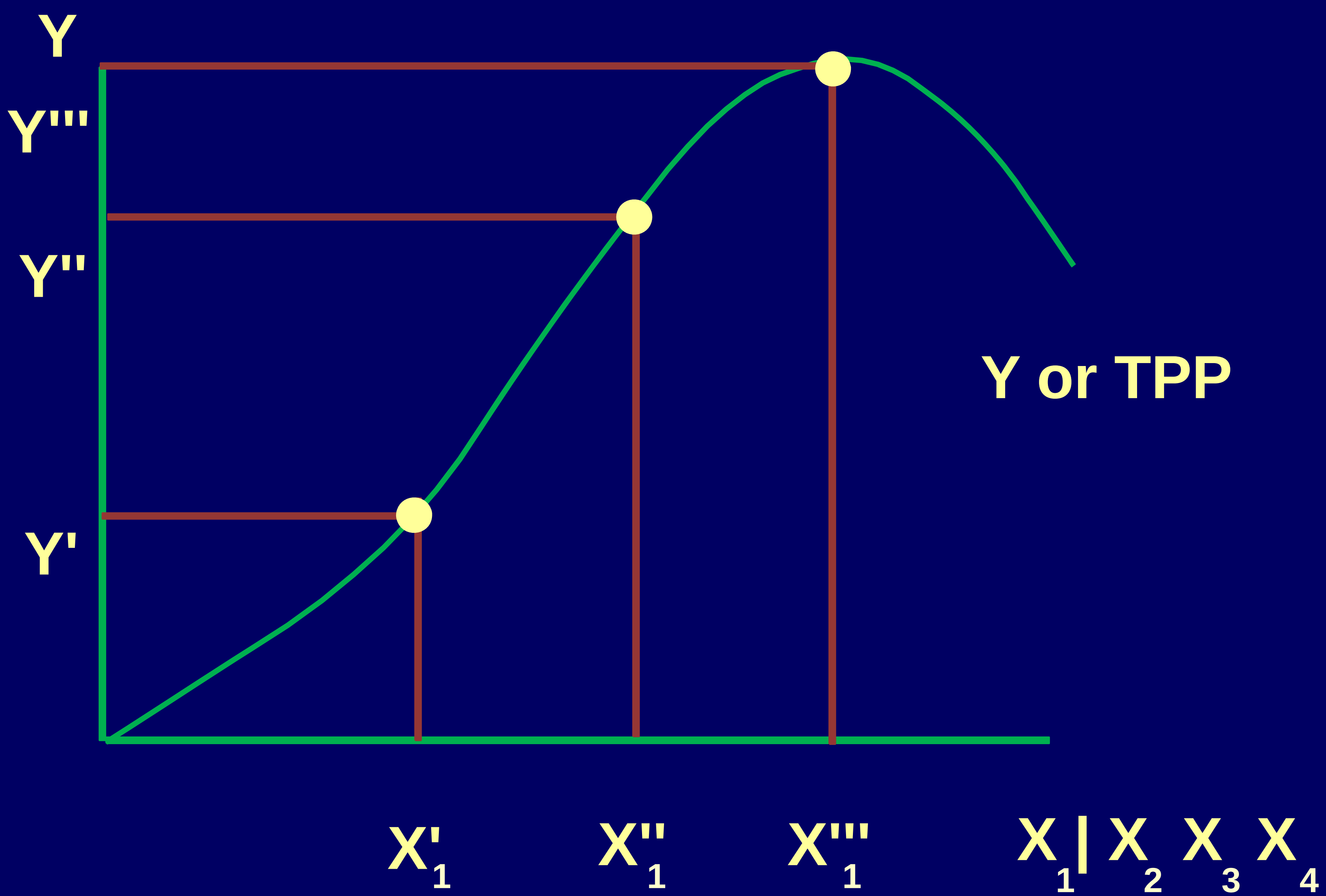
$$Y = f(X_1 \mid X_2\, X_3\, X_4)$$

The output

The Variable input

Inputs treated as fixed





Specific amount of output from
a specific amount of input

Marginal Product

The incremental change in output associated with a 1 unit change in the use of the input

Marginal Product of input x:

Δ y = change in y

Δ x = change in x

$$\frac{\Delta y = \text{change in } y}{\Delta x = \text{change in } x} = \text{Marginal Product}$$

Also called Marginal Physical Product

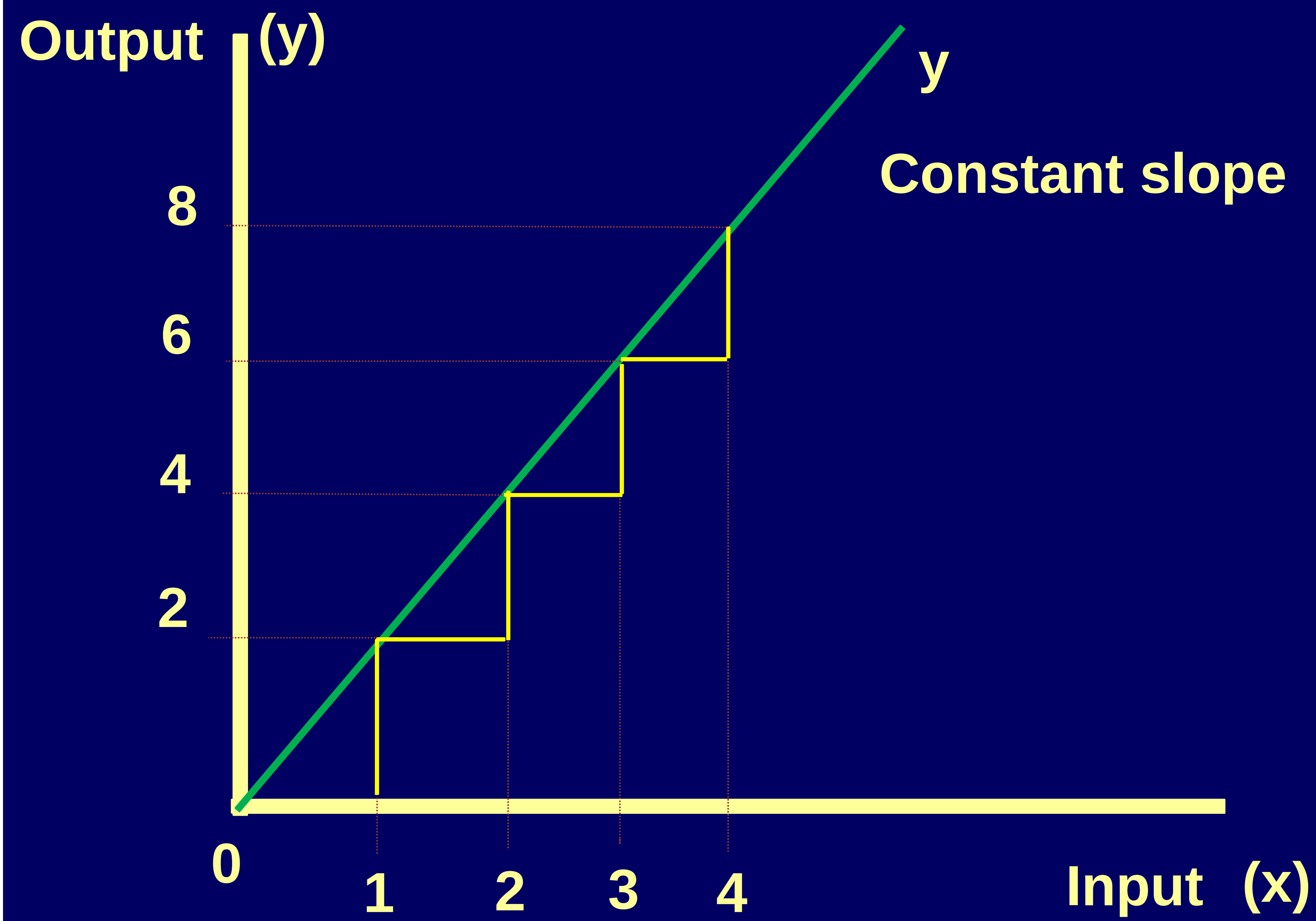
or MPP for short

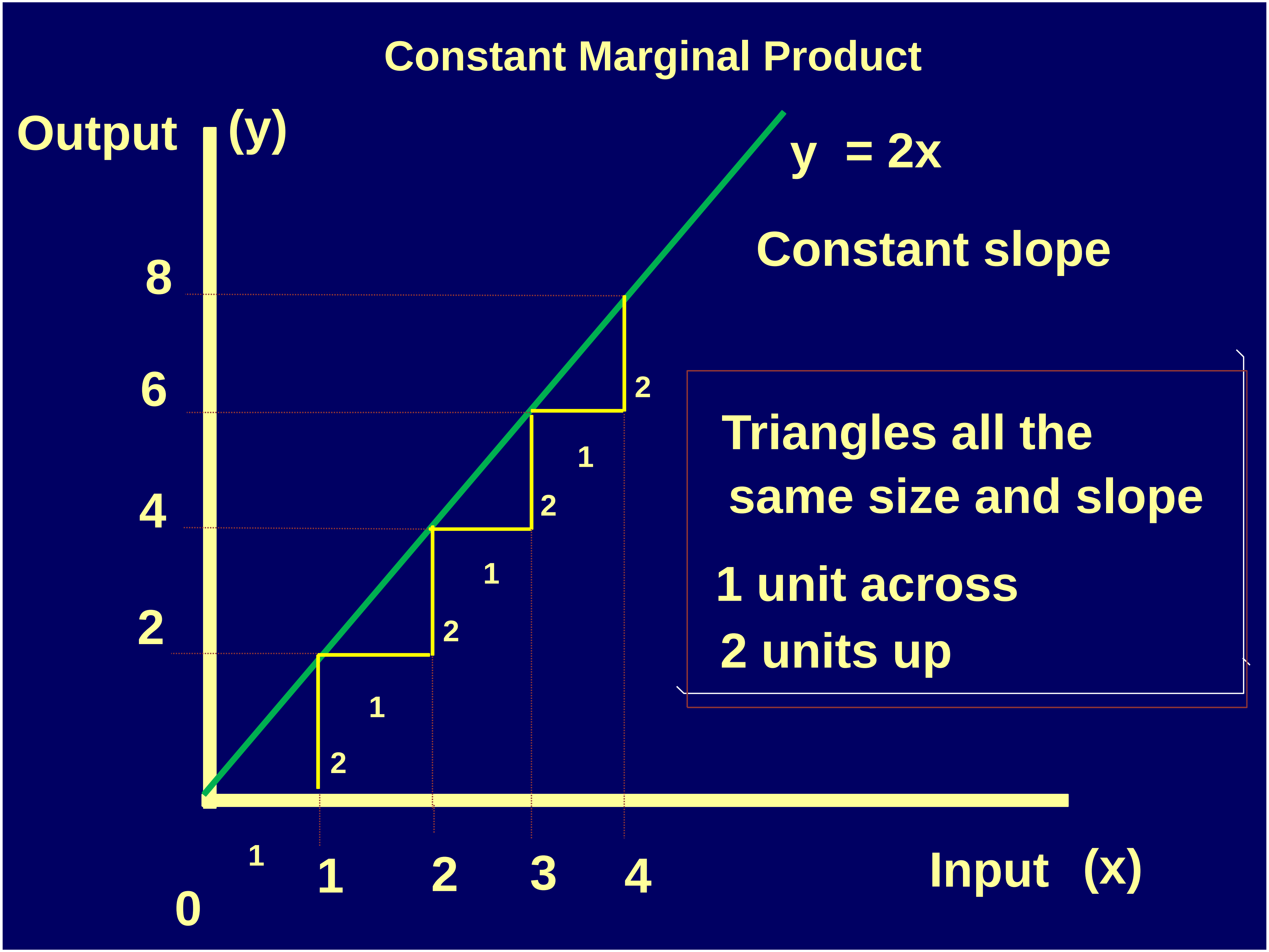
Diminishing, Constant and Increasing Marginal Product

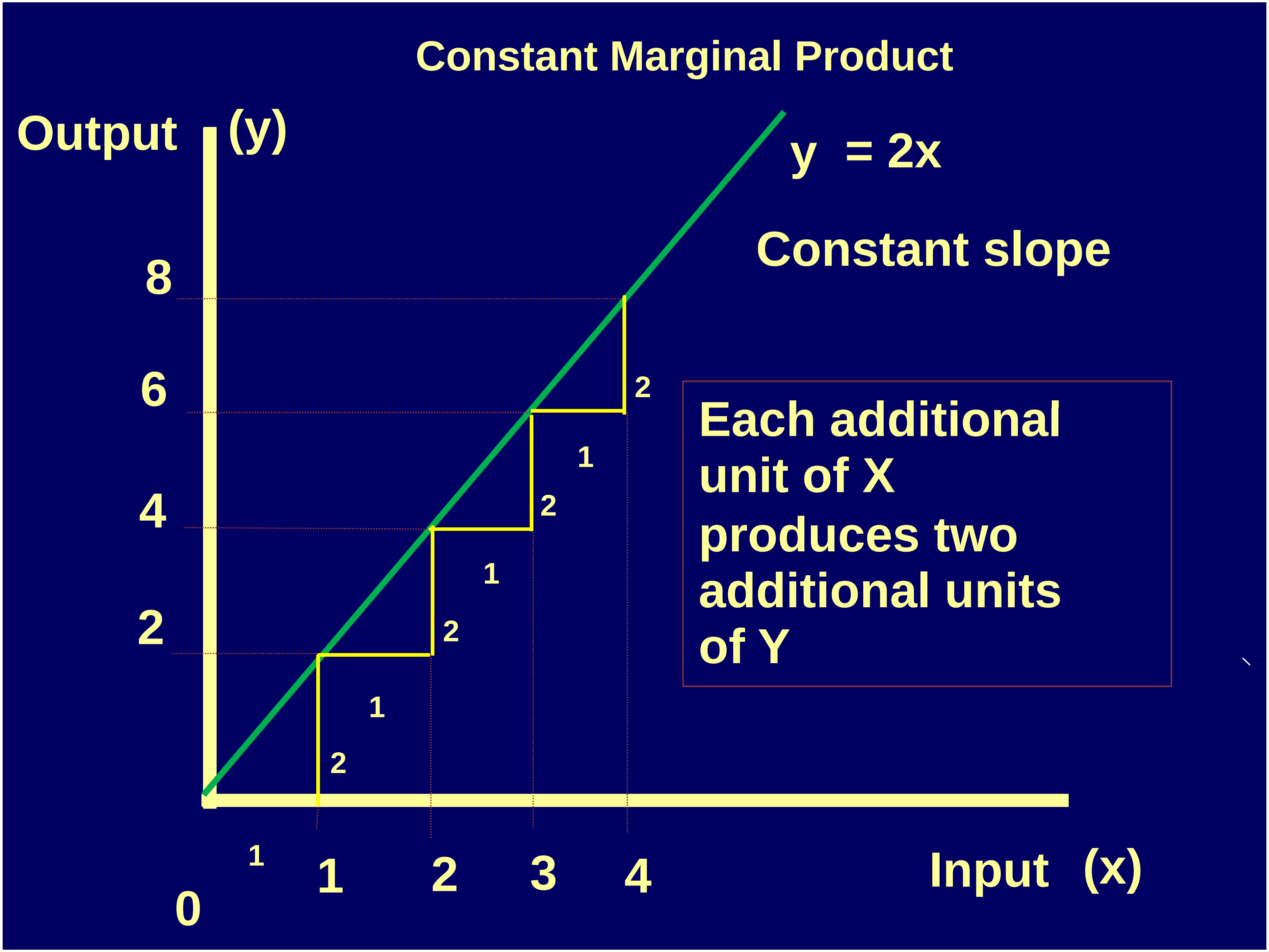
Case 1:

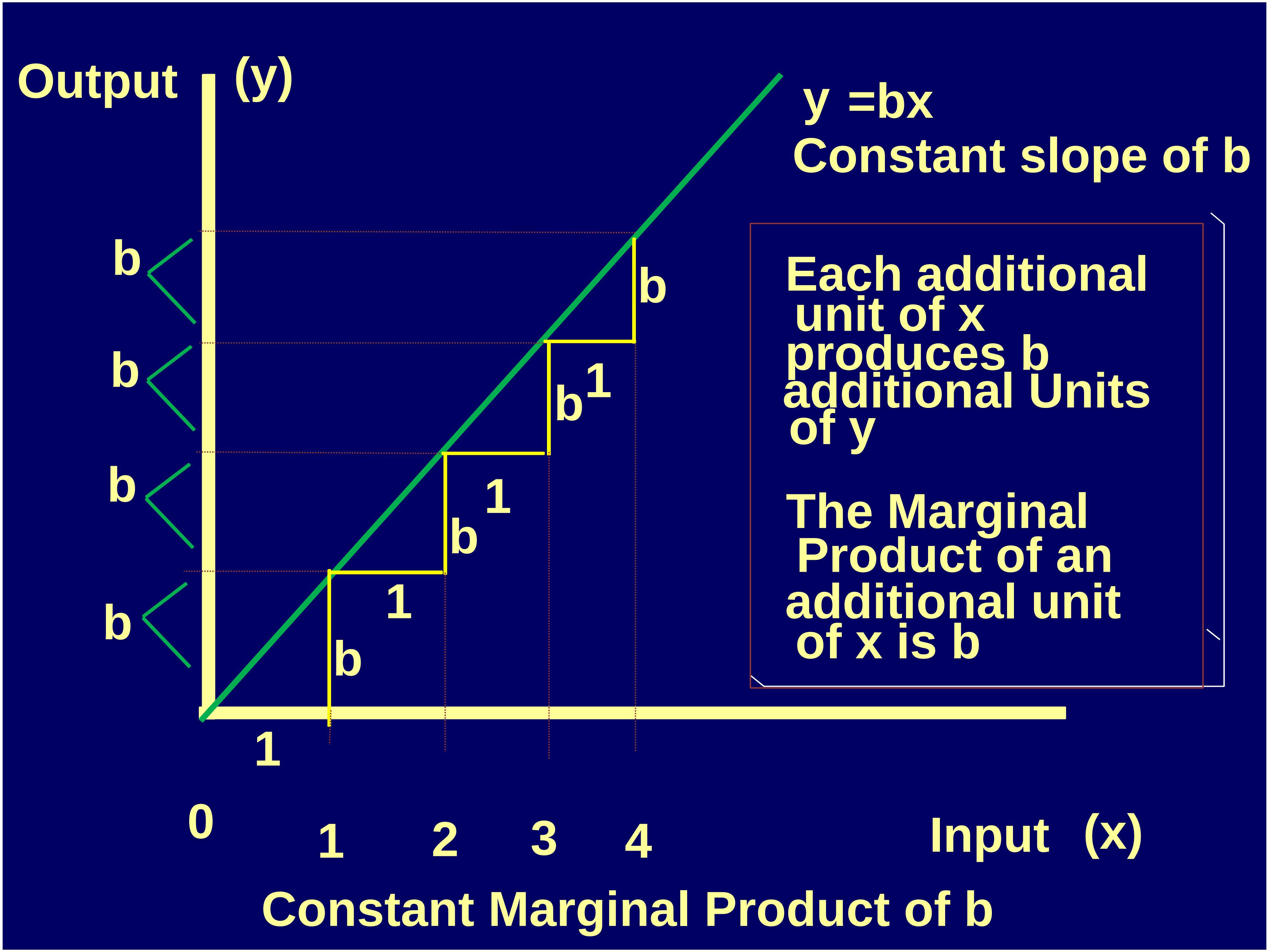
Constant Marginal Product

Constant Marginal Product




Constant Marginal Product
Output (y)
y = 2x
Constant slope
8
6
4
2
0
1
2
1
2
1
2
1
2
Triangles all the
same size and slope
1 unit across
2 units up
1
1
2
3
4
Input (x)


Constant Marginal Product
Output (y)
y = 2x
Constant slope
8
6
4
2
0
2
1
2
1
2
1
2
1
Each additional unit of X produces two additional units of Y
1
1
2
3
4
Input (x)


Output (y)
y =bx
Constant slope of b
b
b
b
b
b
1
b
1
b
1
b
Each additional unit of x produces b additional Units of y
The Marginal Product of an additional unit of x is b
1
0
1
2
3
4
Input (x)
Constant Marginal Product of b

Constant Marginal Product

x	Δx	y	Δy	MPP Δy/ Δx

Constant Marginal Product

x	Δx	y	Δy	MPP $\Delta y / \Delta x$
0		0		
1		2		
2		4		
3		6		
4		8		
5		10		

Constant Marginal Product

x	△x	y	△y	MPP △y /△x
0		0		
	1			
1		2		
	1			
2		4		
	1			
3		6		
	1			
4		8		
	1			
5		10		

Constant Marginal Product

x	△x	y	△y	MPP △Y / △x
0		0		
	1		2	
1		2		
	1		2	
2		4		
	1		2	
3		6		
	1		2	
4		8		
	1		2	
5		10		

Constant Marginal Product

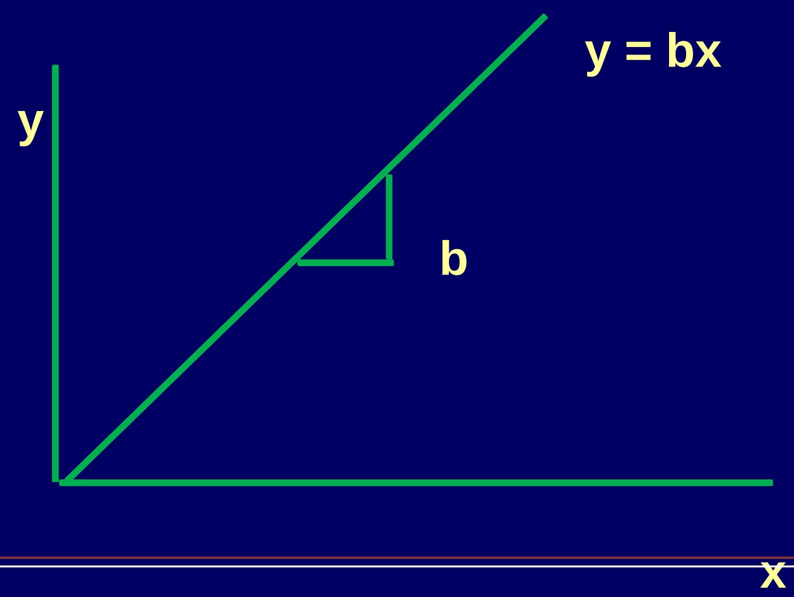
x	△x	y	△ y	MPP △Y /△x
0		0		
	1		2	2/1
1		2		
	1		2	2/1
2		4		
	1		2	2/1
3		6		
	1		2	2/1
4		8		
	1		2	2/1
5		10		

MPP = 2 everywhere

b = Marginal Product of an Additional Unit of x

Constant MPP

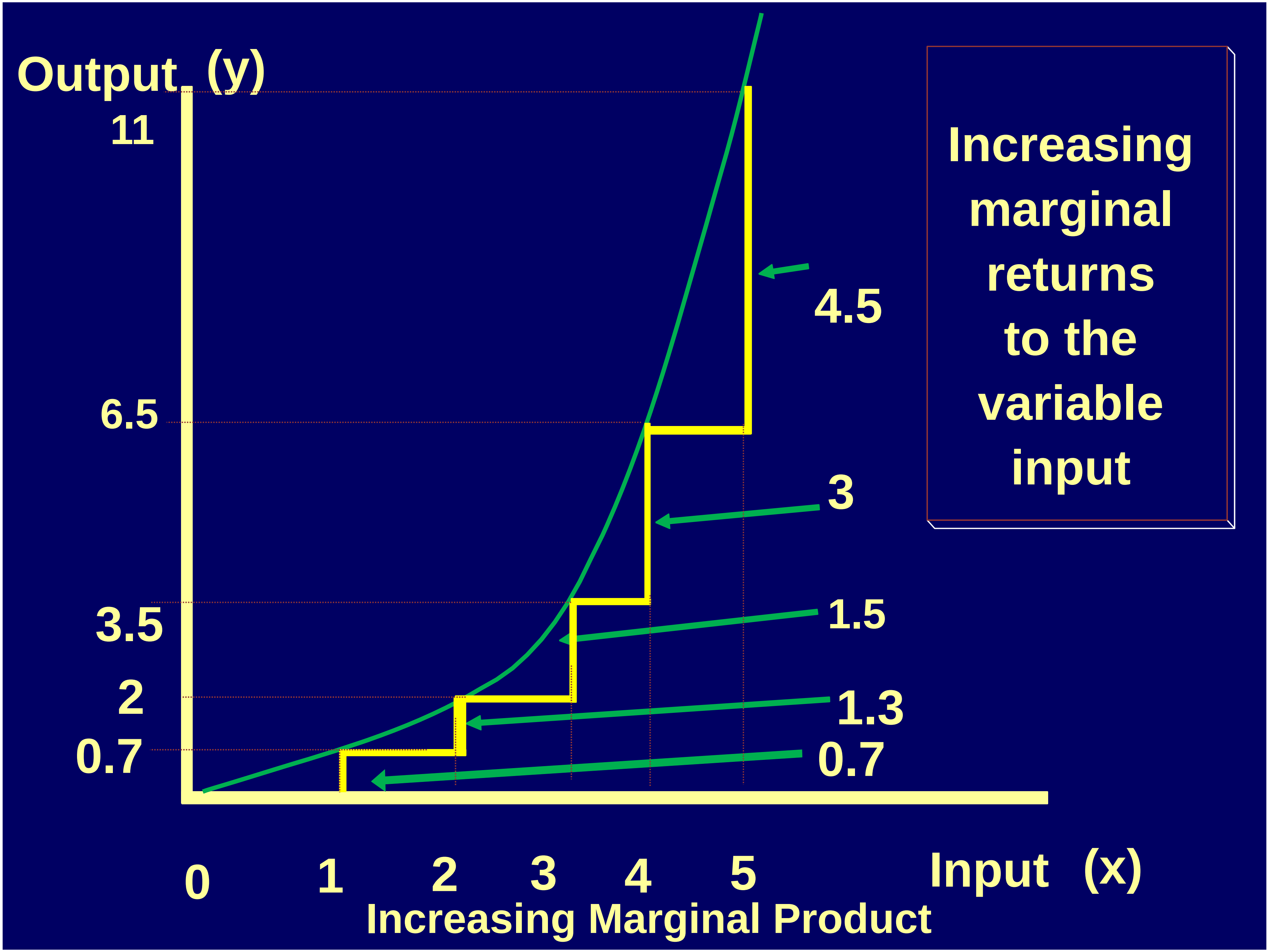
$$\frac{\Delta y}{\Delta x} = b$$



Case 2:

Increasing

Marginal Product



Output (y)
11
6.5
3.5
2
0.7
4.5
3
1.5
1.3
0.7
Increasing marginal returns to the variable input
0
1
2
3
4
5
Input (x)
Increasing Marginal Product

Increasing Marginal Product

x	Δ x	y	Δ y	MPP $\Delta Y / \Delta x$
0		0		
1		0.7		
2		2.0		
3		3.5		
4		6.5		
5		11.0		

Increasing Marginal Product

x	△x	y	△y	MPP △Y / △x
0		0		
	1			
1		0.7		
	1			
2		2.0		
	1			
3		3.5		
	1			
4		6.5		
	1			
5		11.0		

Increasing Marginal Product

MPP increases as x increases

x	△ x	y	△ y	MPP △Y / △x
0		0		
	1		.7	
1		0.7		
	1		1.3	
2		2.0		
	1		1.5	
3		3.5		
	1		3.	
4		6.5		
	1		4.5	
5		11.0		

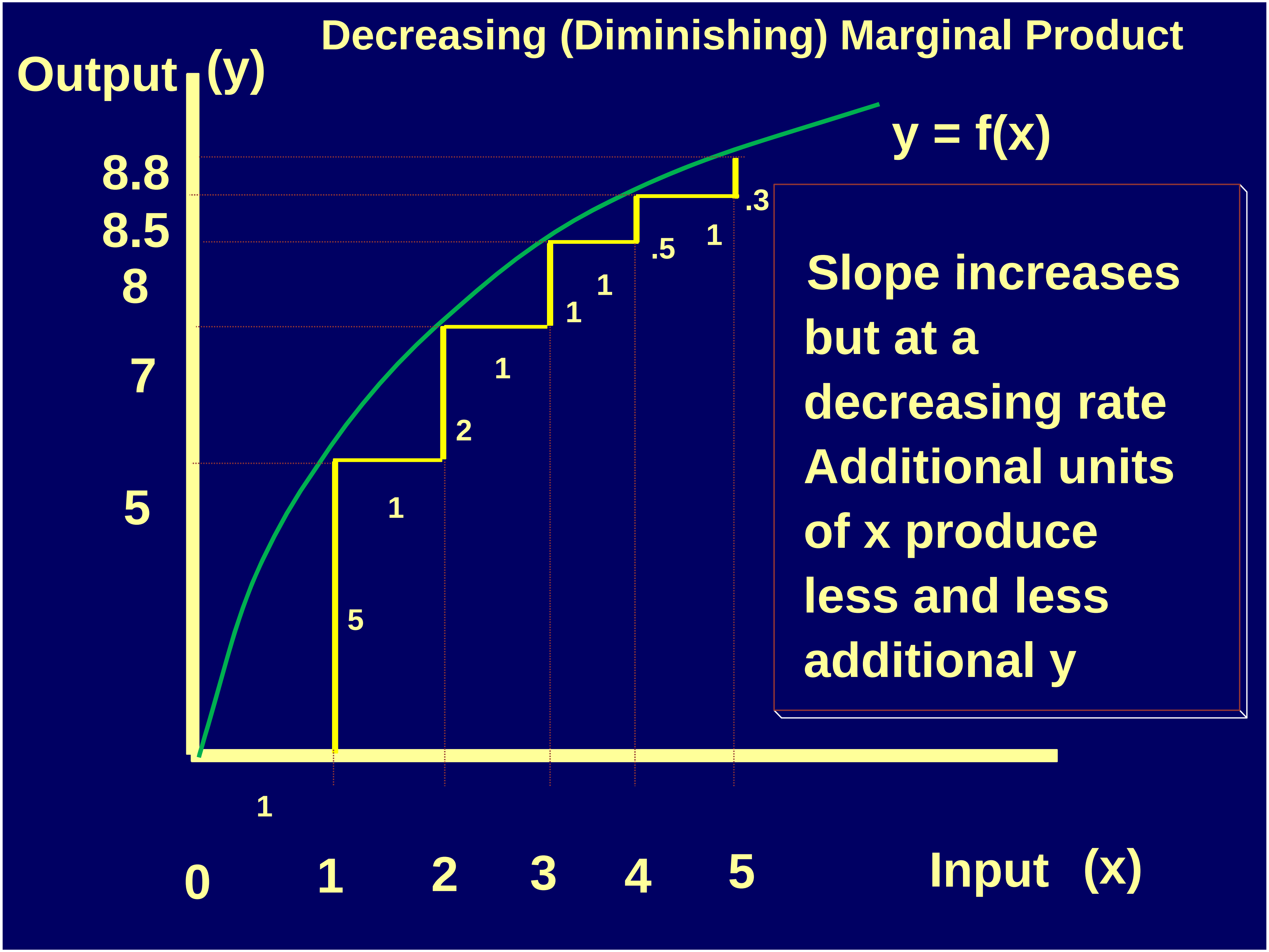
Increasing Marginal Product

MPP increases as x increases

x	Δ x	y	Δ y	MPP $\Delta Y / \Delta x$
0		0		
	1		.7	.7/1
1		0.7		
	1		1.3	1.3/1
2		2.0		
	1		1.5	1.5/1
3		3.5		
	1		3.	3.0/1
4		6.5		
	1		4.5	4.5/1
5		11.0		

Case 3:

Decreasing (Diminishing) Marginal Product



Decreasing (Diminishing) Marginal Product
Output (y)
y = f(x)
8.8
8.5
8
7
5
.3
1
.5
1
1
1
2
1
5
1
1
0
1
2
3
4
5
Input (x)
Slope increases but at a decreasing rate
Additional units of x produce less and less additional y

Decreasing Marginal Product

x	Δx	y	Δy	MPP $\Delta y / \Delta x$

Decreasing Marginal Product

x	△x	y	△y	MPP △y / △x
0		0		
1		5		
2		7		
3		8		
4		8.5		
5		8.8		

Decreasing Marginal Product

x	△x	y	△y	MPP △y / △x
0		0		
	1			
1		5		
	1			
2		7		
	1			
3		8		
	1			
4		8.5		
	1			
5		8.8		

Decreasing Marginal Product

x	△x	y	△y	MPP △y / △x
0		0		
	1		5	
1		5		
	1		2	
2		7		
	1		1	
3		8		
	1		0.5	
4		8.5		
	1		0.3	
5		8.8		

Decreasing Marginal Product

As the use of x increases, MPP decreases

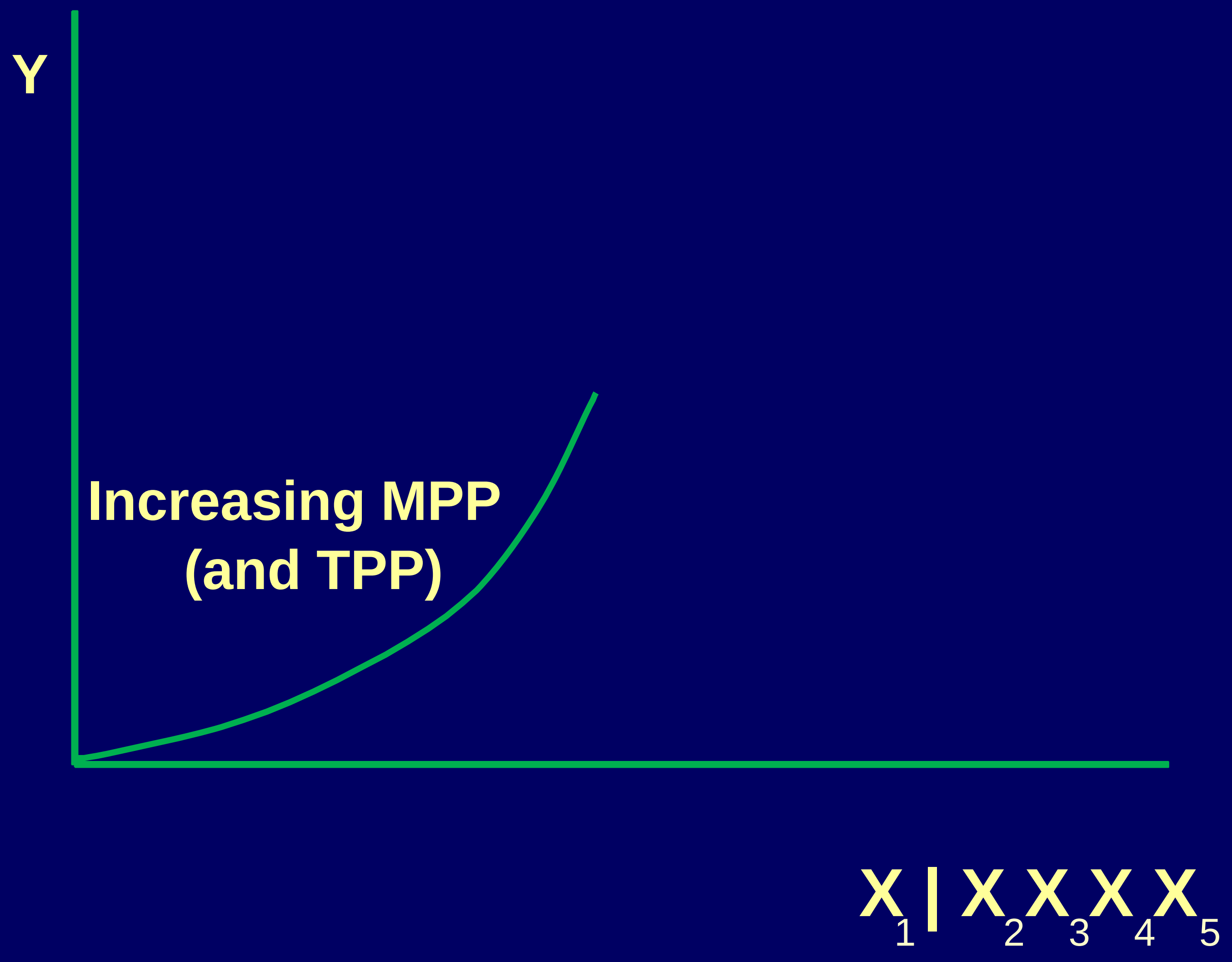
x	△x	y	△y	MPP △y / △x
0		0		
	1		5	5/1
1		5		
	1		2	2/1
2		7		
	1		1	1/1
3		8		
	1		0.5	.5/1
4		8.5		
	1		0.3	.3/1
5		8.8		

A Neoclassical Production Function

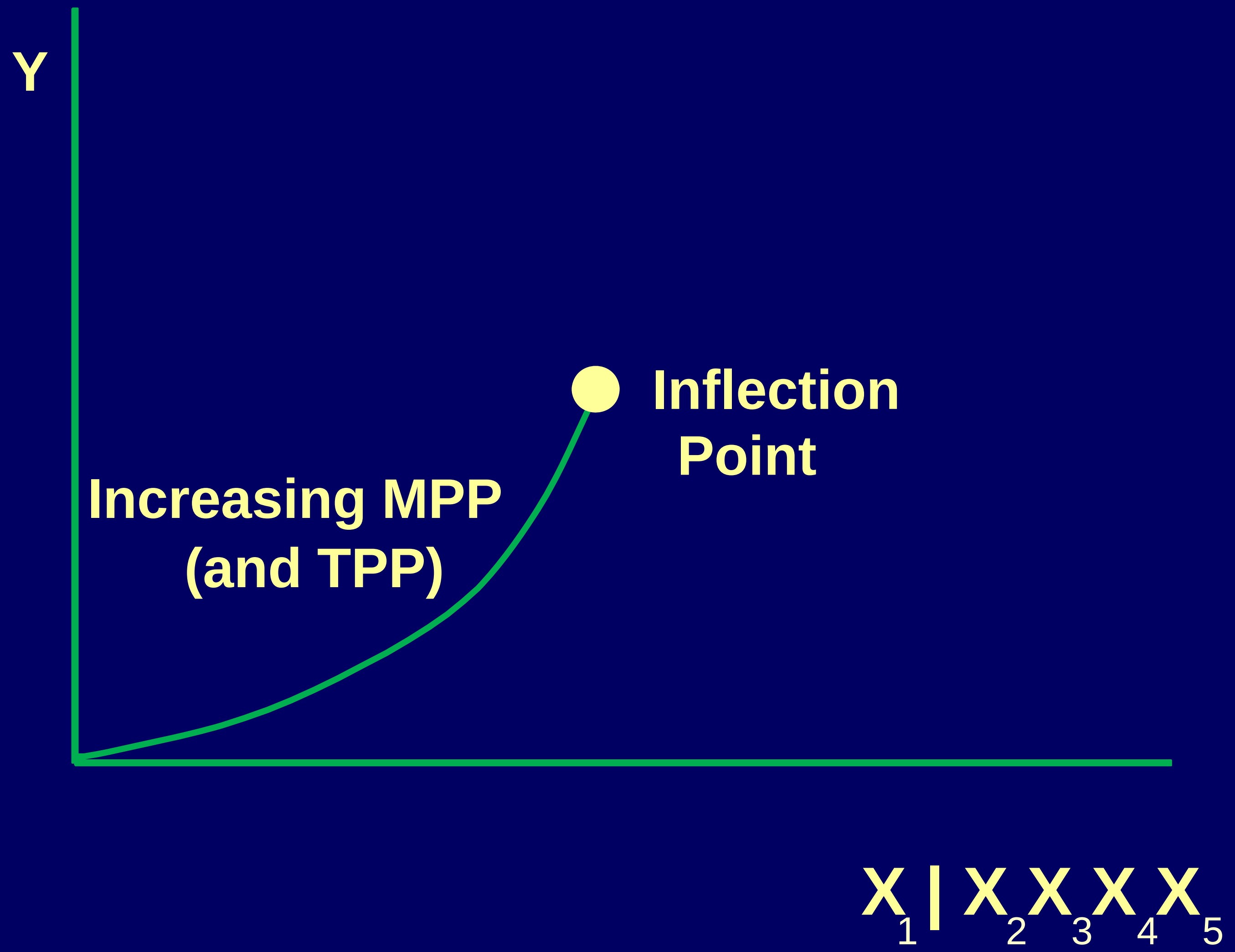
$x_1 \,|\, x_2 \, x_3 \, x_4 \, x_5$

A Neoclassical Production Function

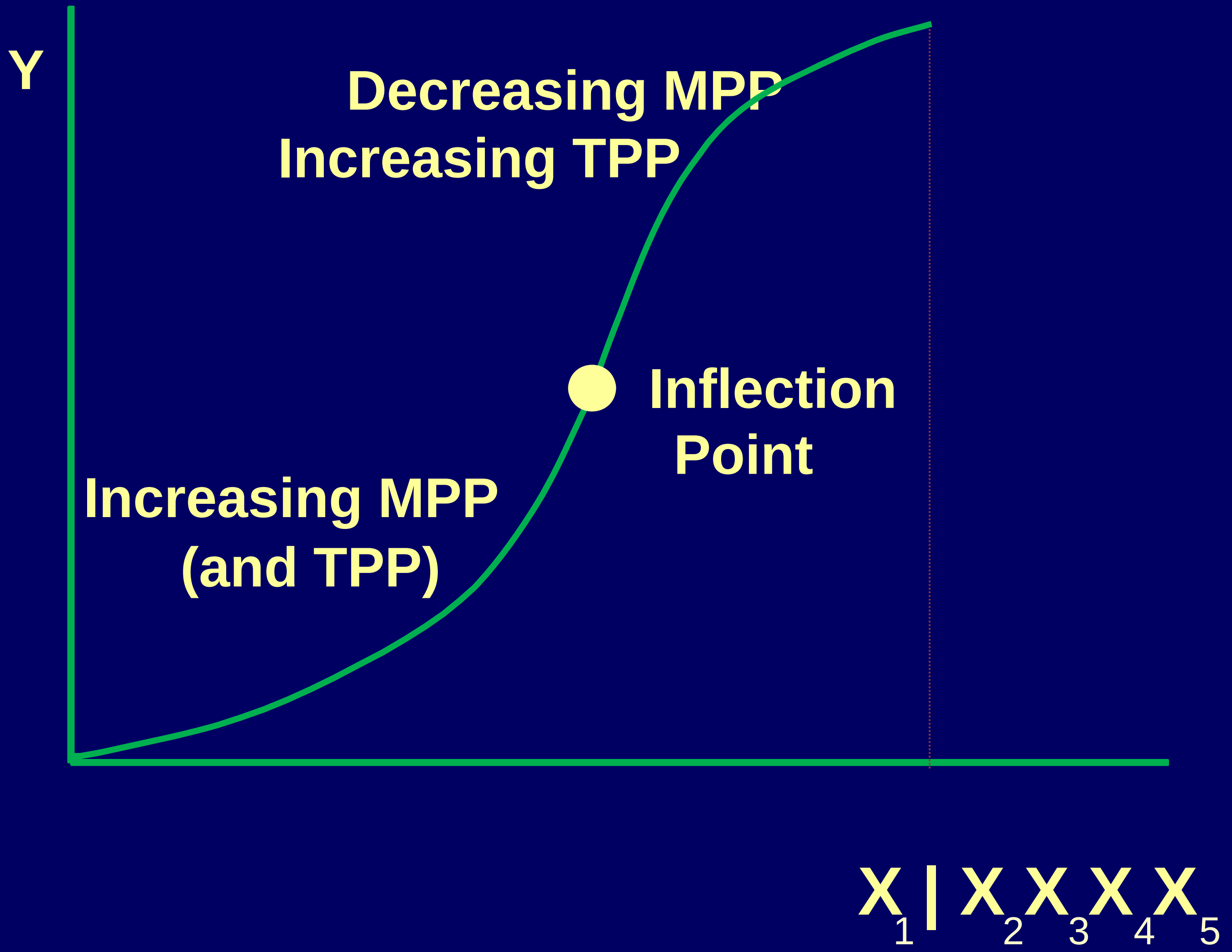
A Neoclassical Production Function



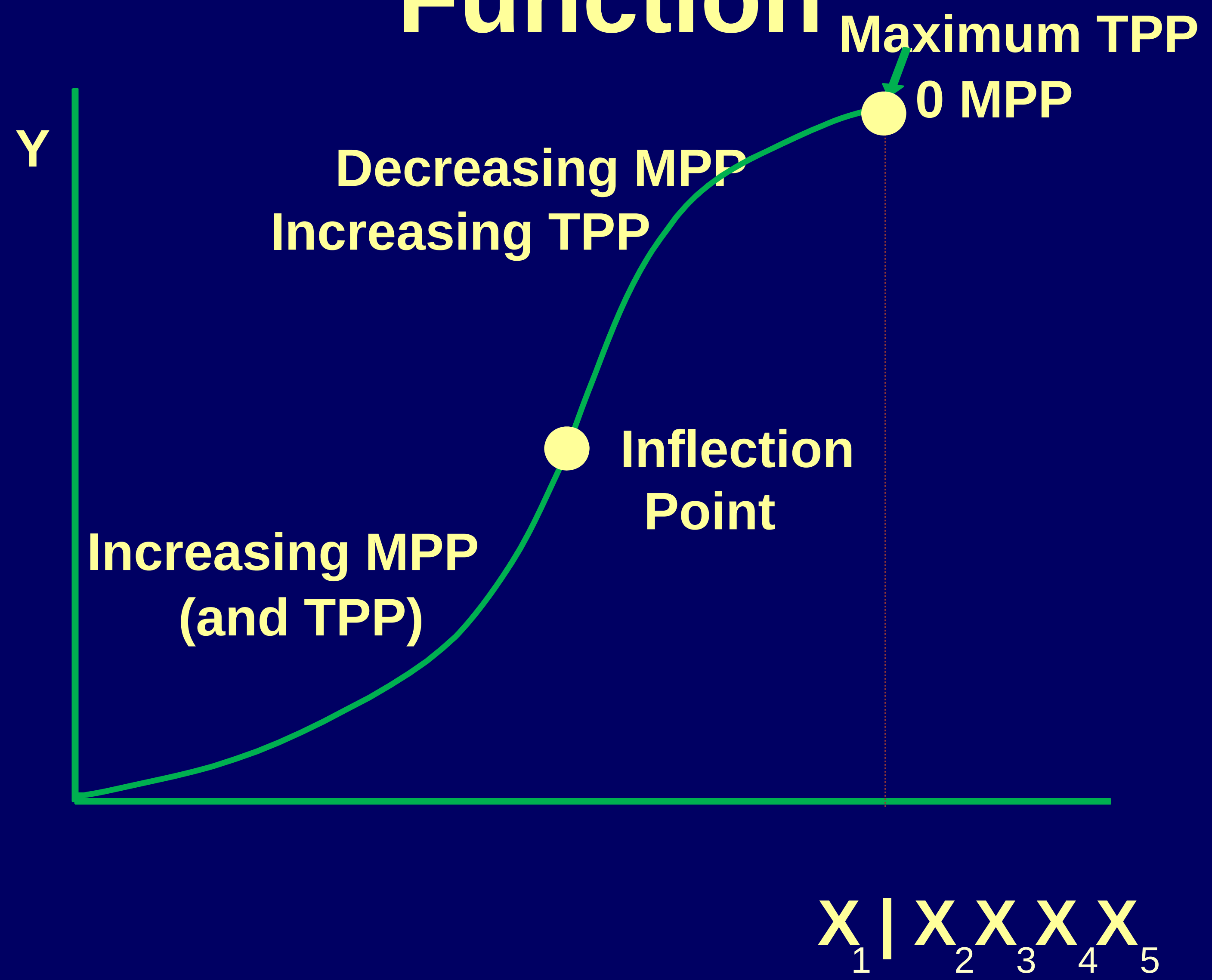
A Neoclassical Production Function



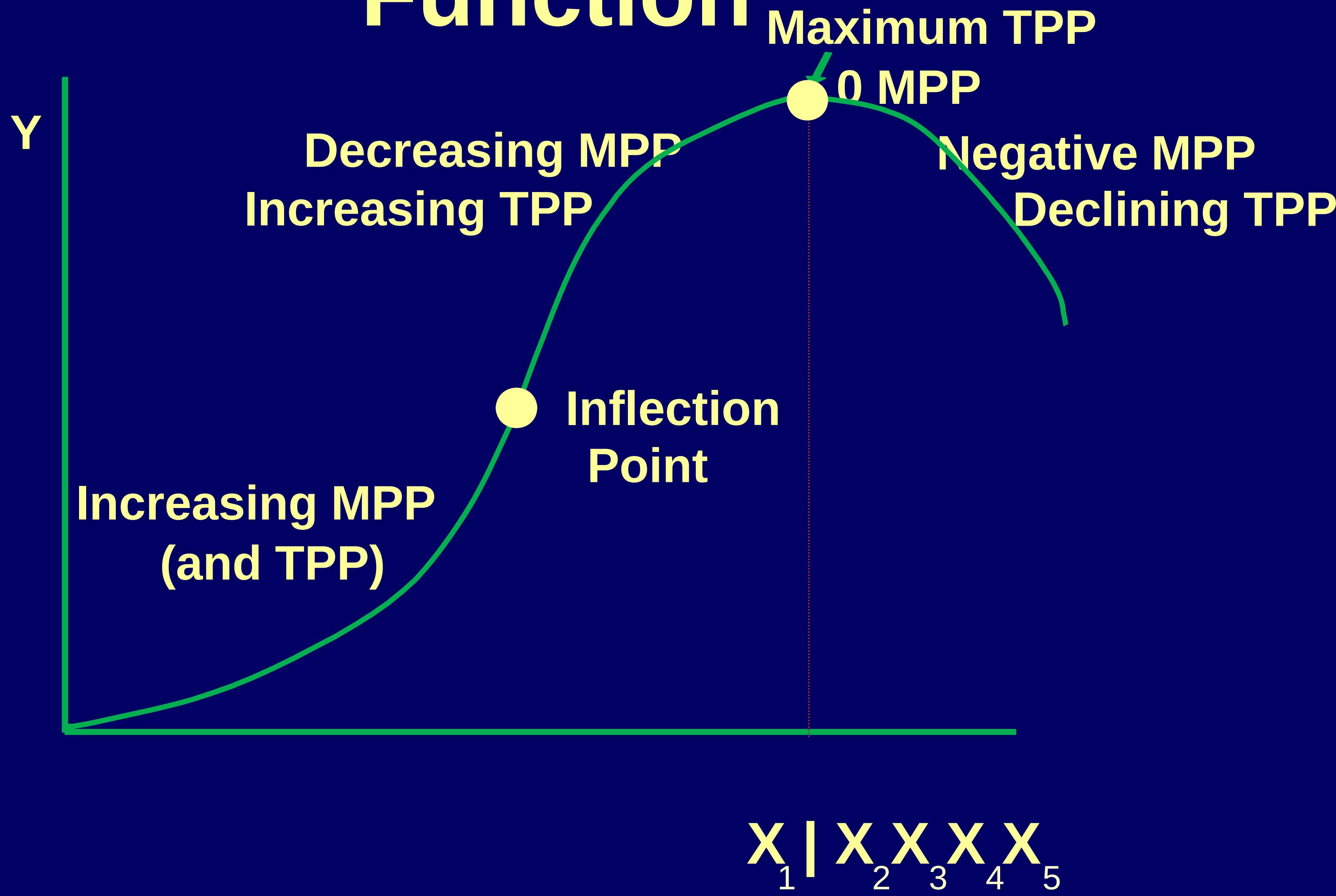
A Neoclassical Production Function



A Neoclassical Production Function

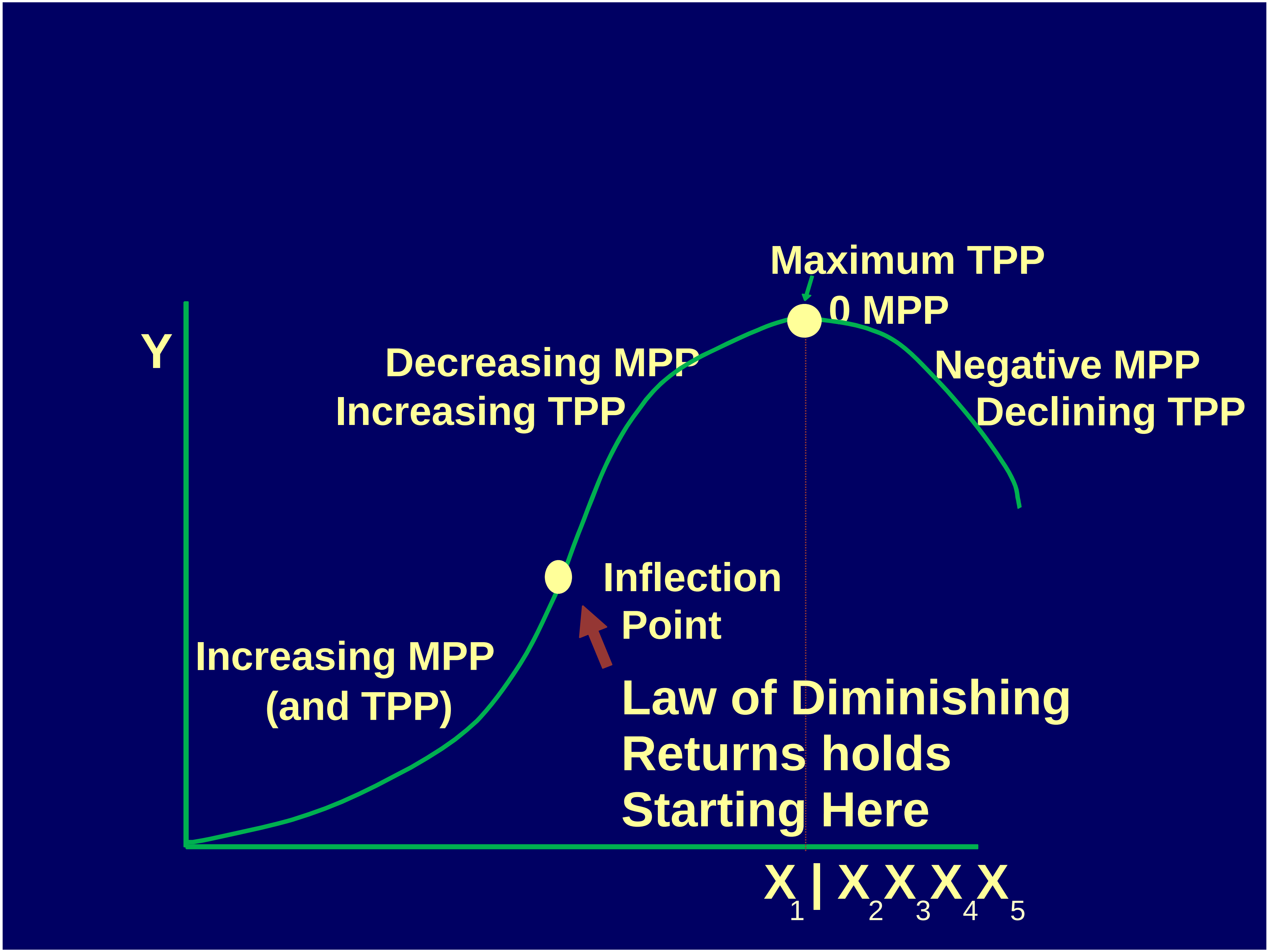


A Neoclassical Production Function

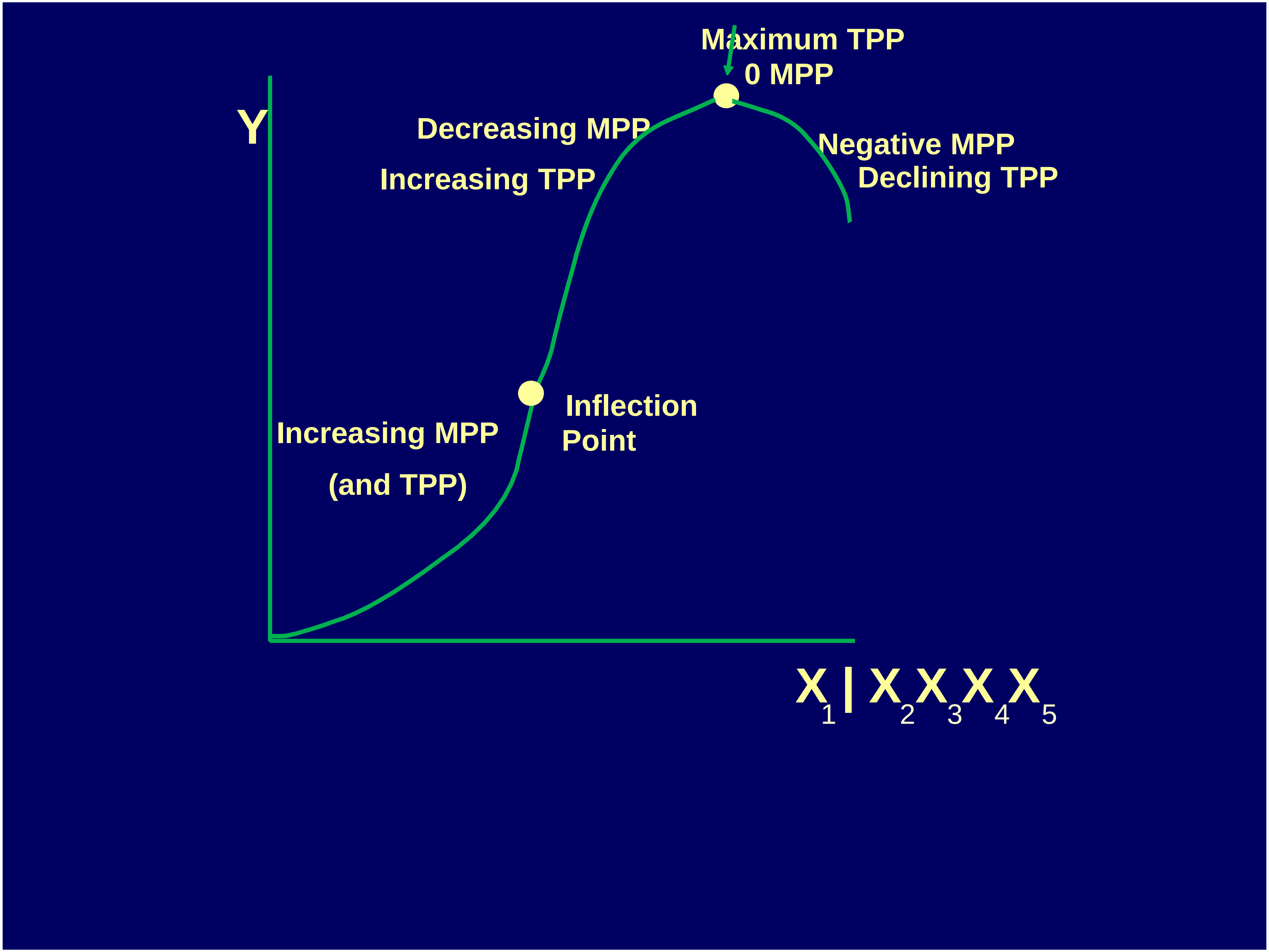


Law of Diminishing (Marginal) Returns

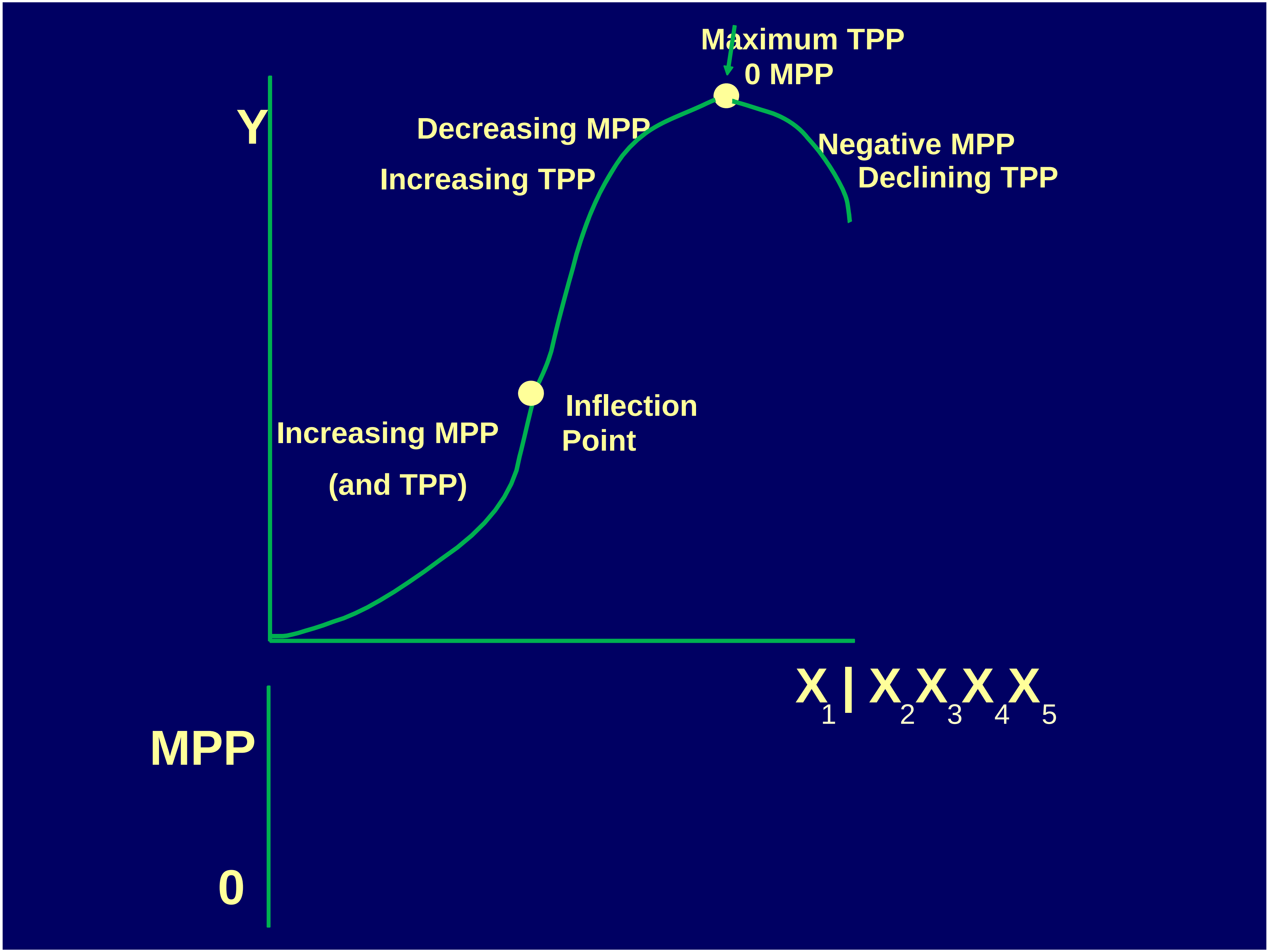
As units of the variable input (X_1)
are added to units
of the fixed inputs (X_2, X_3, X_4, X_5)
we eventually reach a point
where each ADDITIONAL unit
of the variable input (X_1)
produces Less and Less ADDITIONAL output!



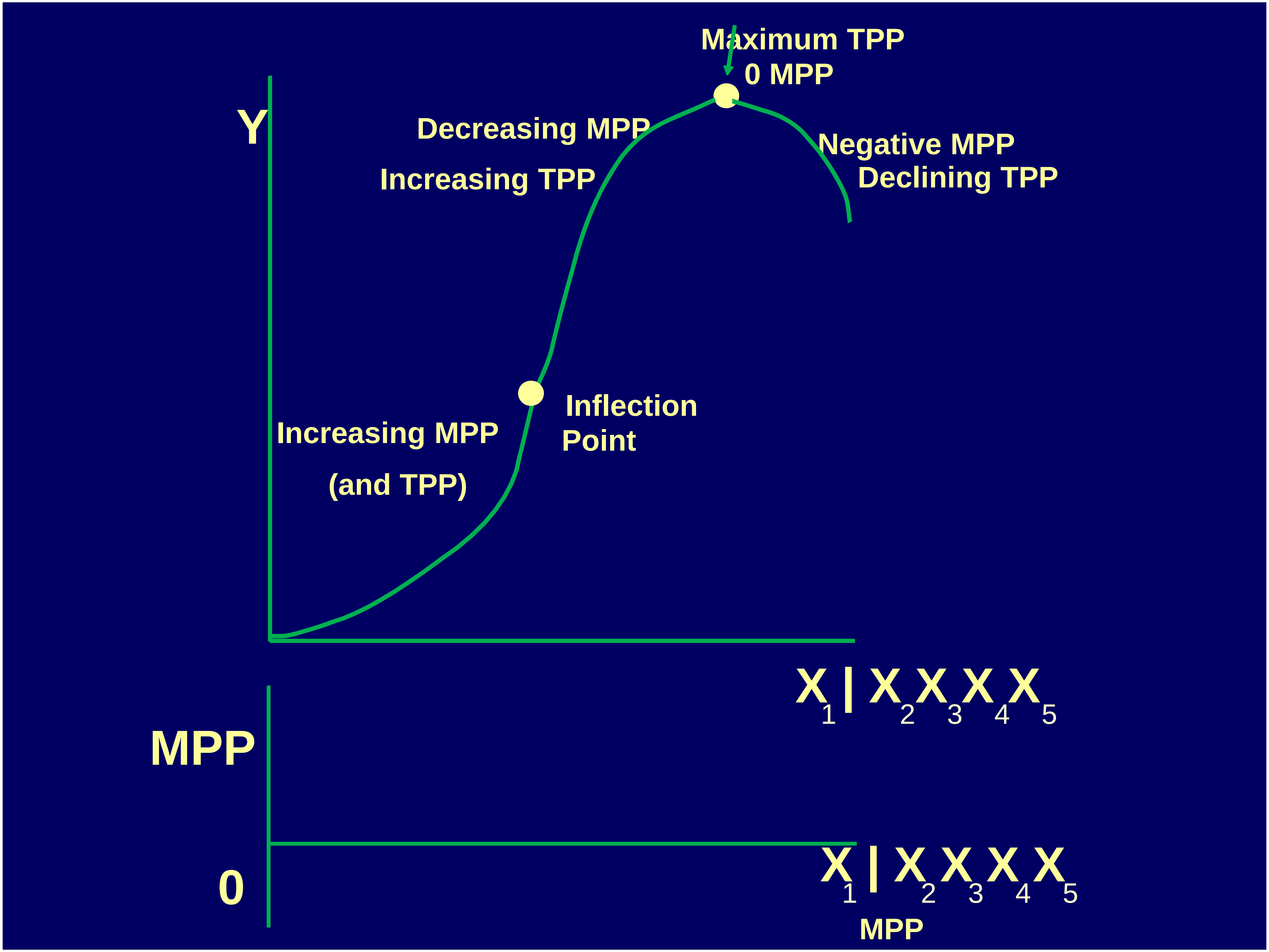
Maximum TPP
0 MPP
Y
Decreasing MPP
Increasing TPP
Negative MPP
Declining TPP
Inflection
Point
Increasing MPP
(and TPP)
Law of Diminishing
Returns holds
Starting Here
X1 | X2 X3 X4 X5

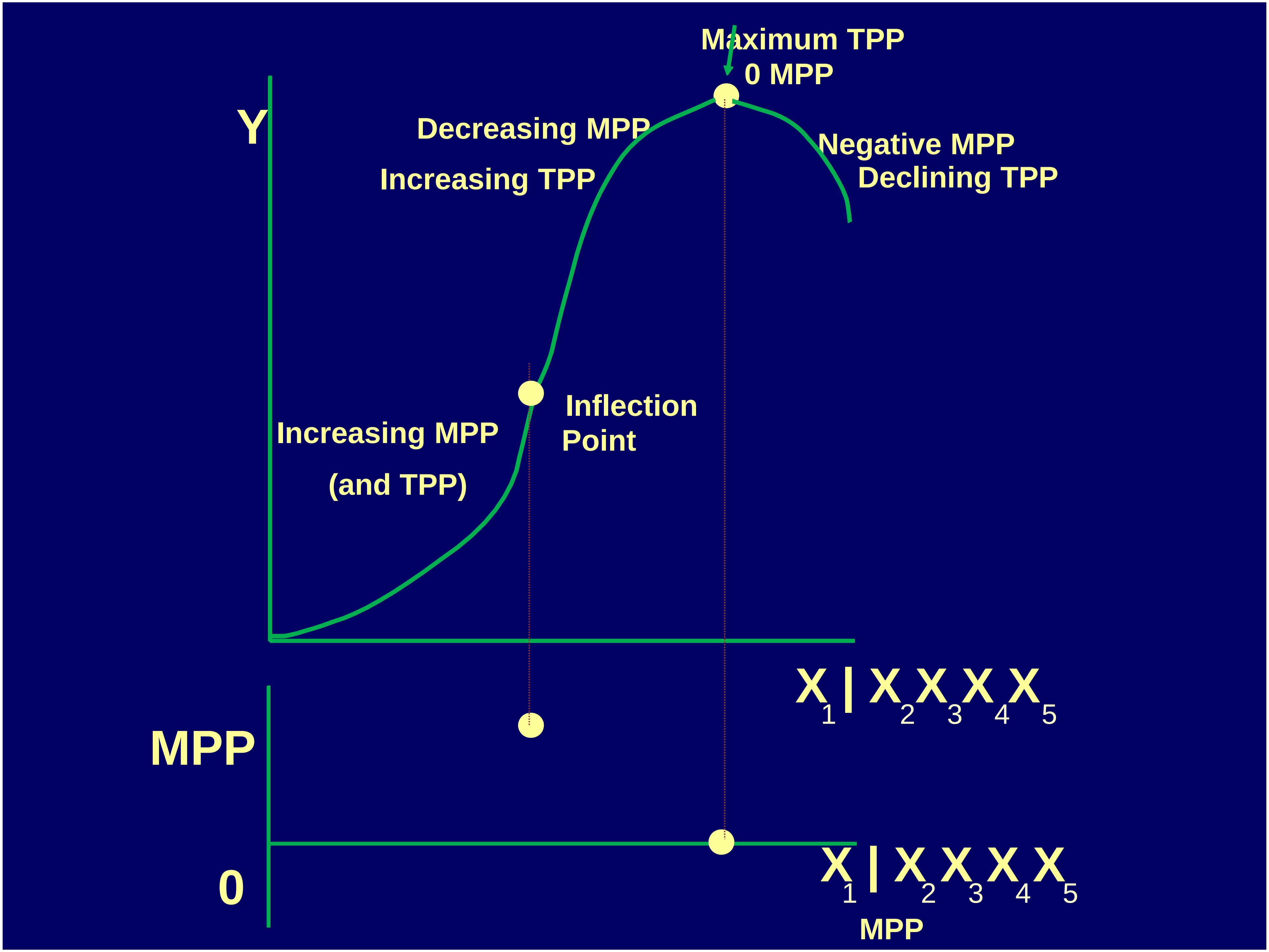


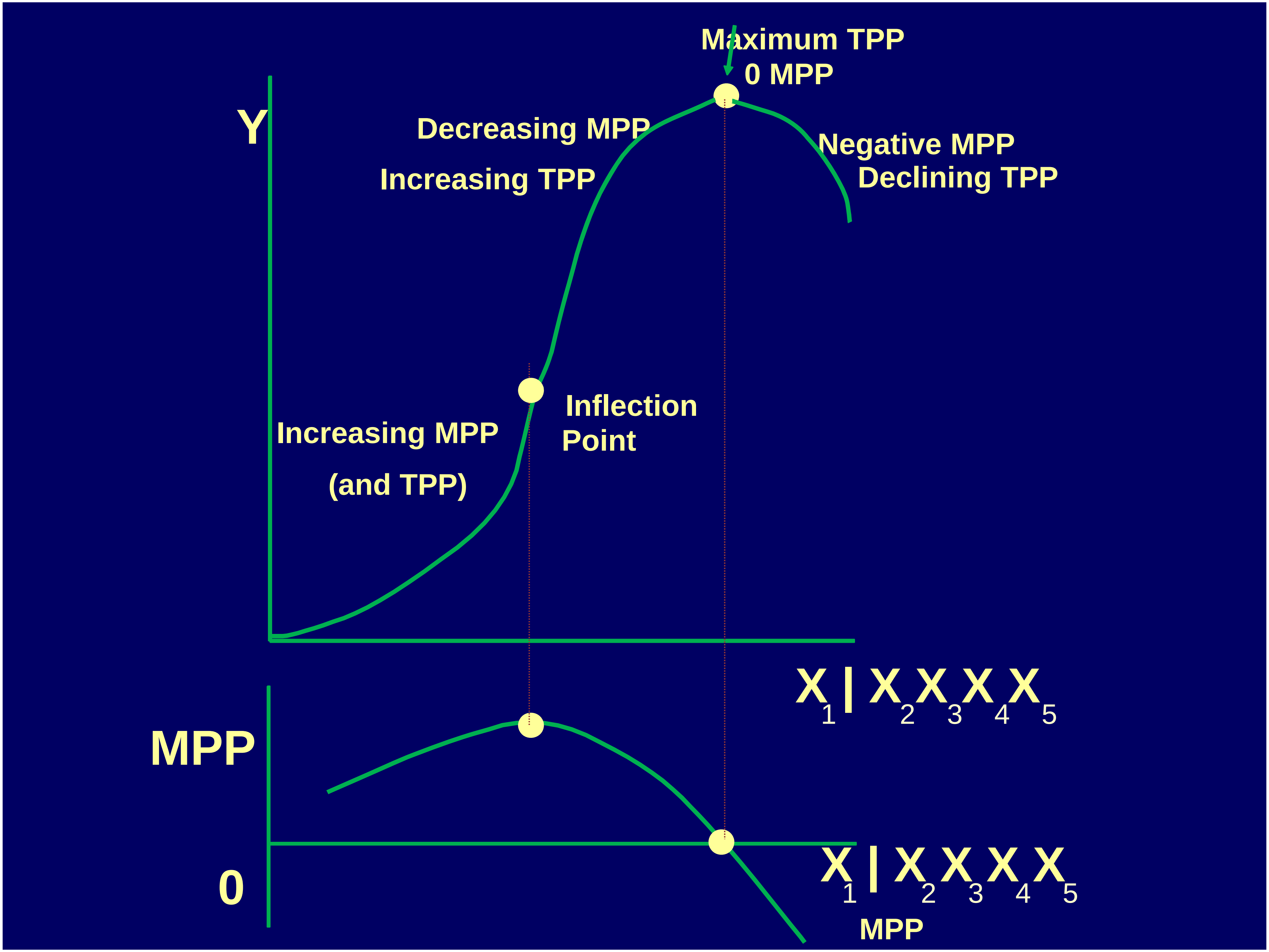
Maximum TPP
0 MPP
Y
Decreasing MPP
Increasing TPP
Negative MPP
Declining TPP
Inflection
Point
Increasing MPP
(and TPP)
X1 | X2 X3 X4 X5



Maximum TPP
0 MPP
Y
Decreasing MPP
Increasing TPP
Negative MPP
Declining TPP
Inflection
Point
Increasing MPP
(and TPP)
X1 | X2 X3 X4 X5
MPP
0


Maximum TPP
0 MPP
Y
Decreasing MPP
Increasing TPP
Negative MPP
Declining TPP
Inflection
Point
Increasing MPP
(and TPP)
X1 | X2 X3 X4 X5
MPP
0
X1 | X2 X3 X4 X5
MPP


Maximum TPP
0 MPP
Y
Decreasing MPP
Increasing TPP
Negative MPP
Declining TPP
Inflection
Point
Increasing MPP
(and TPP)
X1 | X2 X3 X4 X5
MPP
0
X1 | X2 X3 X4 X5
MPP



Maximum TPP
0 MPP
Y
Decreasing MPP
Increasing TPP
Negative MPP
Declining TPP
Inflection
Point
Increasing MPP
(and TPP)
X1 | X2 X3 X4 X5
MPP
0
X1 | X2 X3 X4 X5
MPP

Average
Physical
Product

The ratio of output to variable input

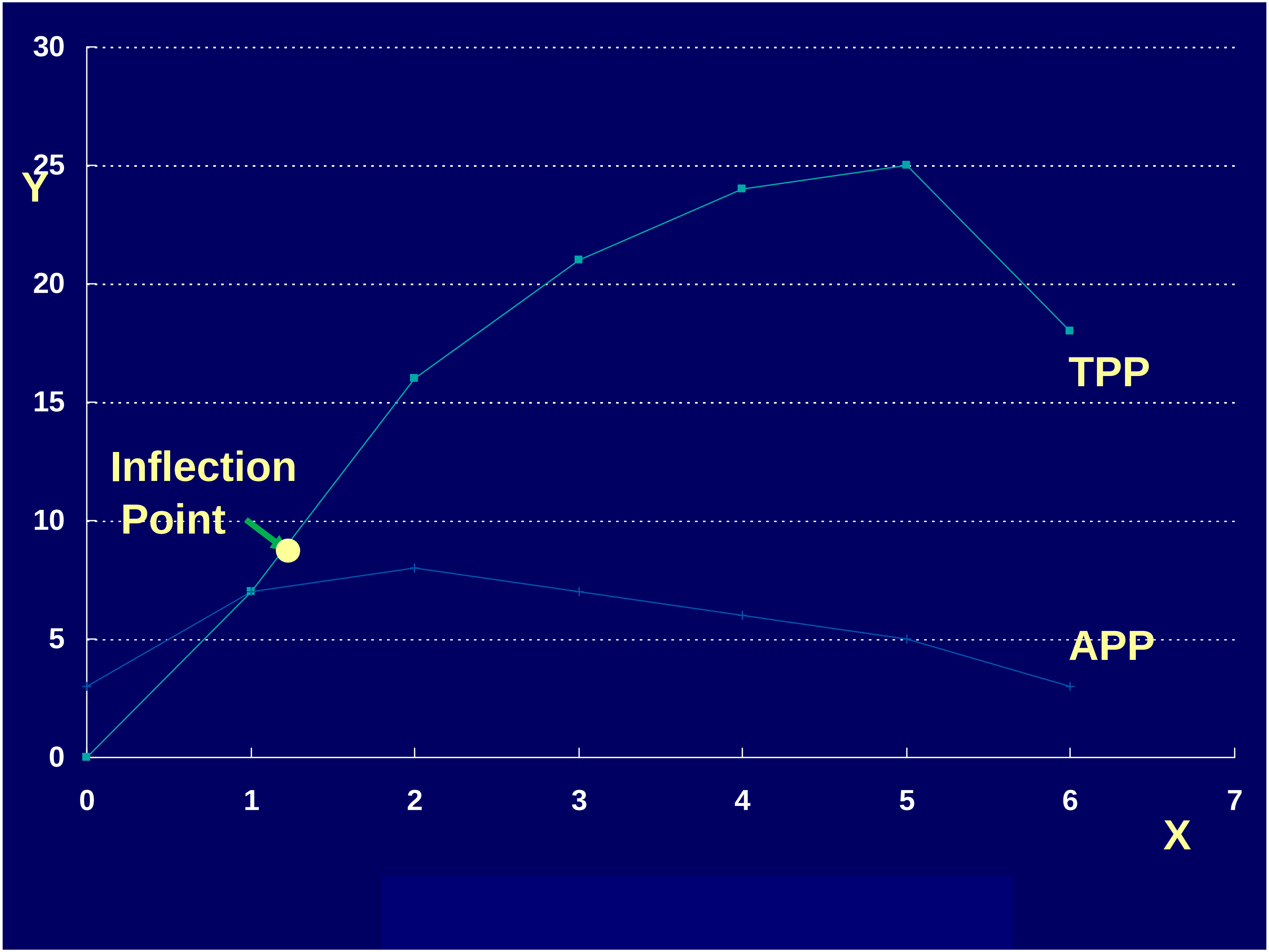
Y/X

$Y/X_1 \mid X_2\ X_3\ X_4\ X_5$

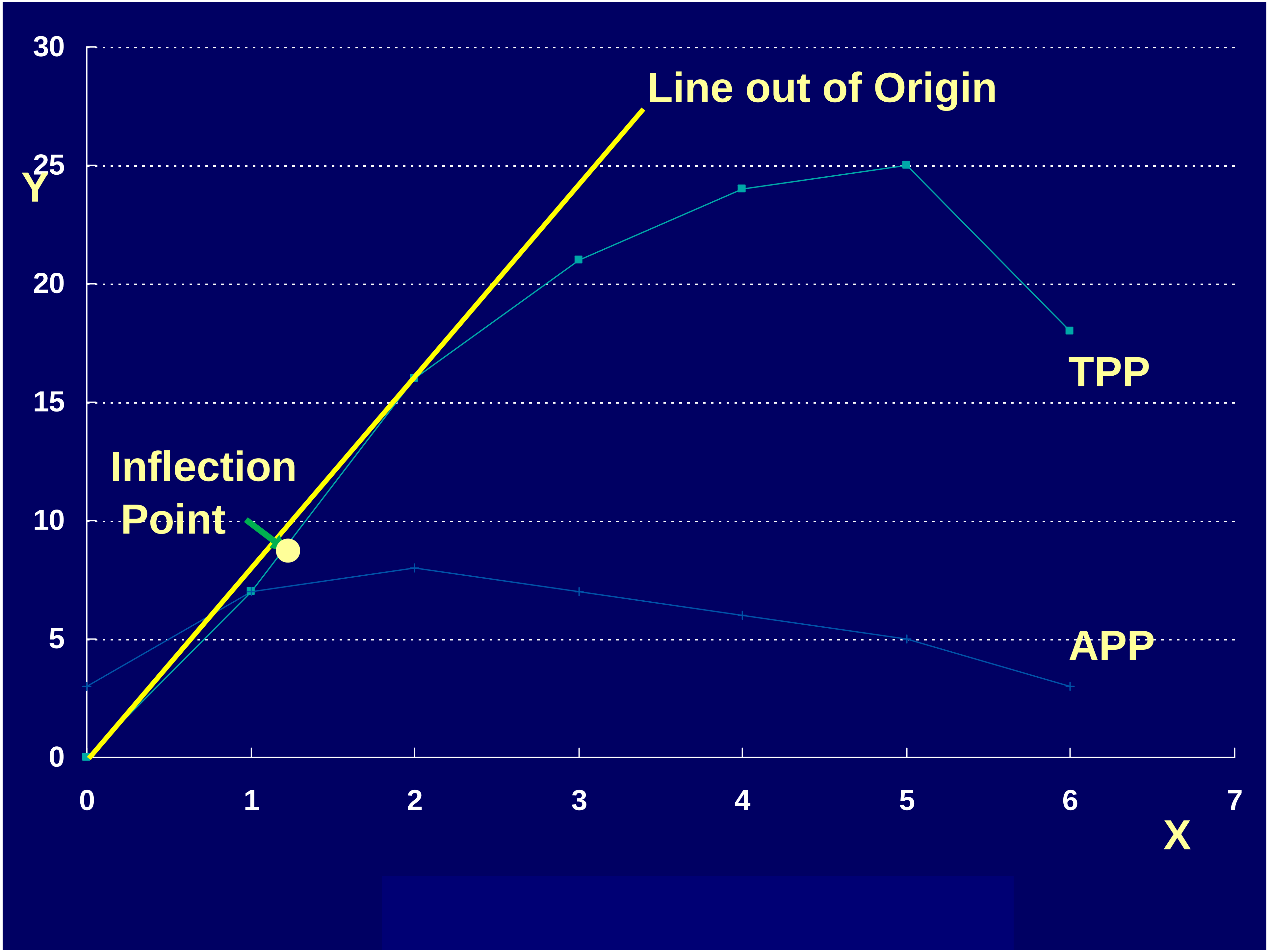
Average product
of ALL units of X used
(not the incremental unit)

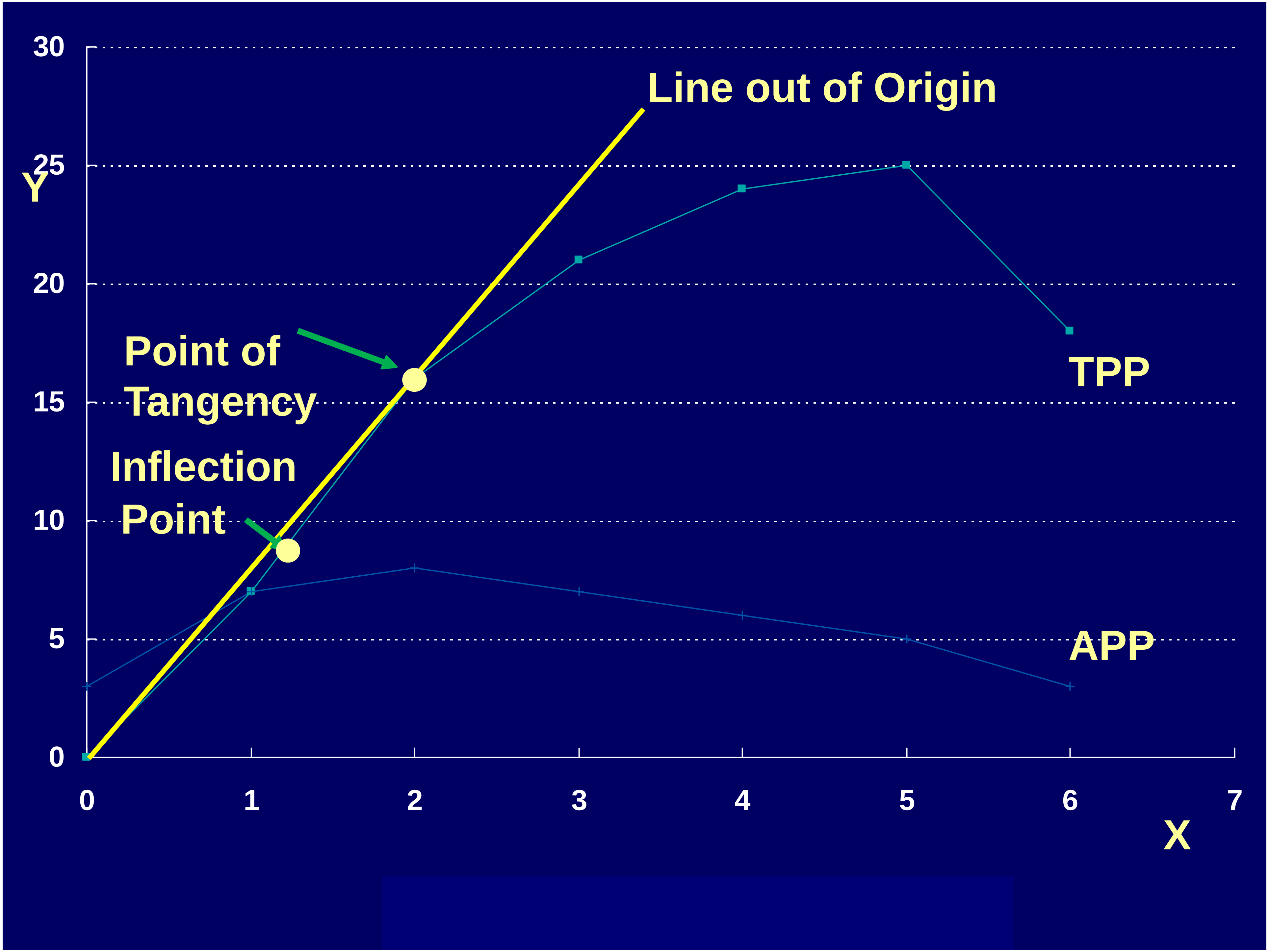
TPP and APP

Input	Output (TPP)	APP
X	Y	Y/X
0	0	undefined
1	7	7
2	16	8
3	21	7
4	24	6
5	25	5
6	18	3

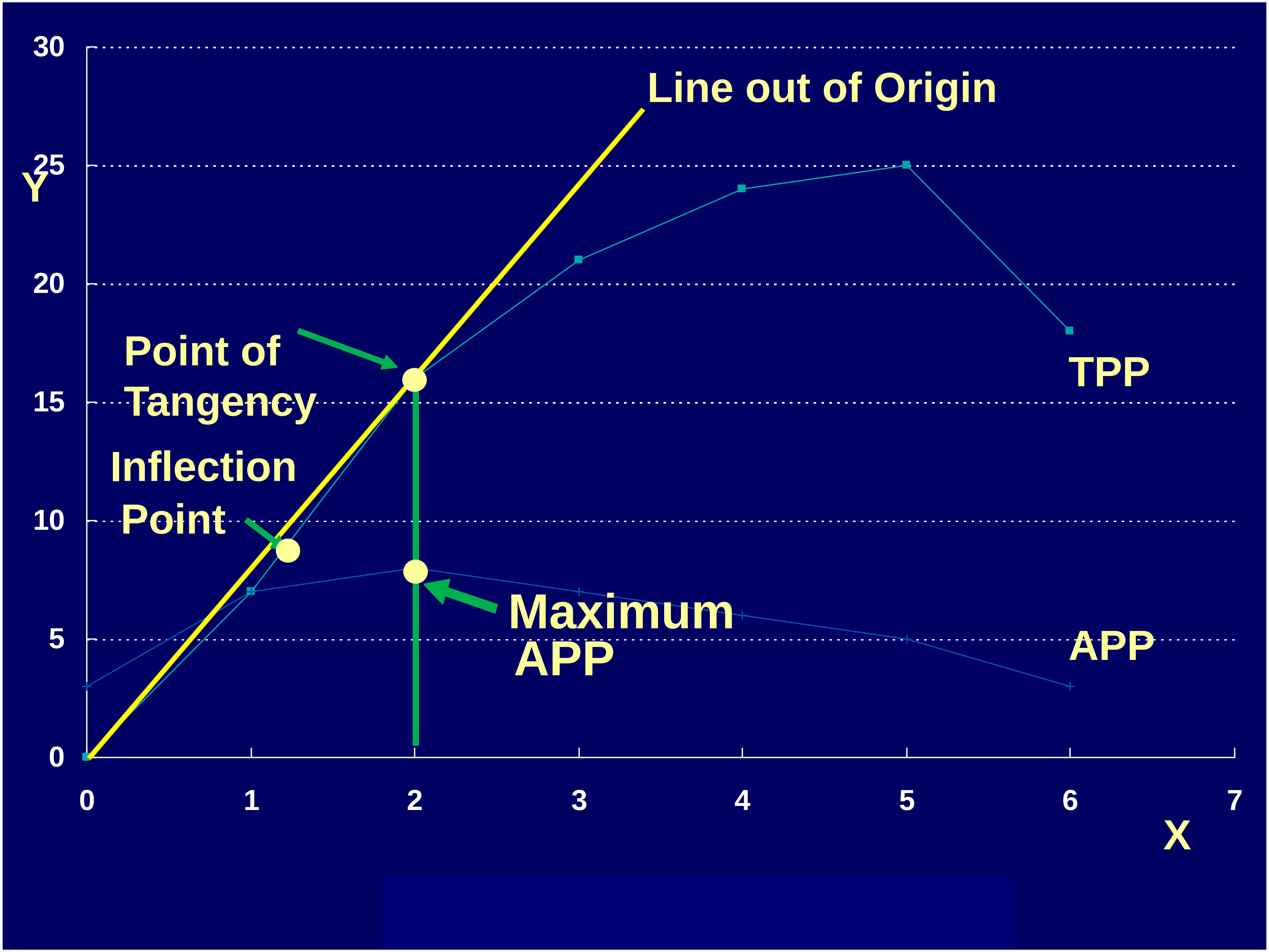


30
25
Y
20
15
Inflection
Point
10
5
0
0
1
2
3
4
5
6
7
X
TPP
APP

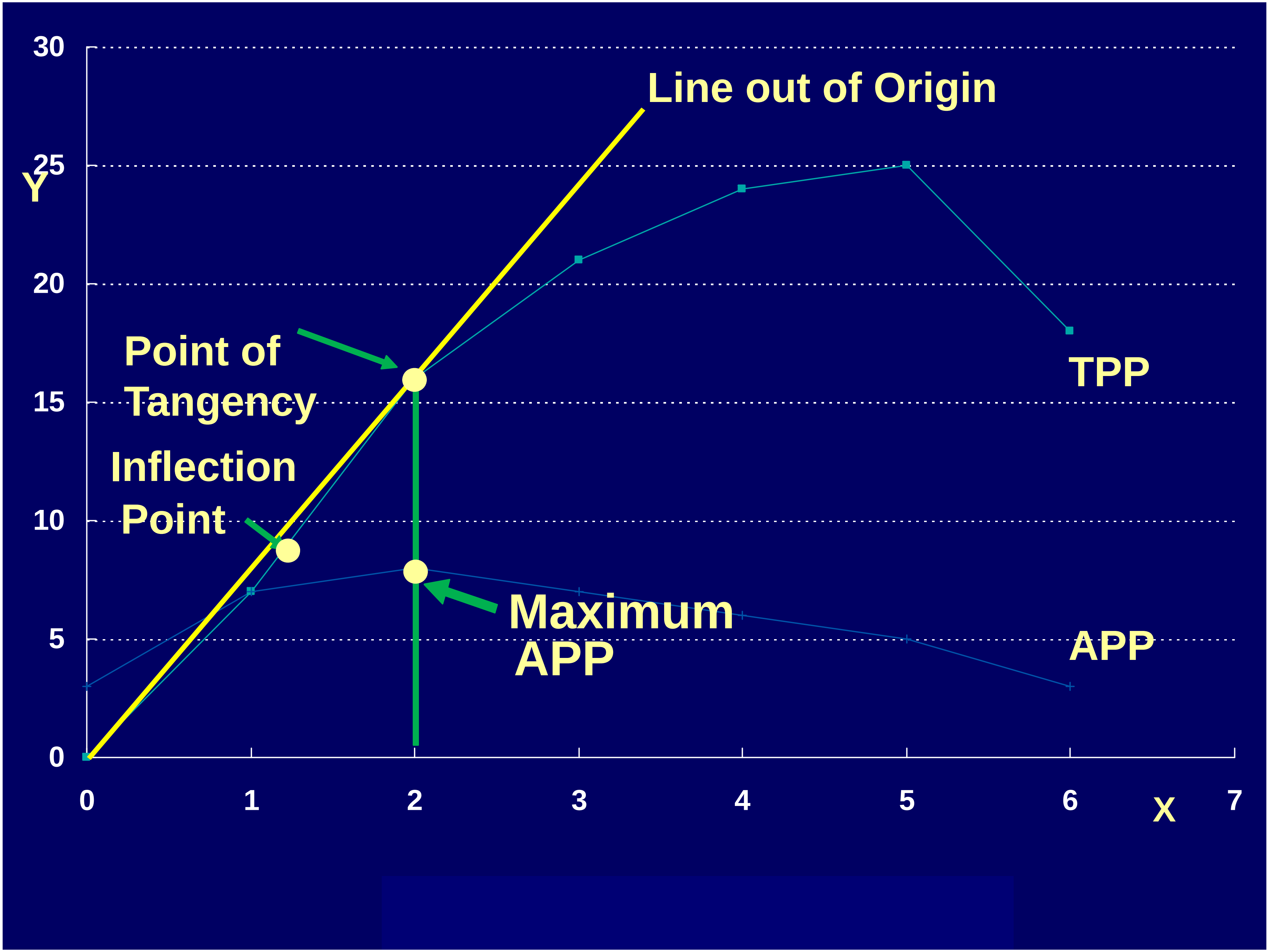

30
25
20
15
10
5
0
Y
Line out of Origin
TPP
Inflection
Point
APP
0
1
2
3
4
5
6
7
X



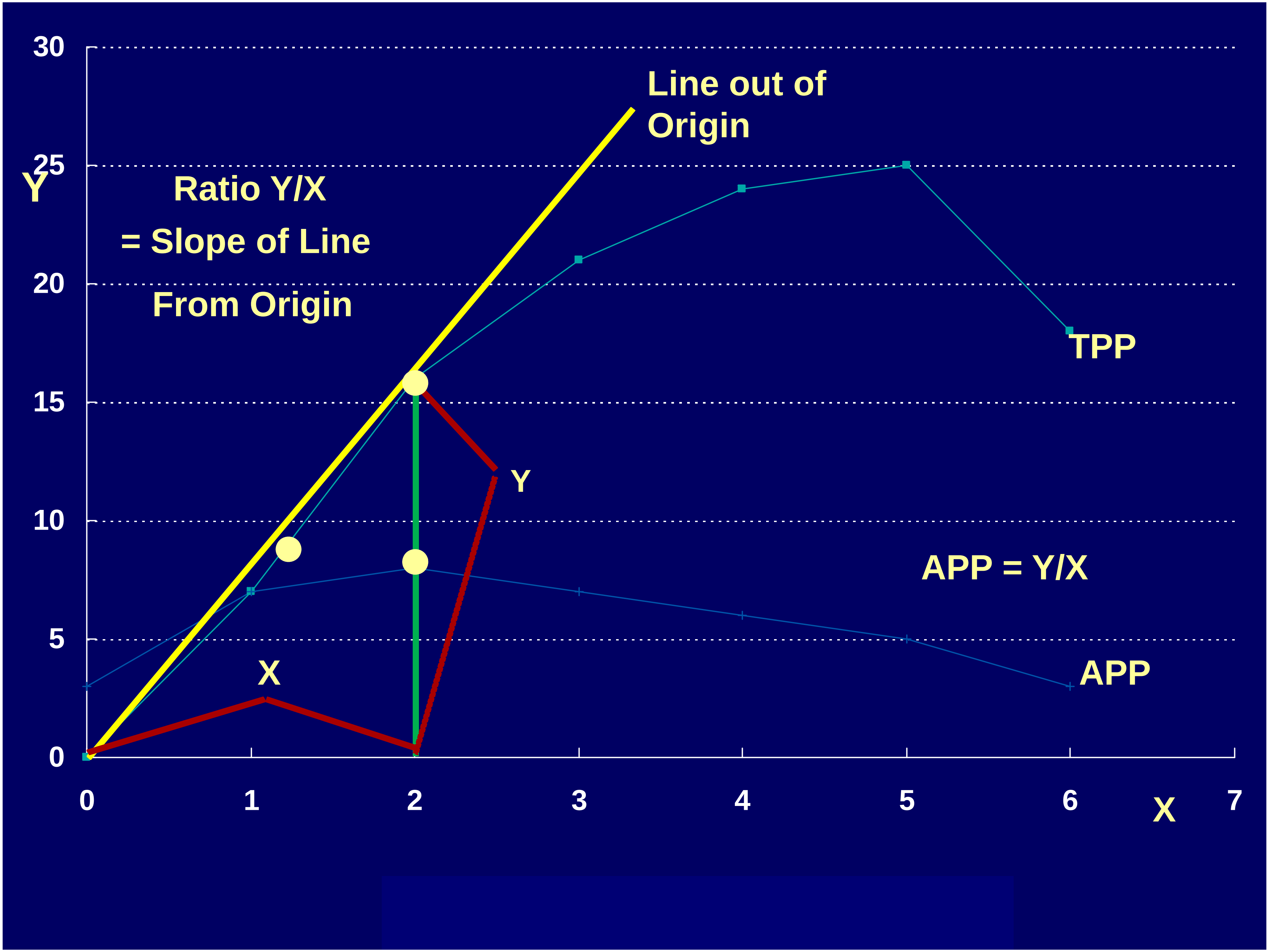
Line out of Origin
Y
30
25
20
15
10
5
0
Point of
Tangency
Inflection
Point
TPP
APP
0
1
2
3
4
5
6
7
X



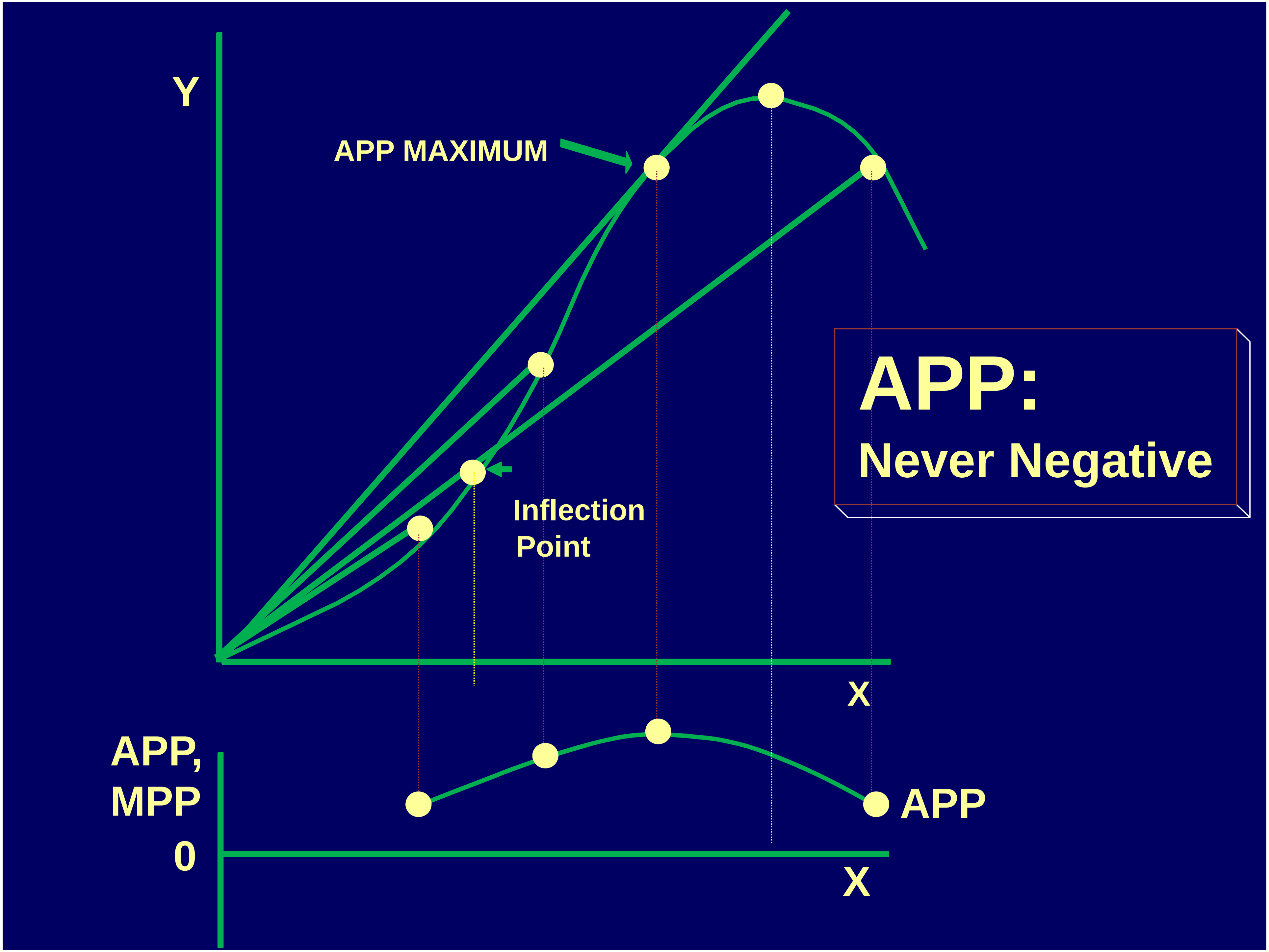
Line out of Origin
Y
X
Point of Tangency
Inflection Point
Maximum APP
TPP
APP
30
25
20
15
10
5
0
0
1
2
3
4
5
6
7



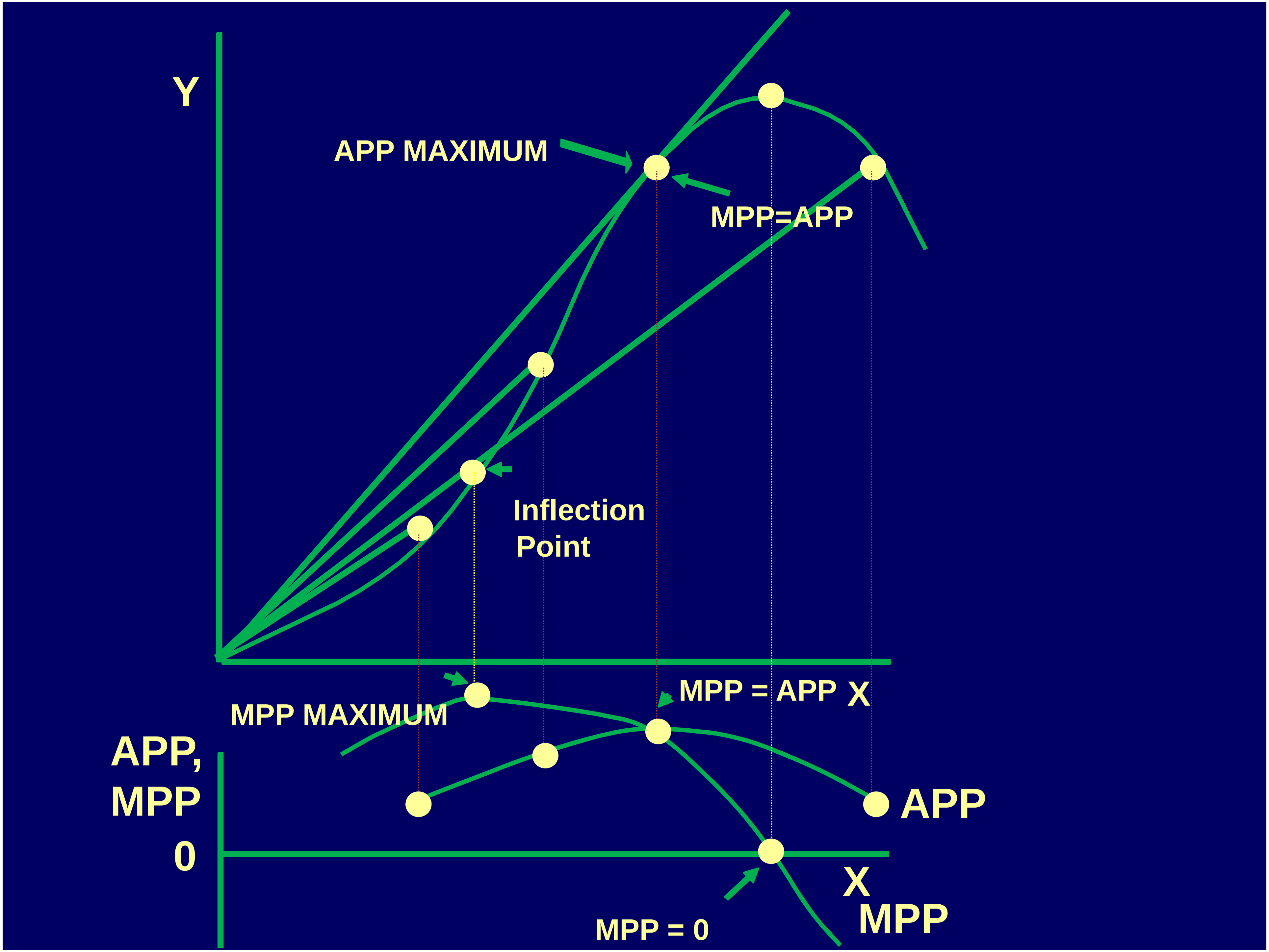
Line out of Origin
Point of Tangency
Inflection Point
Maximum APP
TPP
APP
Y
X
30
25
20
15
10
5
0
0
1
2
3
4
5
6
7



Line out of Origin
Ratio Y/X
= Slope of Line
From Origin
TPP
Y
APP = Y/X
X
APP
Y
X
30
25
20
15
10
5
0
0
1
2
3
4
5
6
7



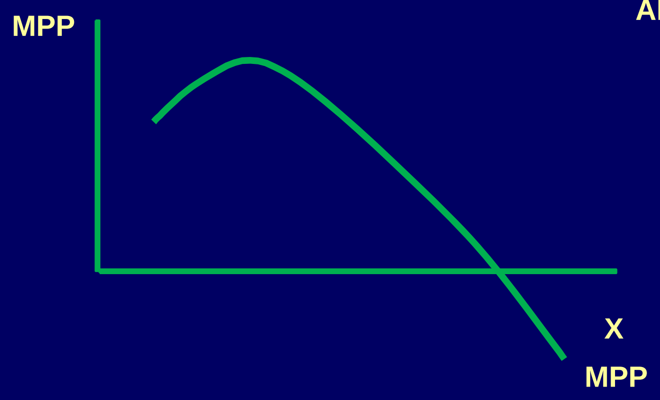
Y
APP MAXIMUM
Inflection
Point
X
APP,
MPP
0
APP
X
APP:
Never Negative

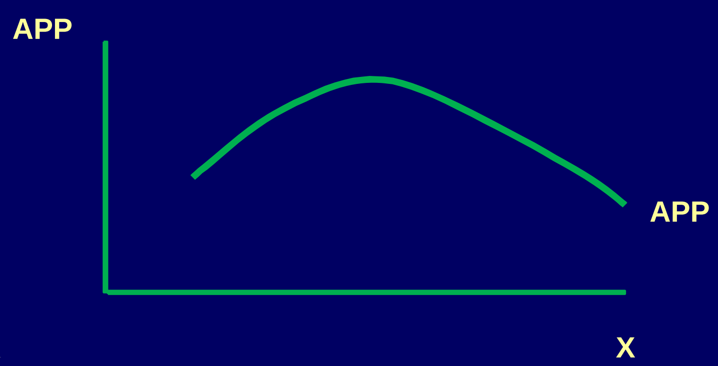


Y
APP MAXIMUM
MPP=APP
Inflection
Point
MPP = APP
X
MPP MAXIMUM
APP,
MPP
0
APP
X
MPP
MPP = 0

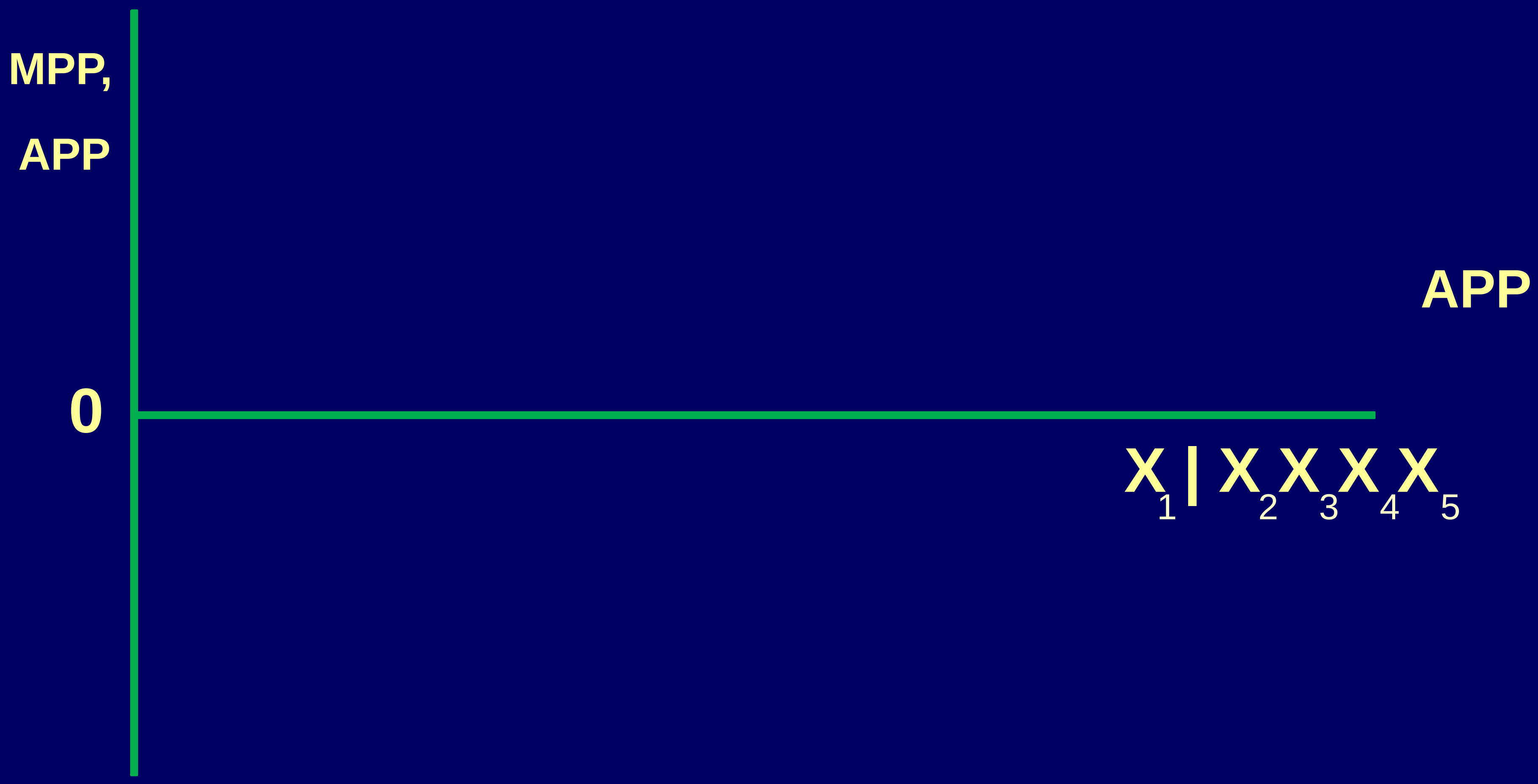
Marginal Physical Product
Average Physical Product

MPP

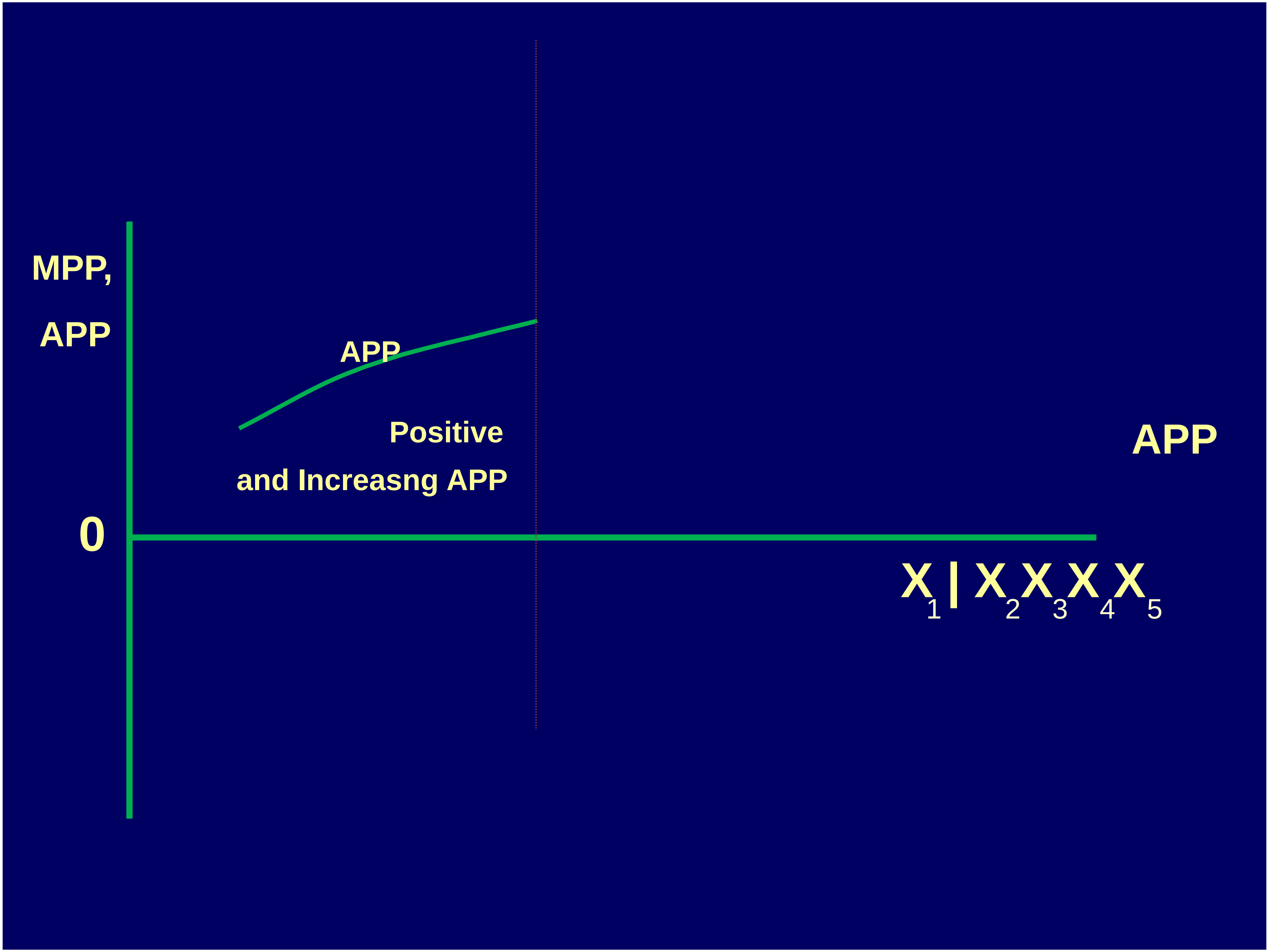


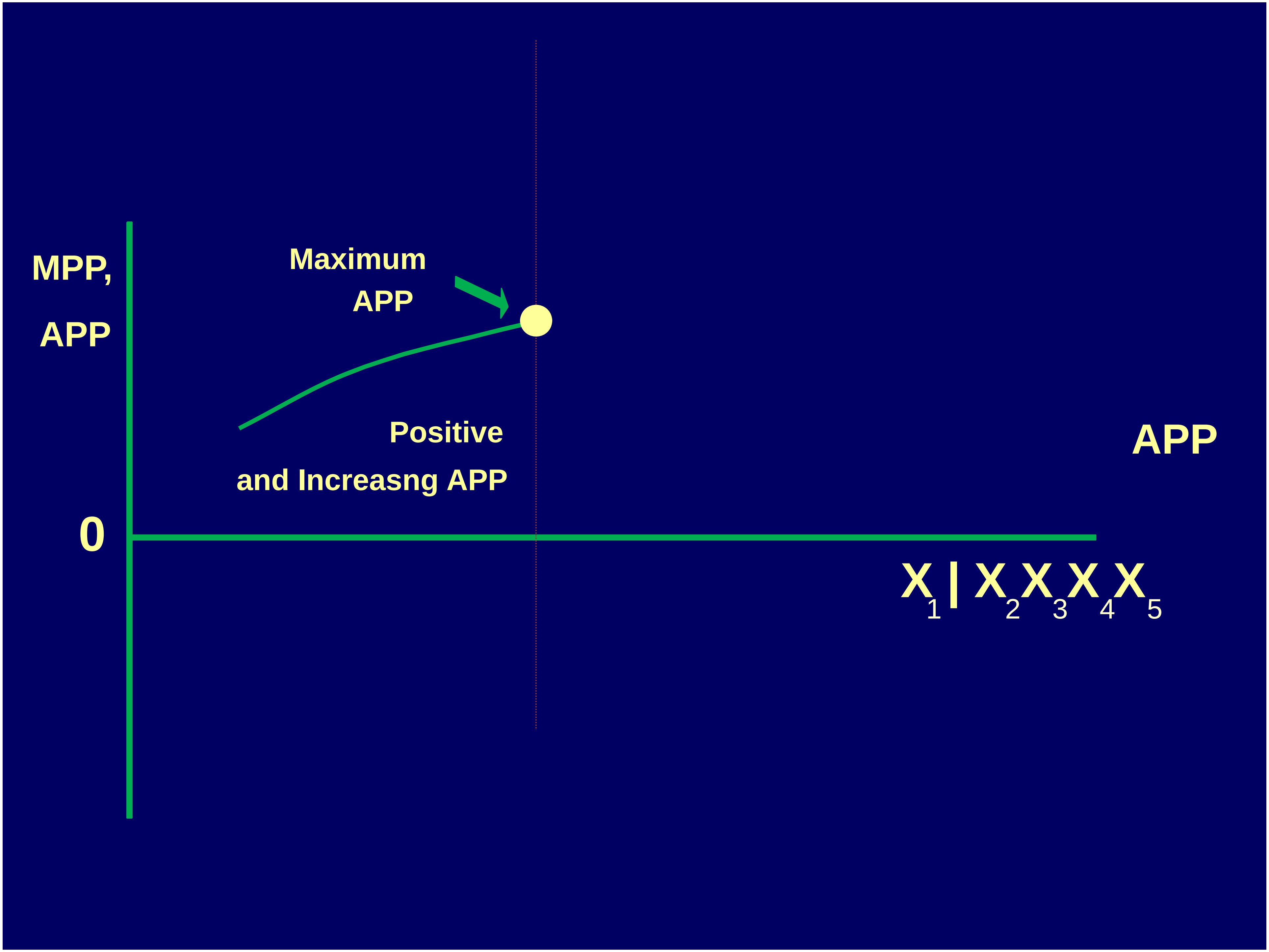


Do They have a Relationship???

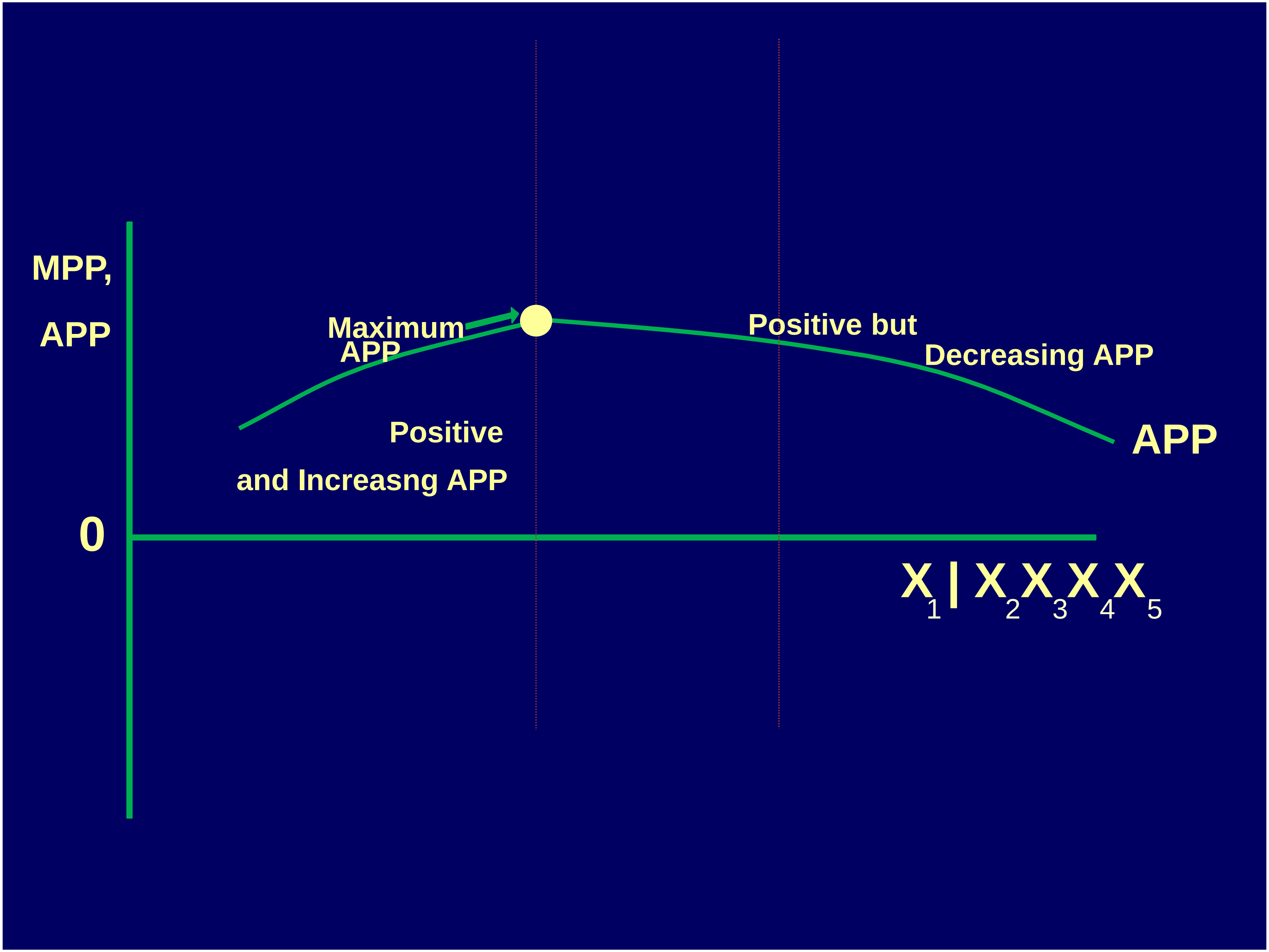


MPP,
APP
APP
0
X1 X2 X3 X4 X5

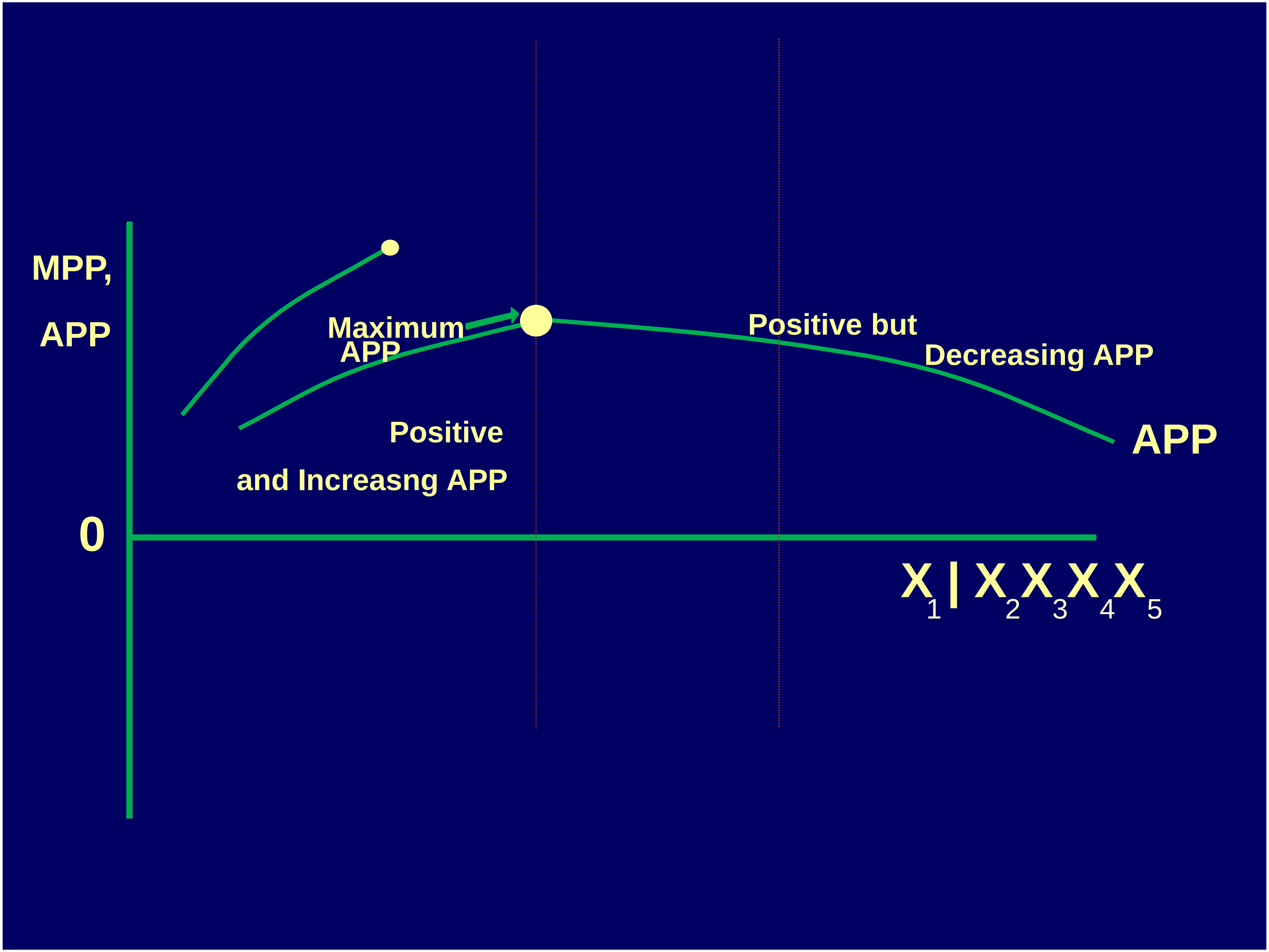

MPP,
APP
APP
Positive
and Increasng APP
0
APP
X1 | X2 X3 X4 X5



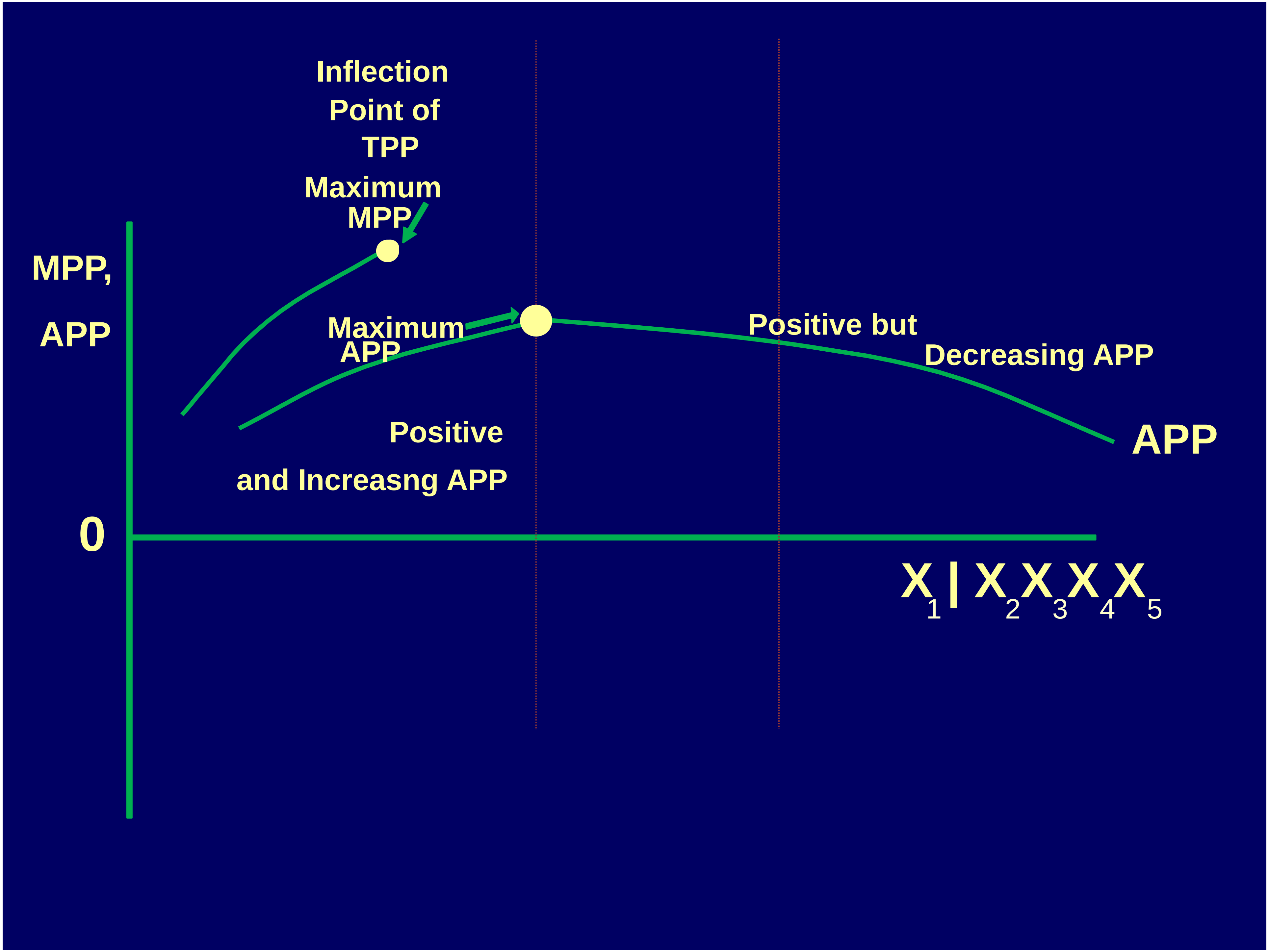
MPP,
APP
Maximum
APP
Positive
and Increasng APP
APP
0
X1 | X2 X3 X4 X5



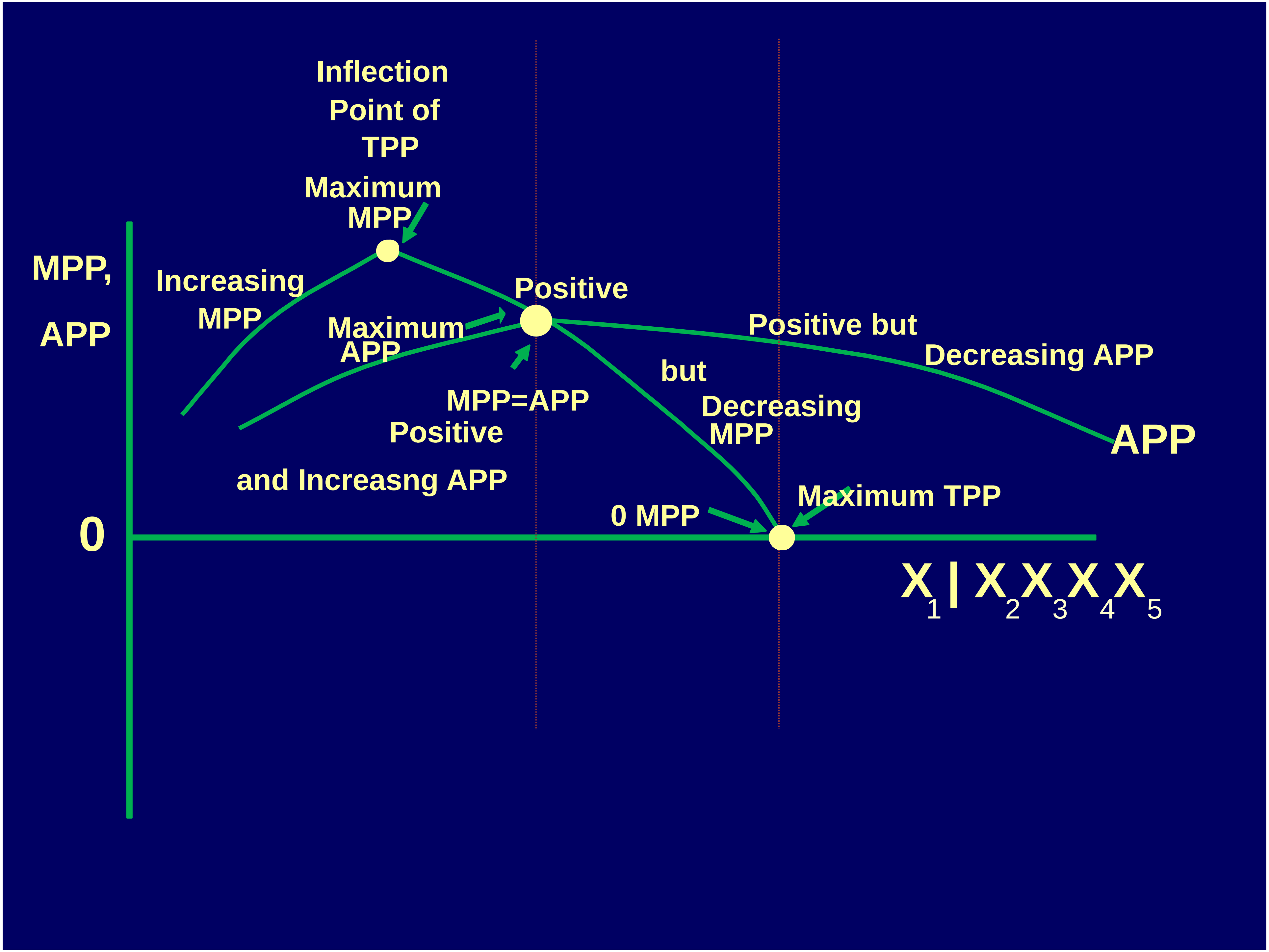
MPP,
APP
Maximum
APP
Positive but
Decreasing APP
APP
Positive
and Increasng APP
0
X1 | X2 X3 X4 X5

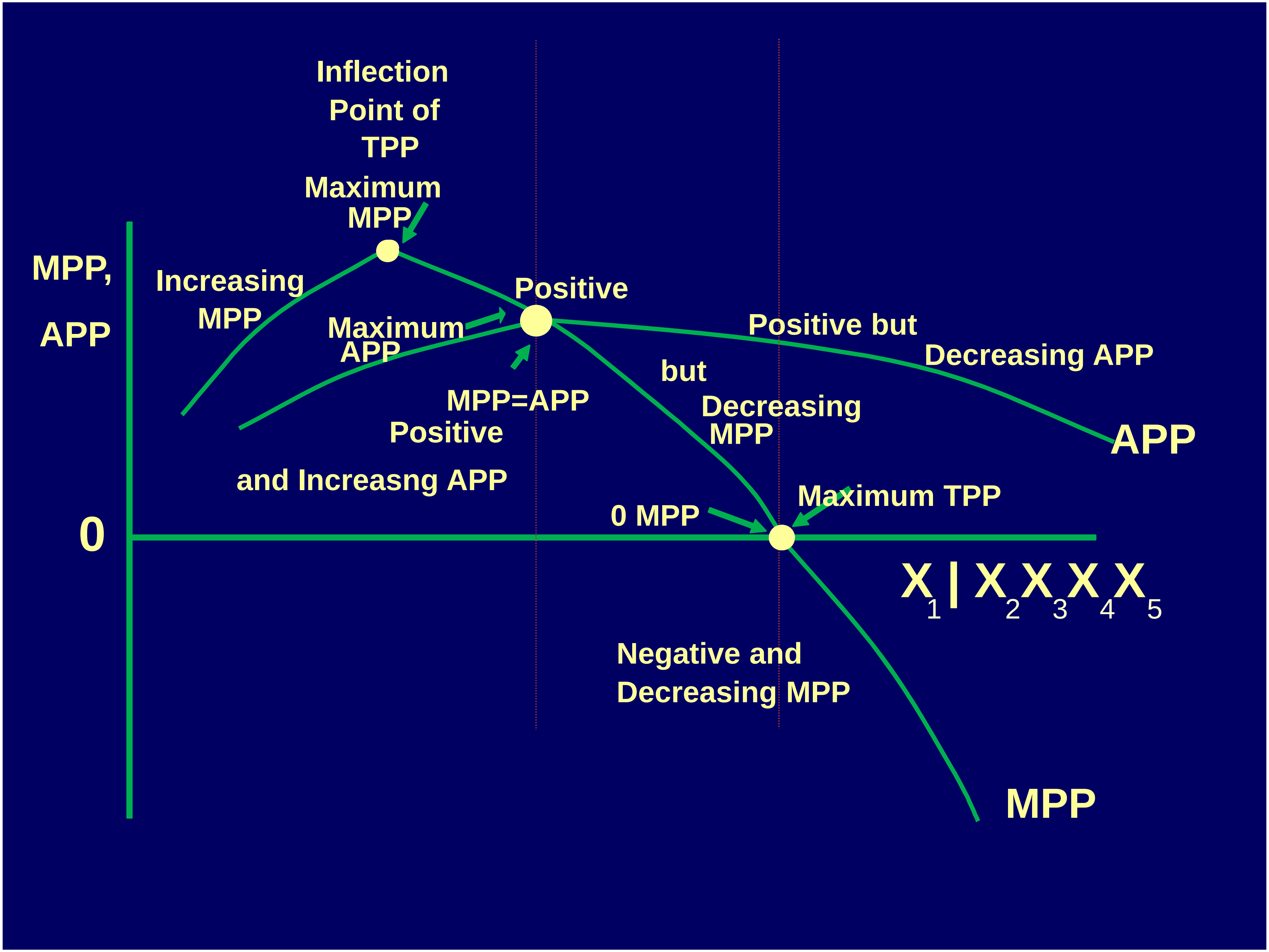


MPP,
APP
Maximum
APP
Positive but
Decreasing APP
APP
Positive
and Increasng APP
0
X
1
|
X
2
X
3
X
4
X
5



Inflection
Point of
TPP
Maximum
MPP
MPP,
APP
Maximum
APP
Positive but
Decreasing APP
APP
Positive
and Increasng APP
0
X_1 | X_2 X_3 X_4 X_5


Inflection
Point of
TPP
Maximum
MPP
MPP,
APP
Increasing
MPP
Positive
Maximum
APP
Positive but
Decreasing APP
but
Decreasing
MPP
MPP=APP
Positive
APP
and Increasng APP
Maximum TPP
0 MPP
0
$X_1 \mid X_2 X_3 X_4 X_5$



Inflection Point of TPP
Maximum MPP
MPP, APP
Increasing MPP
Positive
Maximum APP
Positive but Decreasing APP
but Decreasing MPP
MPP=APP
Positive and Increasng APP
APP
0
0 MPP
Maximum TPP
X1 | X2 X3 X4 X5
Negative and Decreasing MPP
MPP

Elasticity of Production

measures:

responsiveness of output
to changes in the use
of Inputs

A pure number
(has no units)

Elasticity of Production

= % Change in output (Y) divided by % Change in input (X)

$$\frac{\% \Delta \text{ in output } Y}{\% \Delta \text{ in input } X}$$

Elasticity of Production

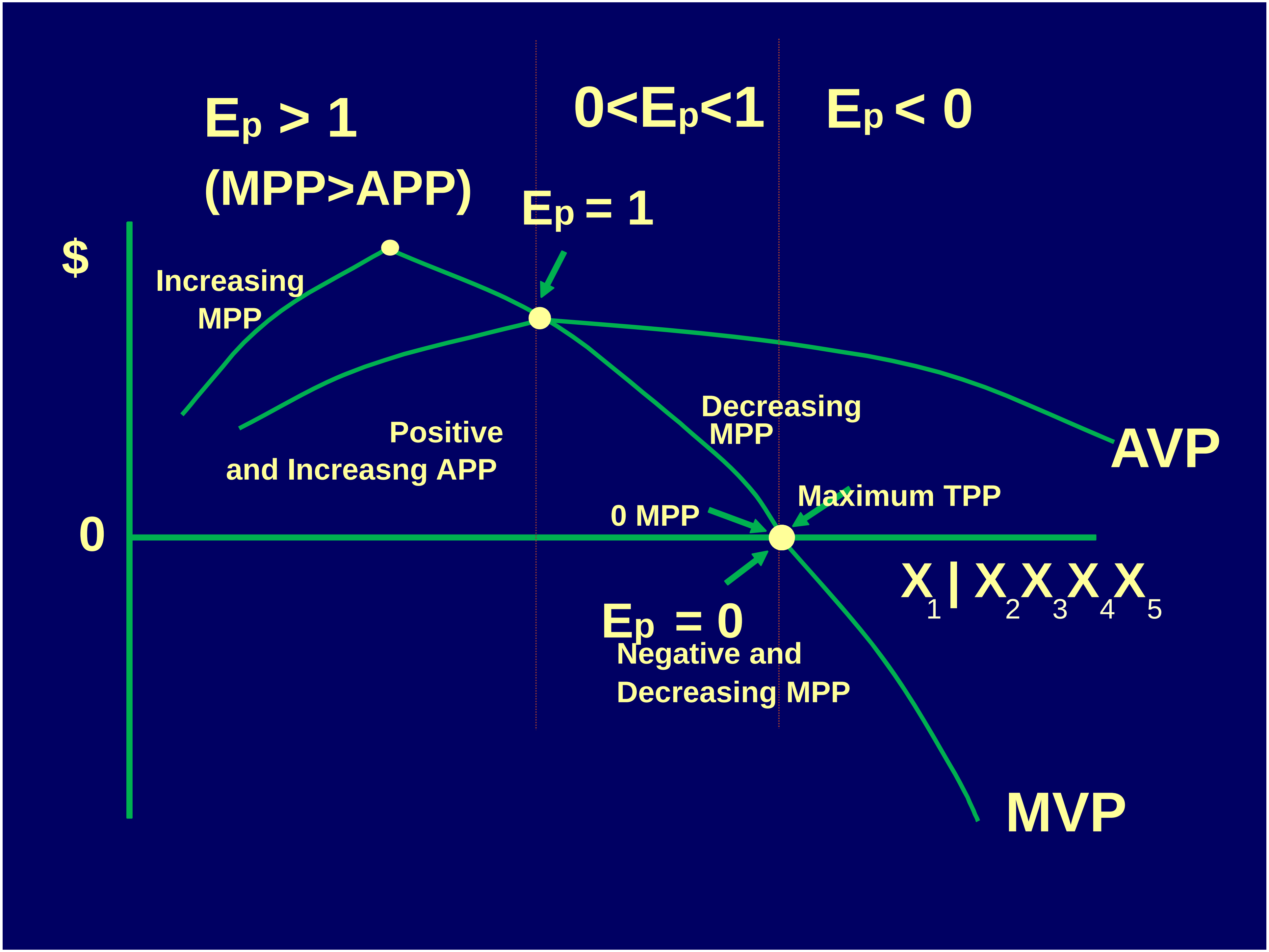
$$\frac{\%\ \Delta \text{ in output Y}}{\%\ \Delta \text{ in input X}}$$

$$= \frac{\Delta Y/Y}{\Delta X/X}$$

$$= \underbrace{\frac{\Delta Y}{\Delta X}}_{\text{MPP}} \cdot \underbrace{\frac{X}{Y}}_{\text{1/APP}} = \text{MPP/APP}$$

$$\frac{\%\Delta \text{ in output } Y}{\%\Delta \text{ in input } X} = MPP/APP$$

The Elasticity of Production (E_p)
is the Ratio
of MPP to APP

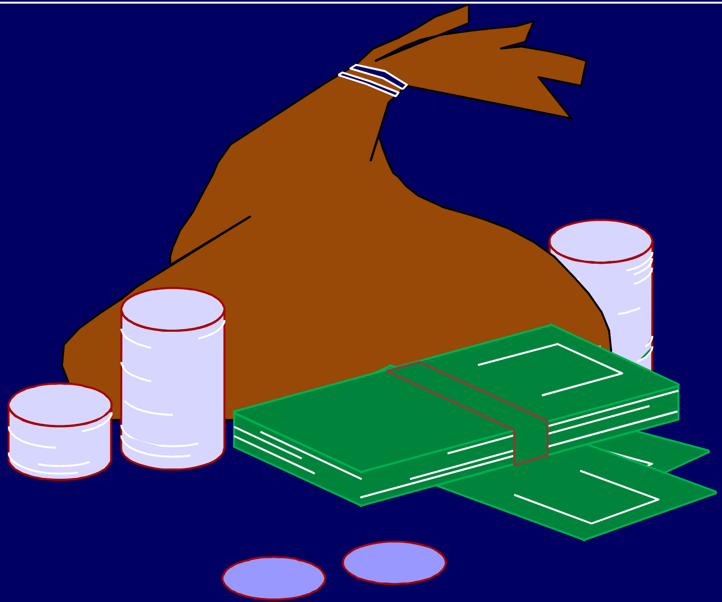

Ep > 1
(MPP>APP)
0<Ep<1
Ep < 0
Ep = 1
$
Increasing
MPP
Positive
and Increasng APP
Decreasing
MPP
AVP
Maximum TPP
0 MPP
0
X1 | X2 X3 X4 X5
Ep = 0
Negative and
Decreasing MPP
MVP

When the elasticity of production is greater than one, MPP lies above APP, APP is increasing, but MPP may be either increasing or decreasing.

When the elasticity of production is between zero and 1, both MPP and APP are decreasing. However, MPP is positive here.

Wnen the elasticity of production is negative, MPP is negative, and TPP is falling. However, APP still remains positive.

Profit Maximixation: 1 input (X) and 1 output (Y)



Assumptions:

1. Constant Input Price

The producer can purchase as much or as little of the needed input at the going market price.

No producer can affect input prices by the amount of the purchase.

2. Constant Output Price

No producer can affect
the price of the output (Y)
because of the
individual production decision.

The price of the input is V.
The price of the output is P.

3. Production Function Known with Certainty

This is an unrealistic assumption for agriculture!

Profit =

Total Revenue - Total Cost

$$\Pi = TR - TC$$

$$\Pi = P \cdot Y - V \cdot X \quad \text{but } Y = f(X)$$

so

$$\Pi = P \cdot f(X) - V \cdot X$$

Total Value of Product

Total Factor Cost

Maximizing Profit:

Maximize the difference

between

TVP and TFC

$$\prod \quad P \cdot f(X) - \quad V \cdot X$$

Total Value of Product

TVP

Total Factor Cost

TFC

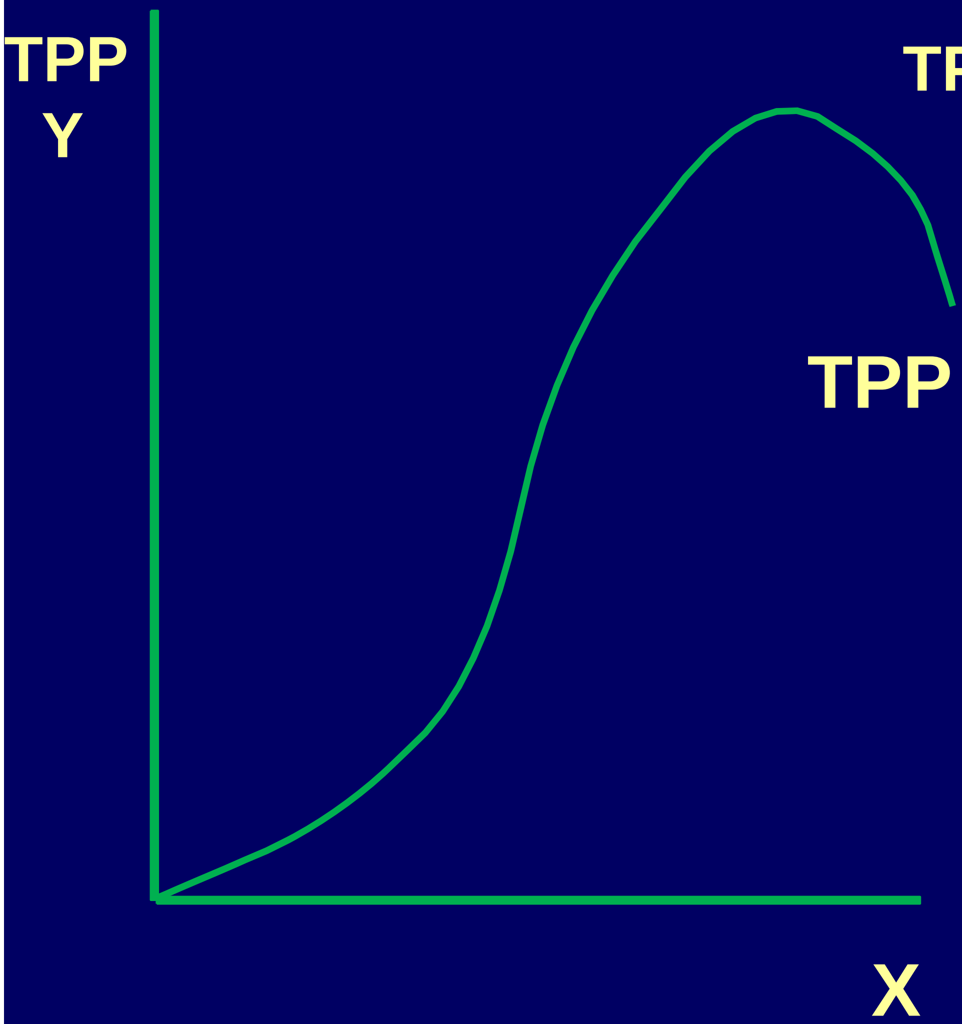
What is the appearance of a

TVP CURVE?

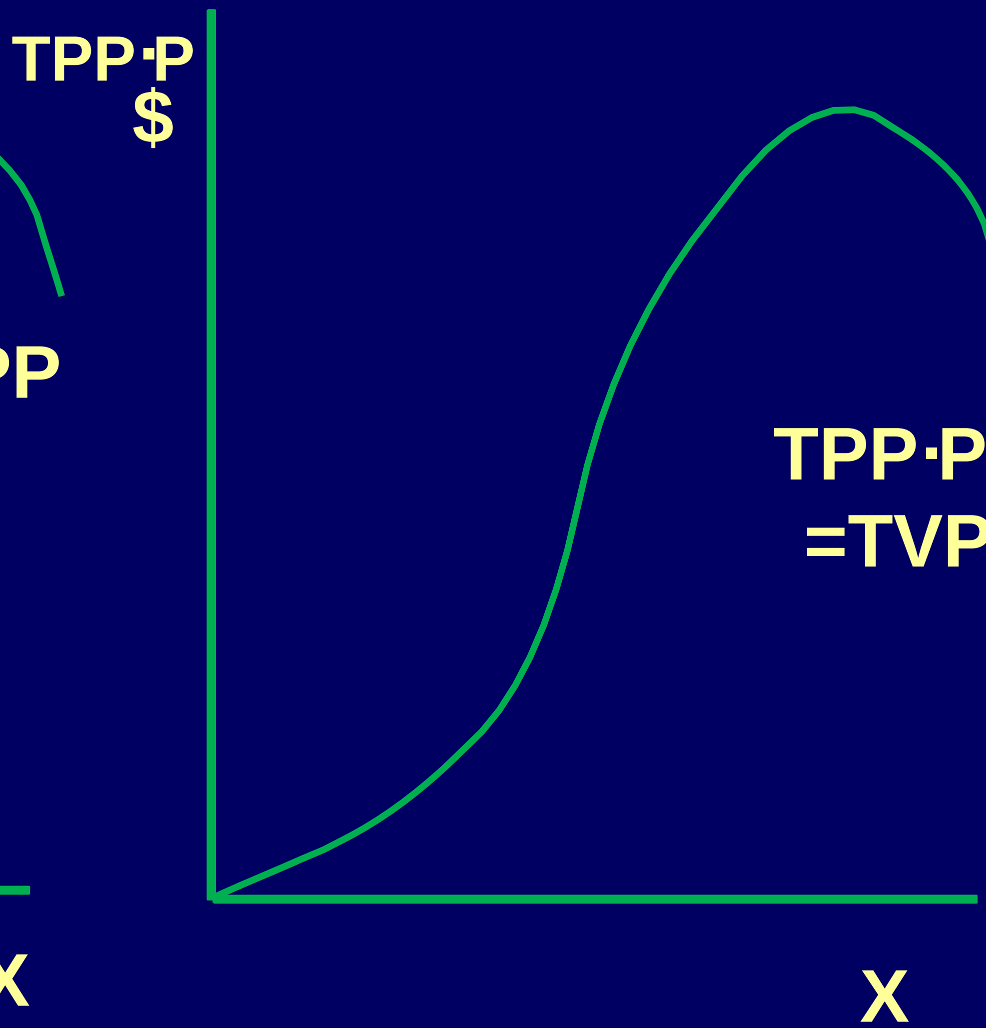
The TVP curve is a production function with the vertical axis measured in dollar value of output, not physical units such as bushels or pounds.

$$TVP = P \cdot TPP$$

Production Function



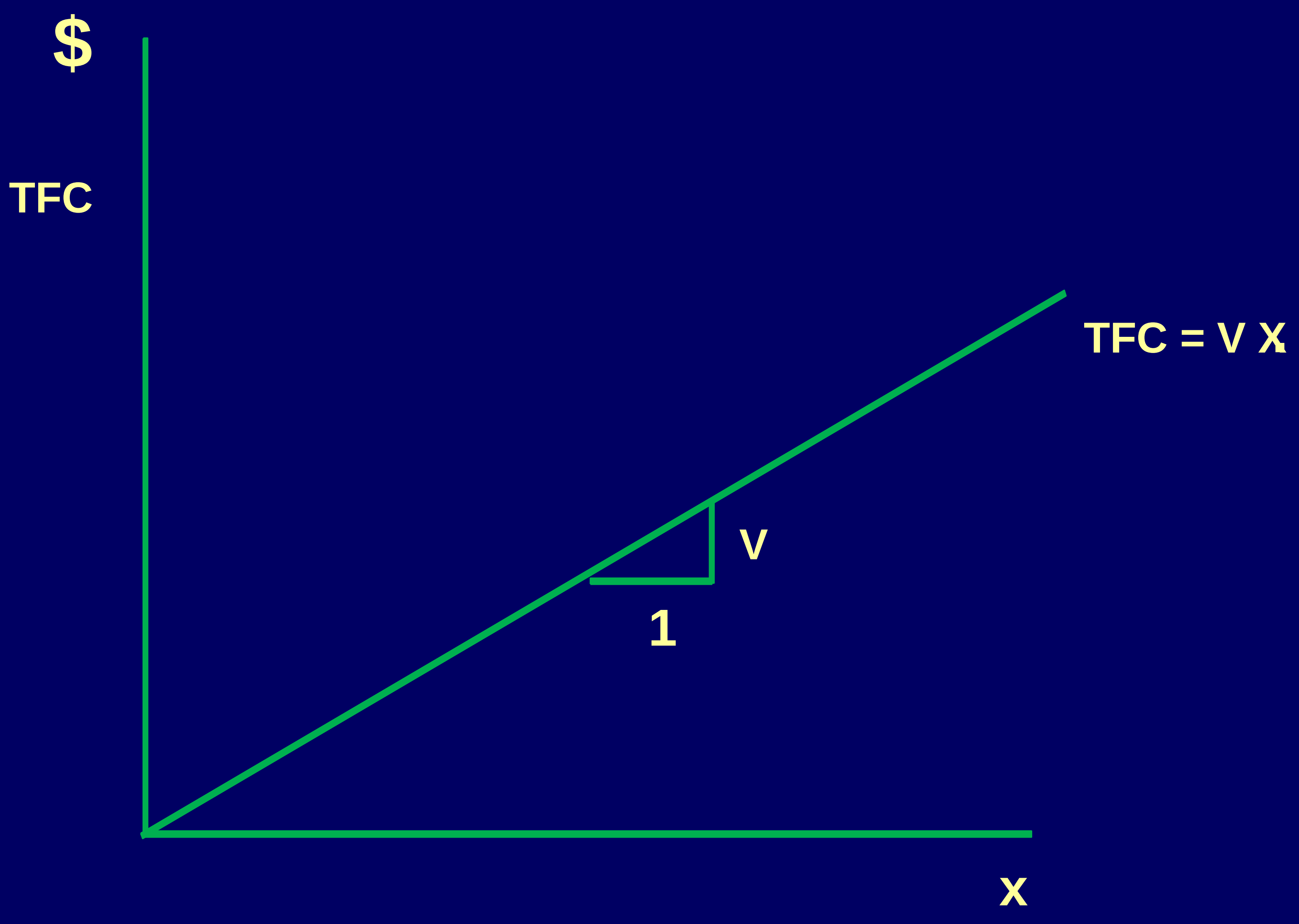
TVP Curve



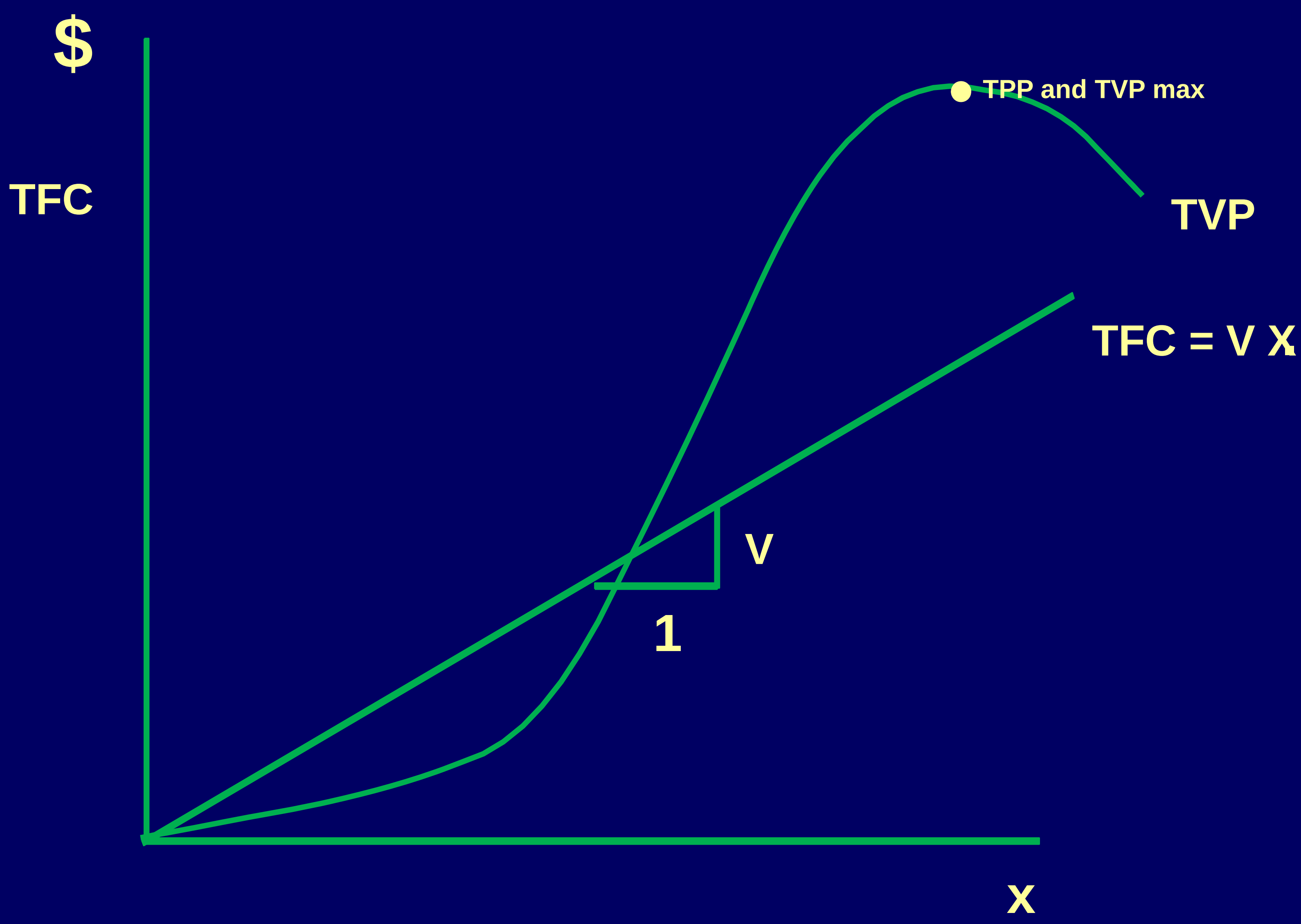
What is the appearance of a

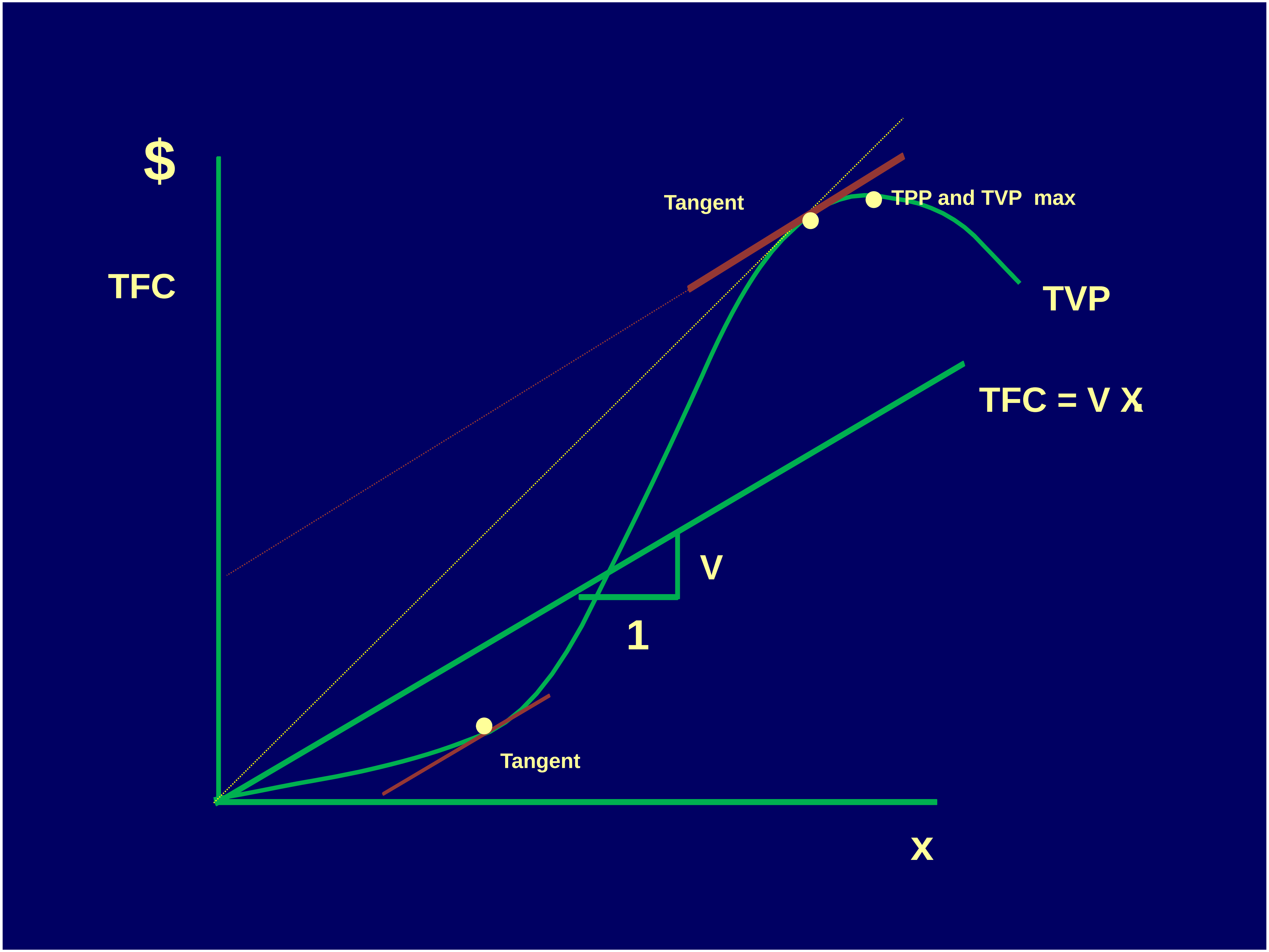
Total Factor Cost (TFC) Curve?

Total Factor Cost (TFC) Curve

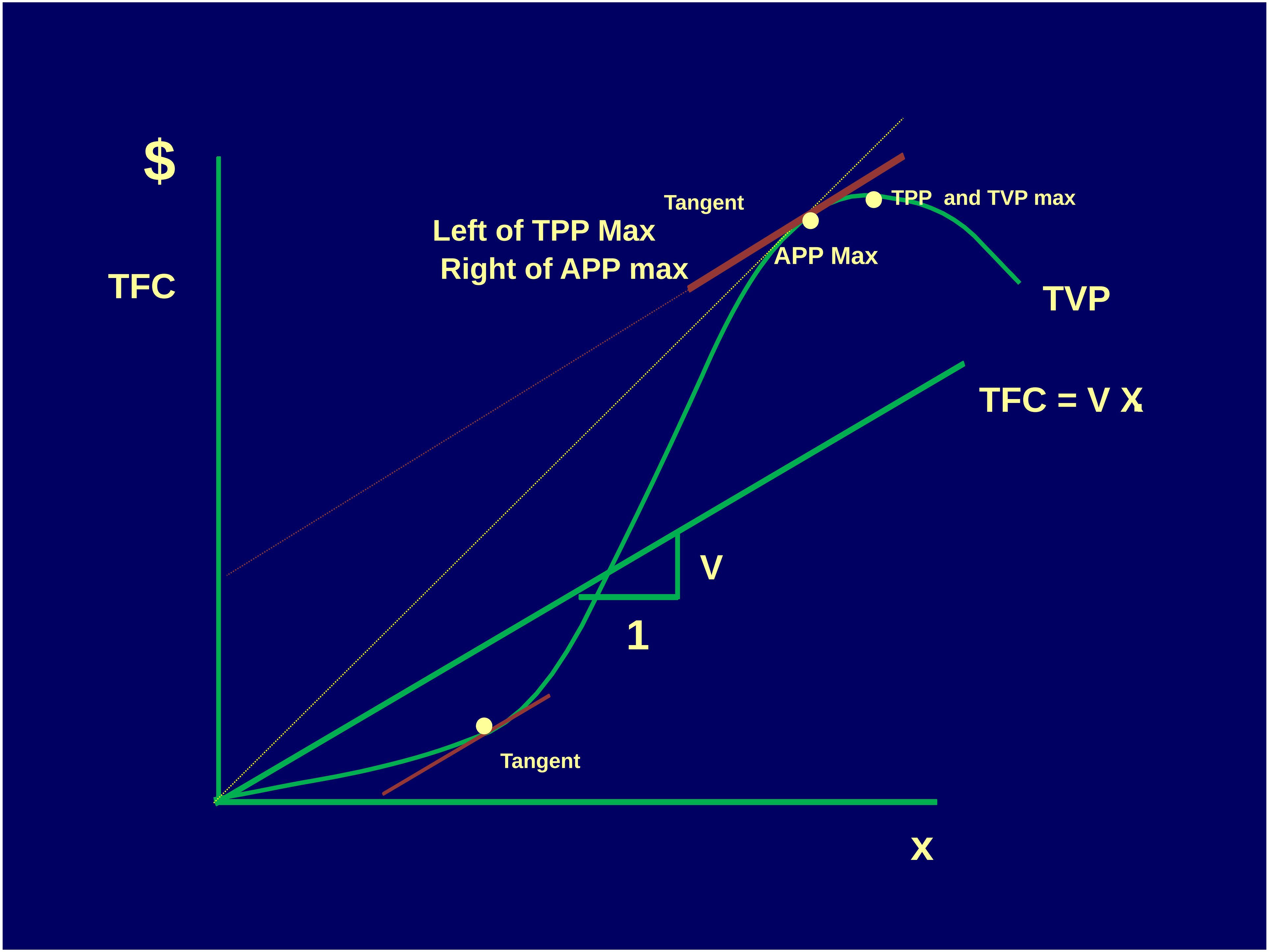


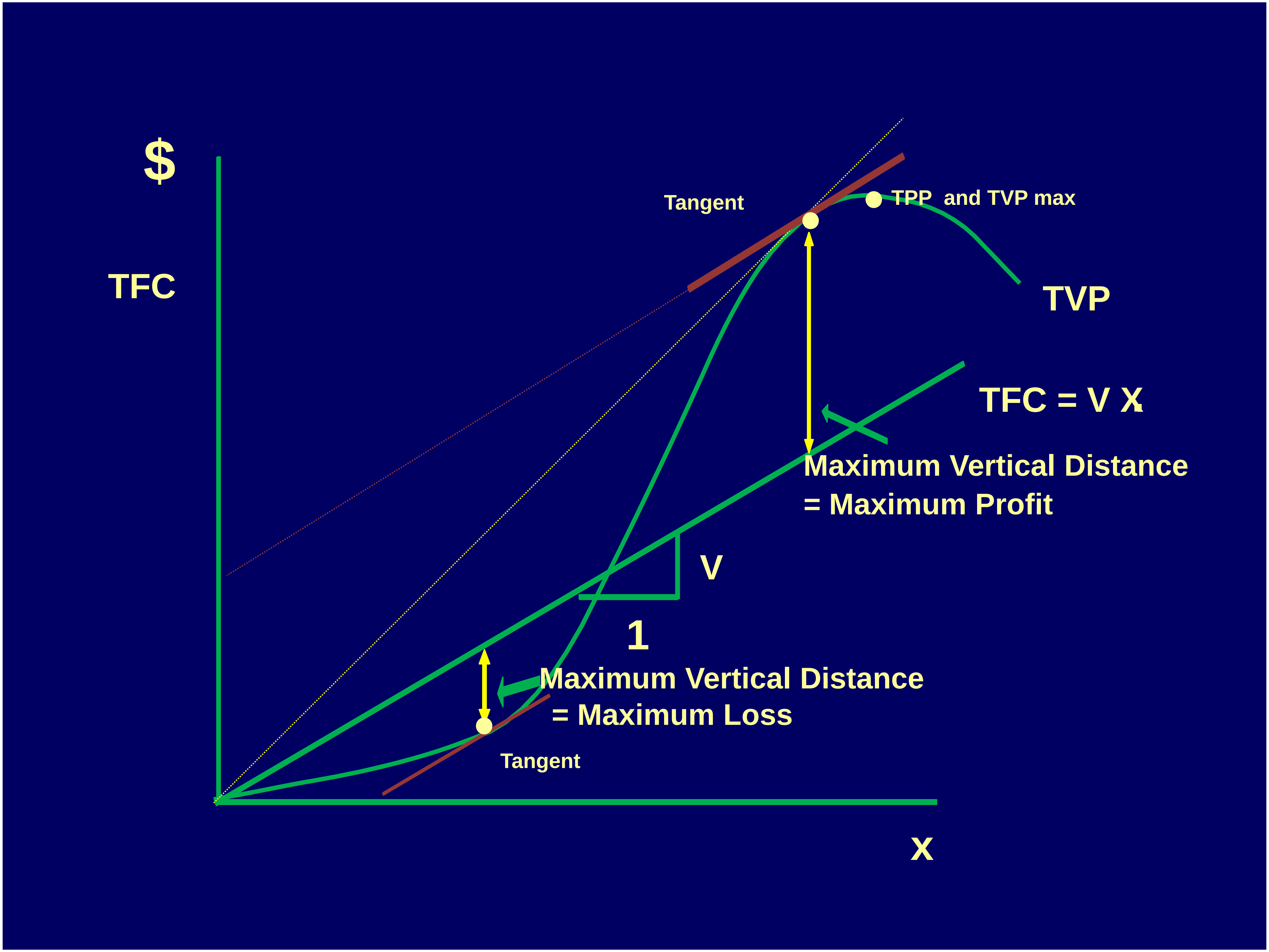
Now Superimpose TVP Curve

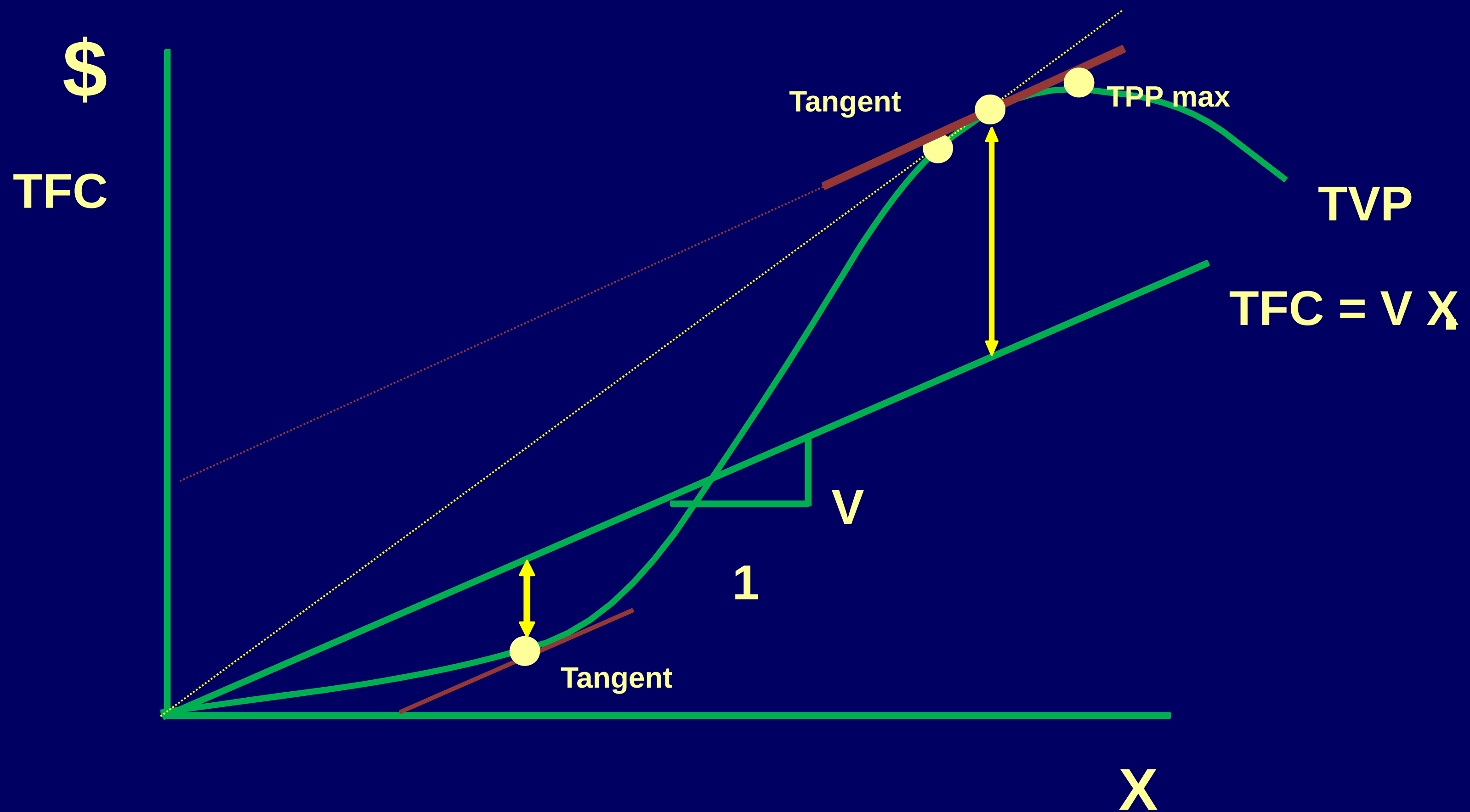




$
TFC
Tangent
TPP and TVP max
TVP
TFC = V X
V
1
Tangent
X


$
TFC
Tangent
Left of TPP Max
Right of APP max
TPP and TVP max
APP Max
TVP
TFC = V X
V
1
Tangent
X


$
TFC
Tangent
TPP and TVP max
TVP
TFC = V X
Maximum Vertical Distance
= Maximum Profit
V
1
Maximum Vertical Distance
= Maximum Loss
Tangent
X



Profit is maximum where slope of TVP = Slope of TFC

Slope of TVP = Slope of TPP P ·

= MPP·P

= MVP

= Marginal Value of the Product

So profits are maximum where:

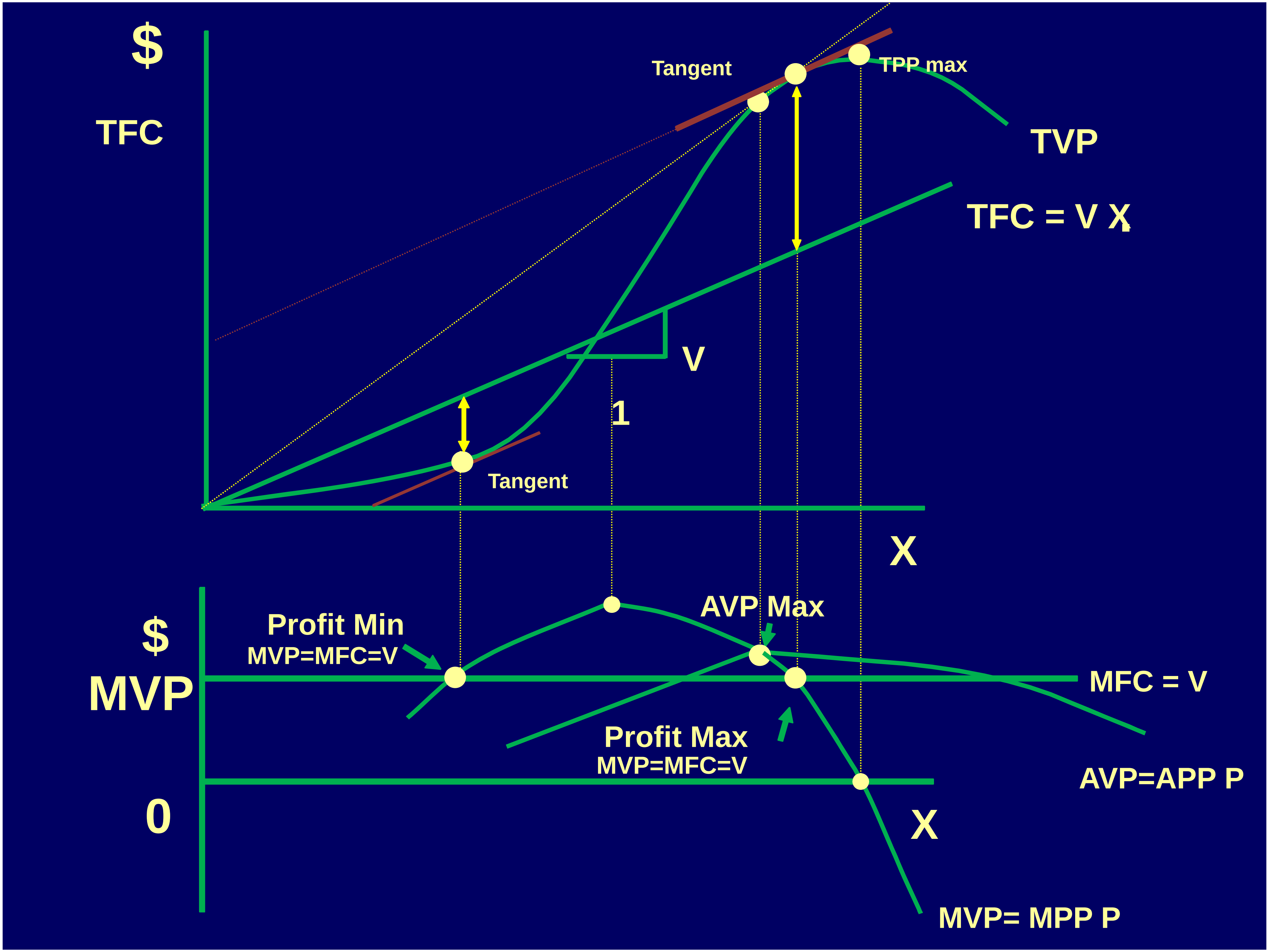
Slope of TVP = Slope of TFC

MVP = MFC

MVP = V

MVP = the input price,

assuming constant input and output prices


$
TFC
Tangent
TPP max
TVP
TFC = V X
V
1
Tangent
X
$
MVP
0
Profit Min
MVP=MFC=V
AVP Max
MFC = V
Profit Max
MVP=MFC=V
AVP=APP P
X
MVP= MPP P

Stages of Production

Stage I

0 units of X
to level of X which
Maximizes AVP

Stage II

Level of X that Maximizes AVP

to

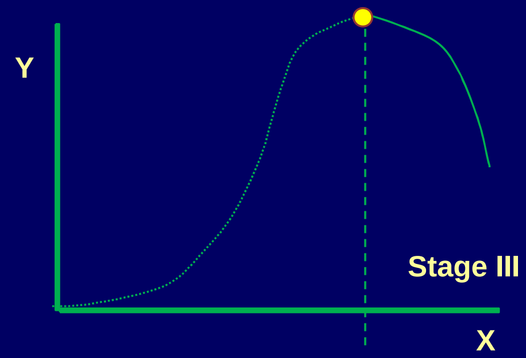
Level of X that Maximizes TPP

(0 MVP and 0 MPP)

Stage III

Level of X that

Maximizes TPP (0 MPP)



and Beyond ......

The Rational Producer...

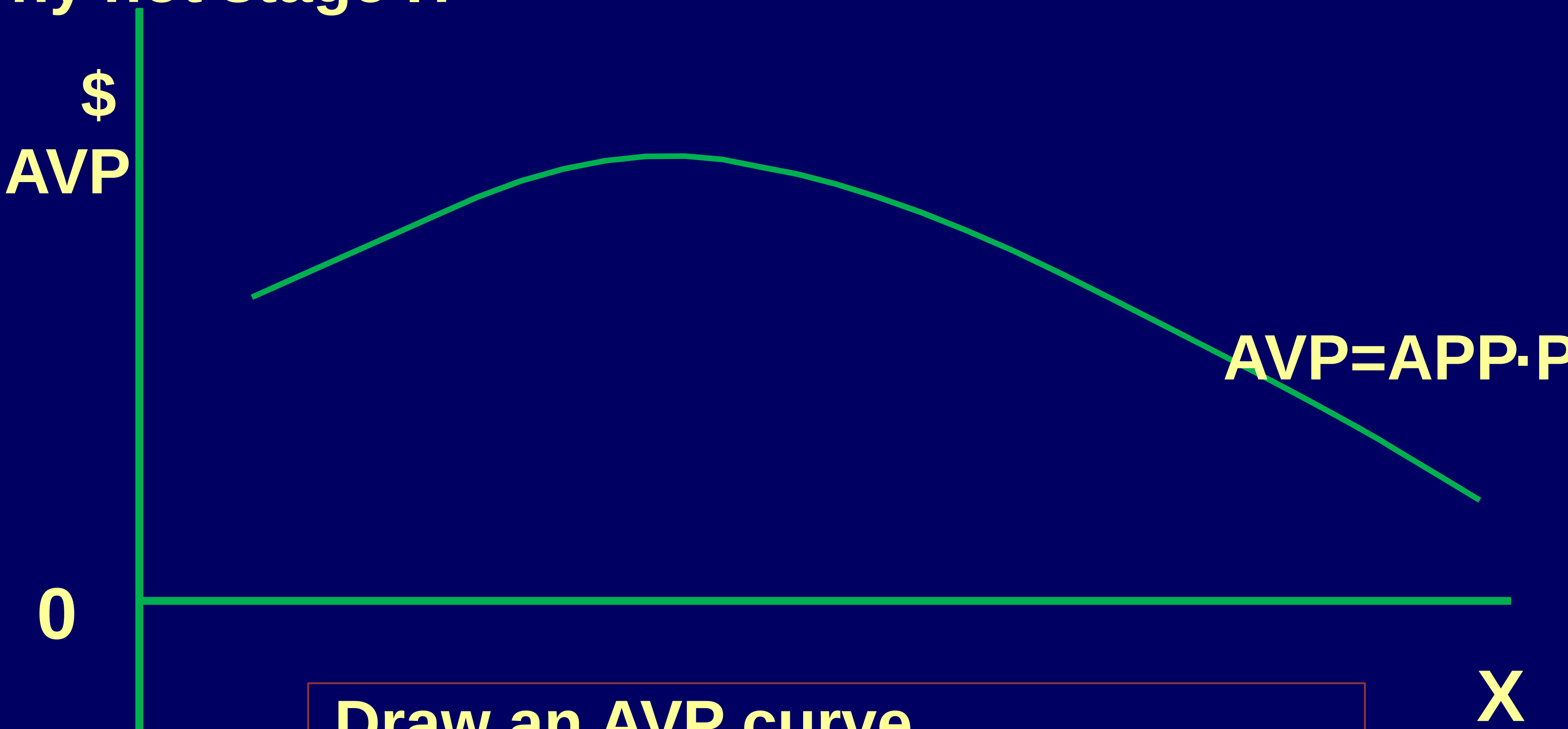
1. Never produces beyond the point of maximum TPP (input prices are never negative)
2. Produces at the point of maximum TPP only if the input is free!
3. Does not normally produce in stage I of Production

Stage II is the

Rational Stage of Production

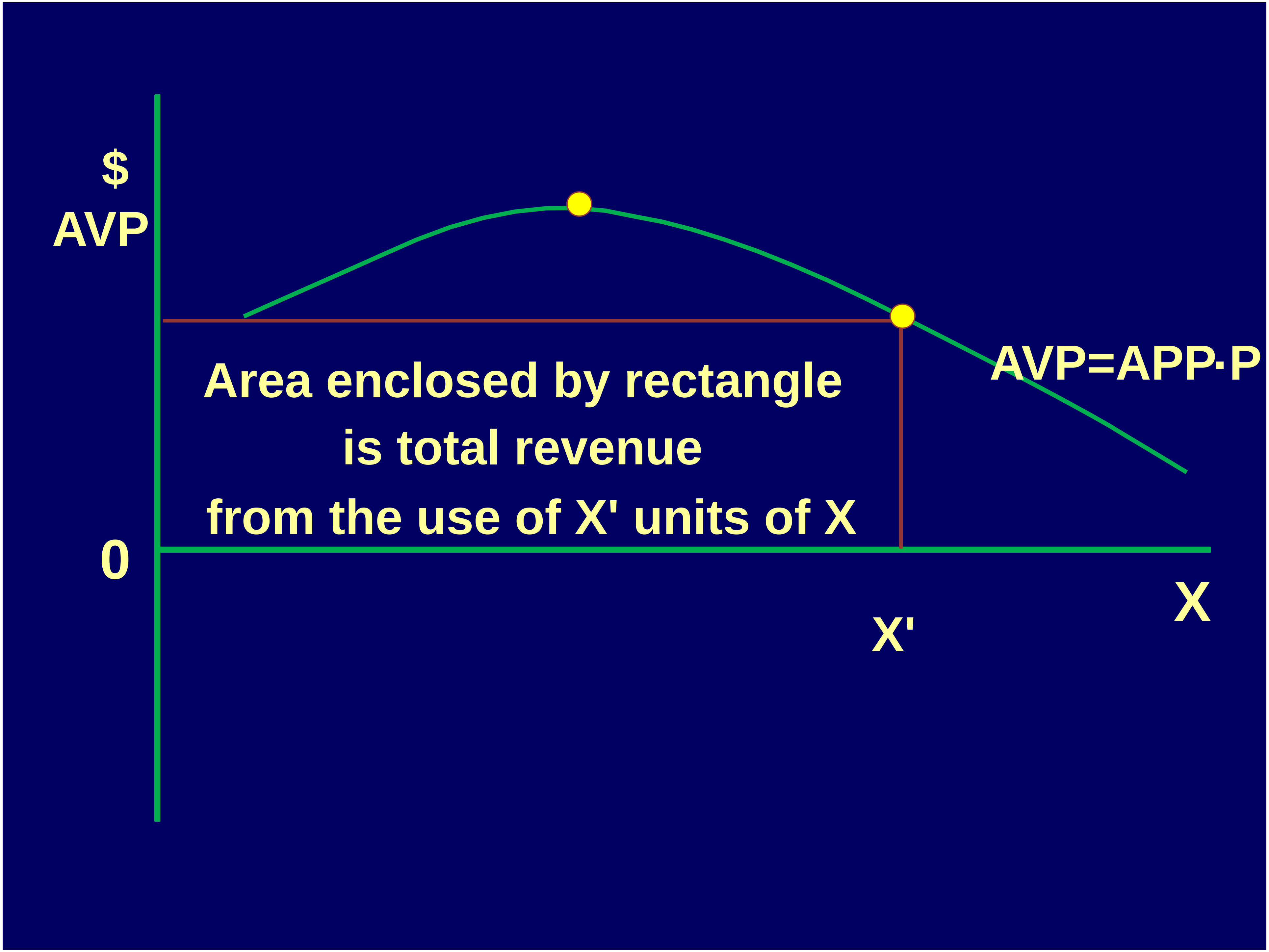
Where the profit maximizing point is found

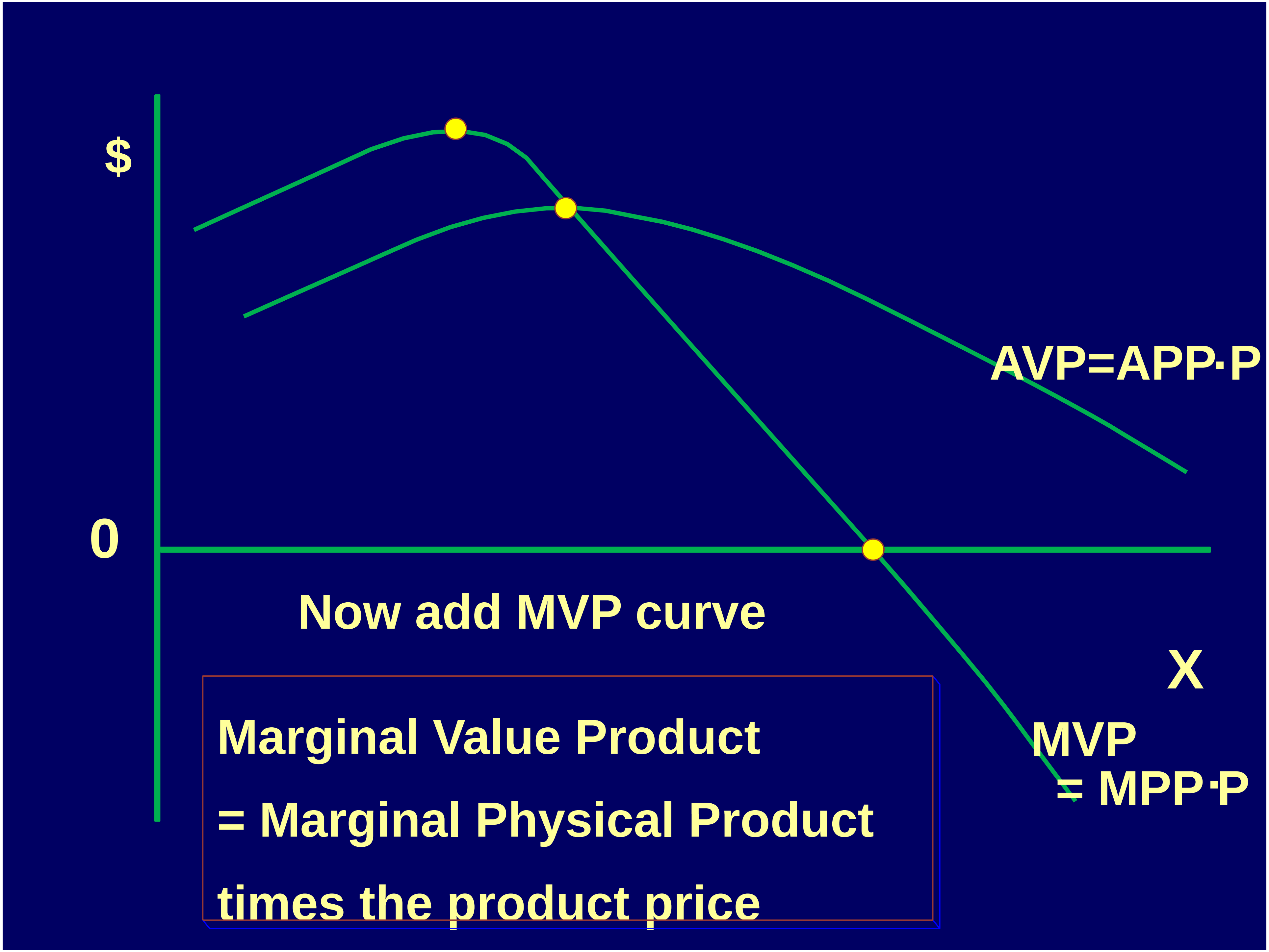
Why not stage I?

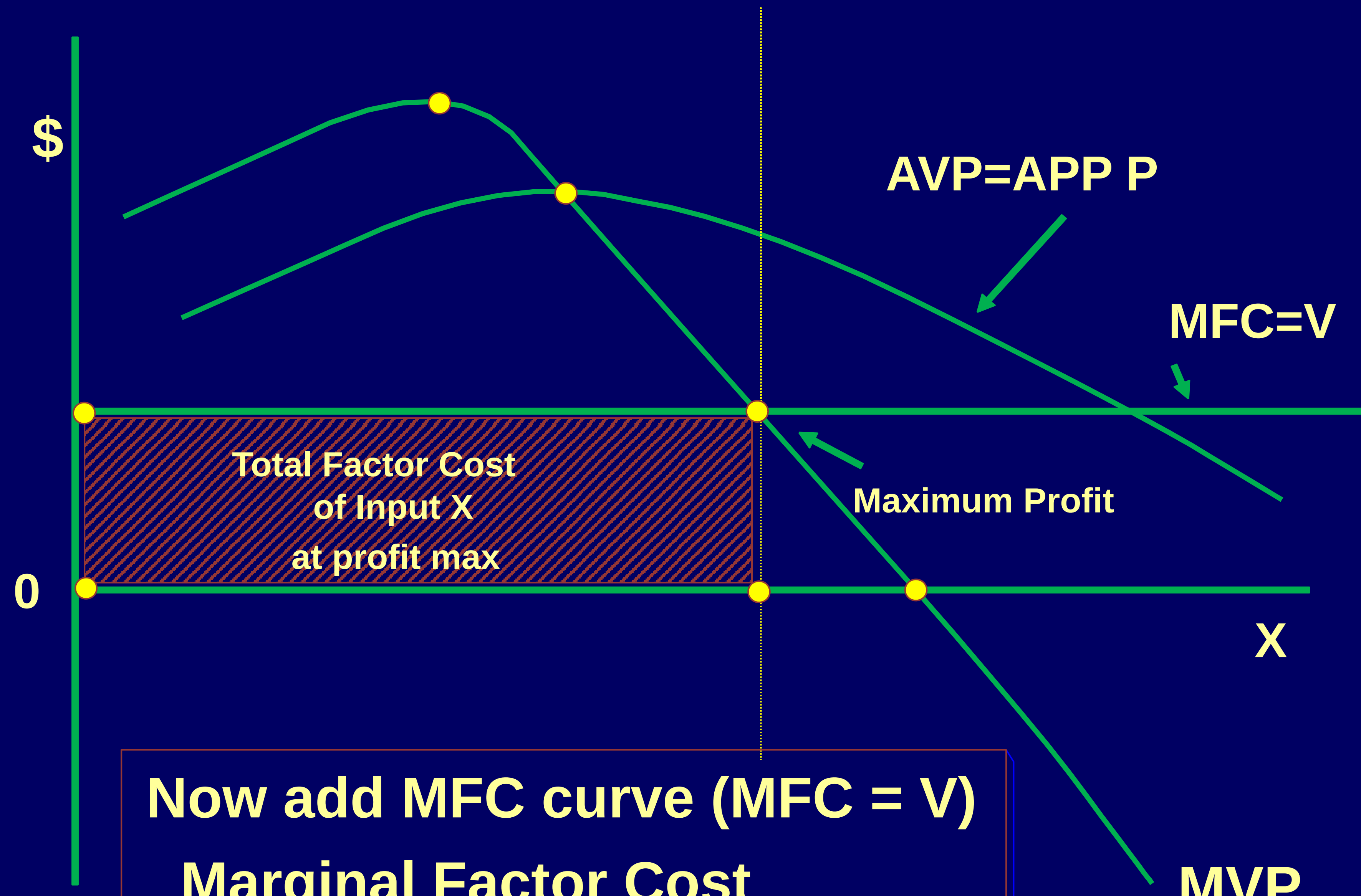


Draw an AVP curve.
Pick any point on the AVP curve.

Average Value of the Product
= Average Physical Product
times the product price

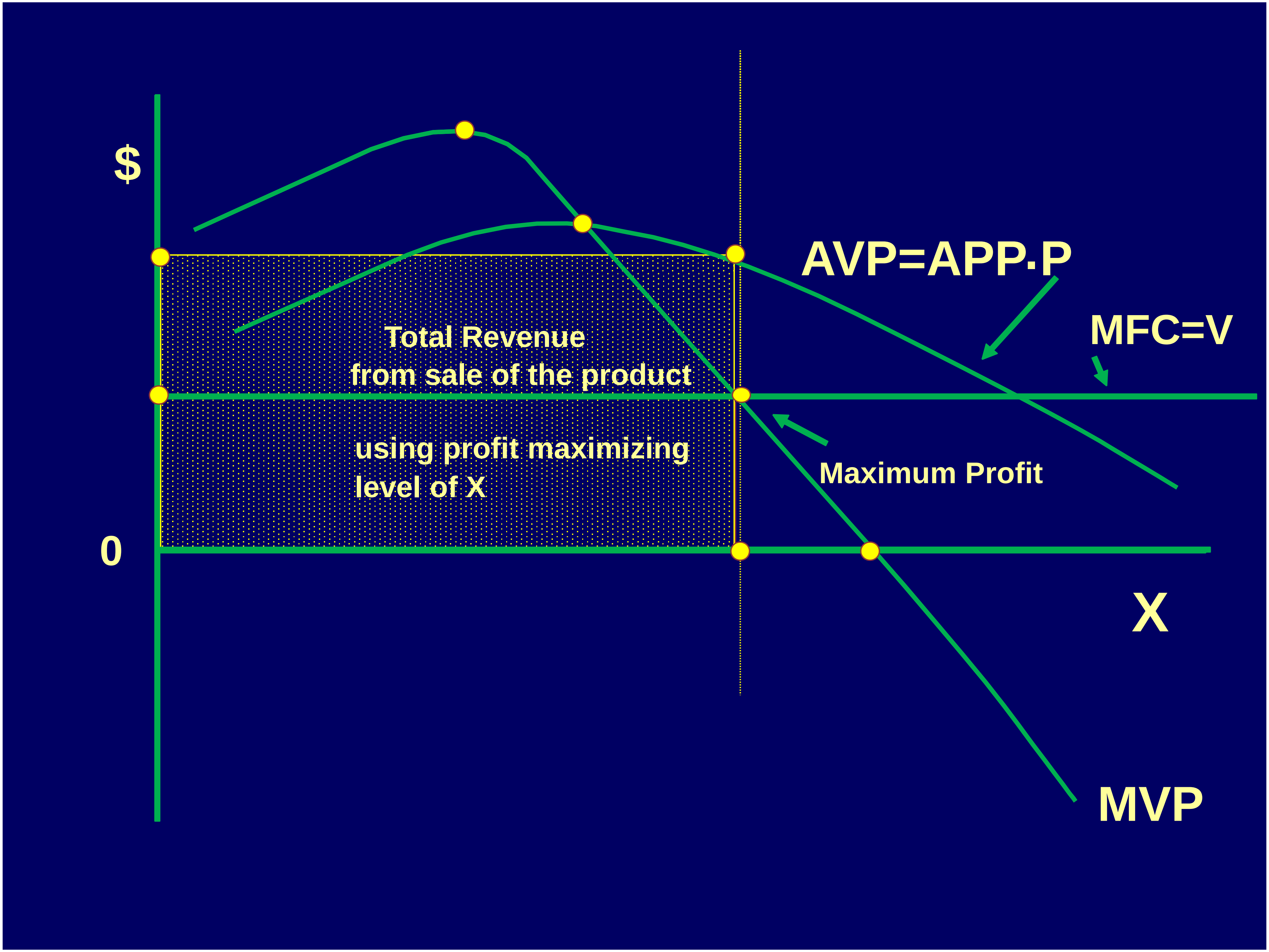

$
AVP
0
AVP=APP·P
Area enclosed by rectangle
is total revenue
from the use of X' units of X
X'
X


$
0
AVP=APP·P
Now add MVP curve
X
MVP
= MPP·P
Marginal Value Product
= Marginal Physical Product
times the product price

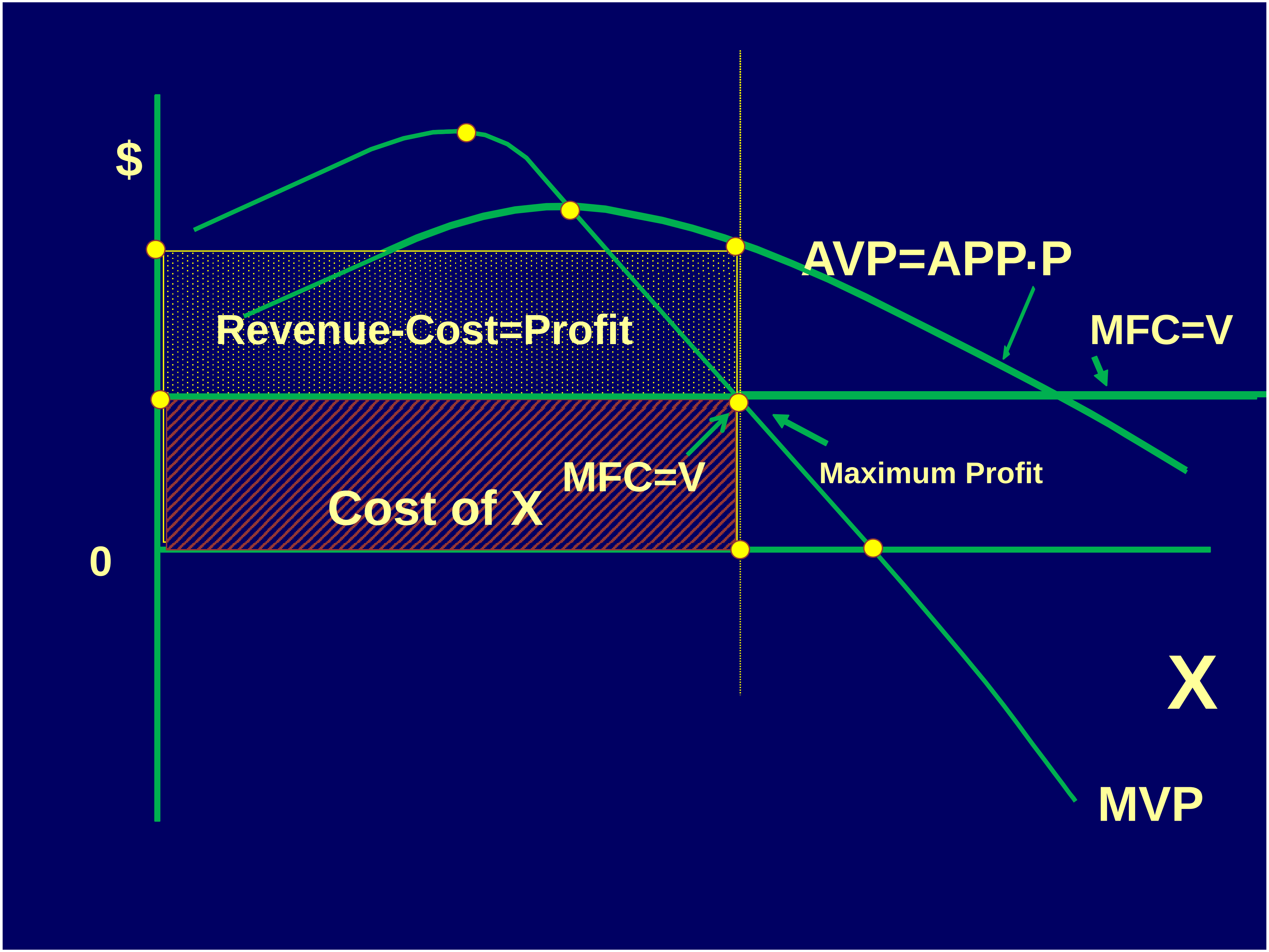


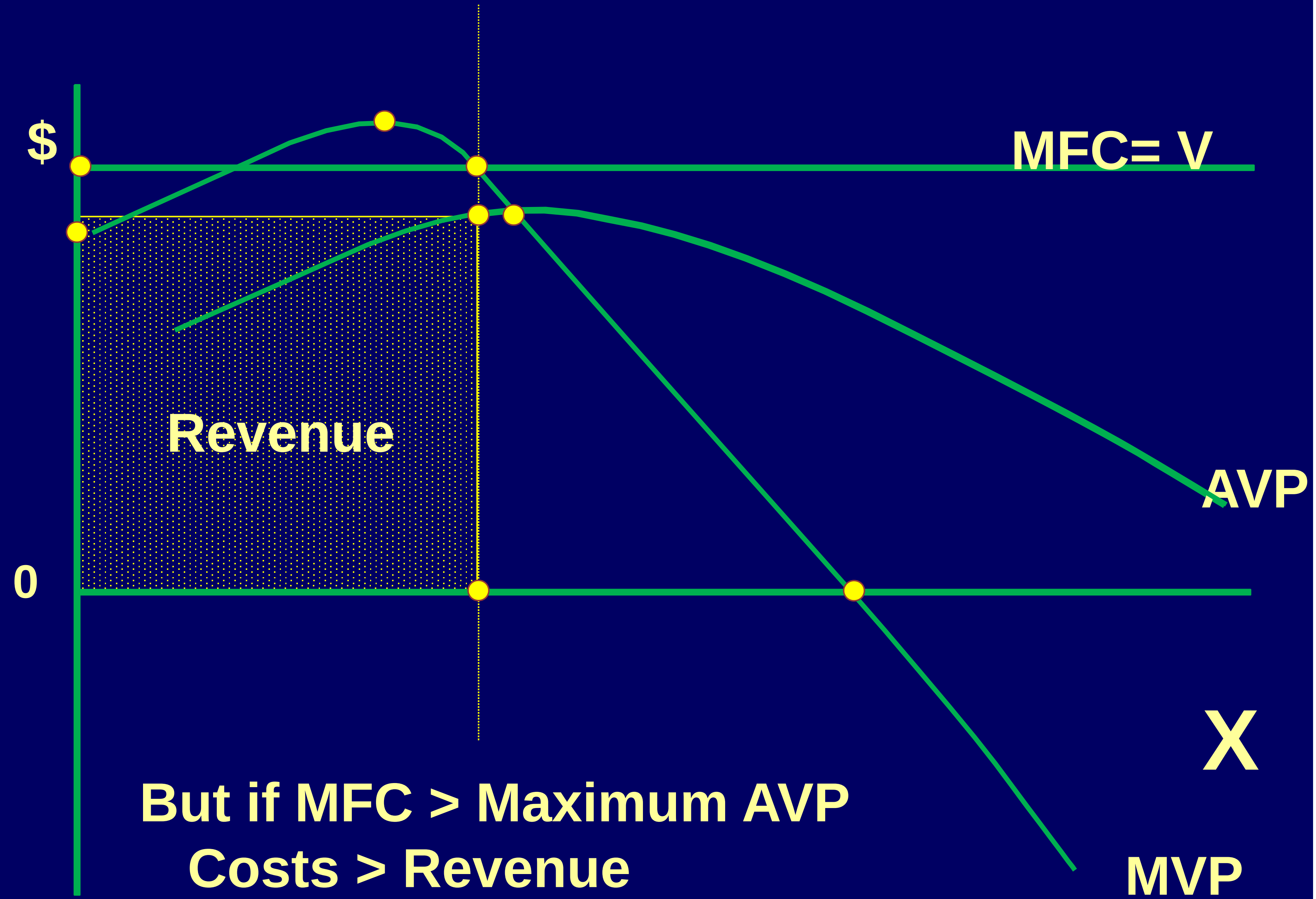
Now add MFC curve (MFC = V)

Marginal Factor Cost
= the price (V) of the input (X)



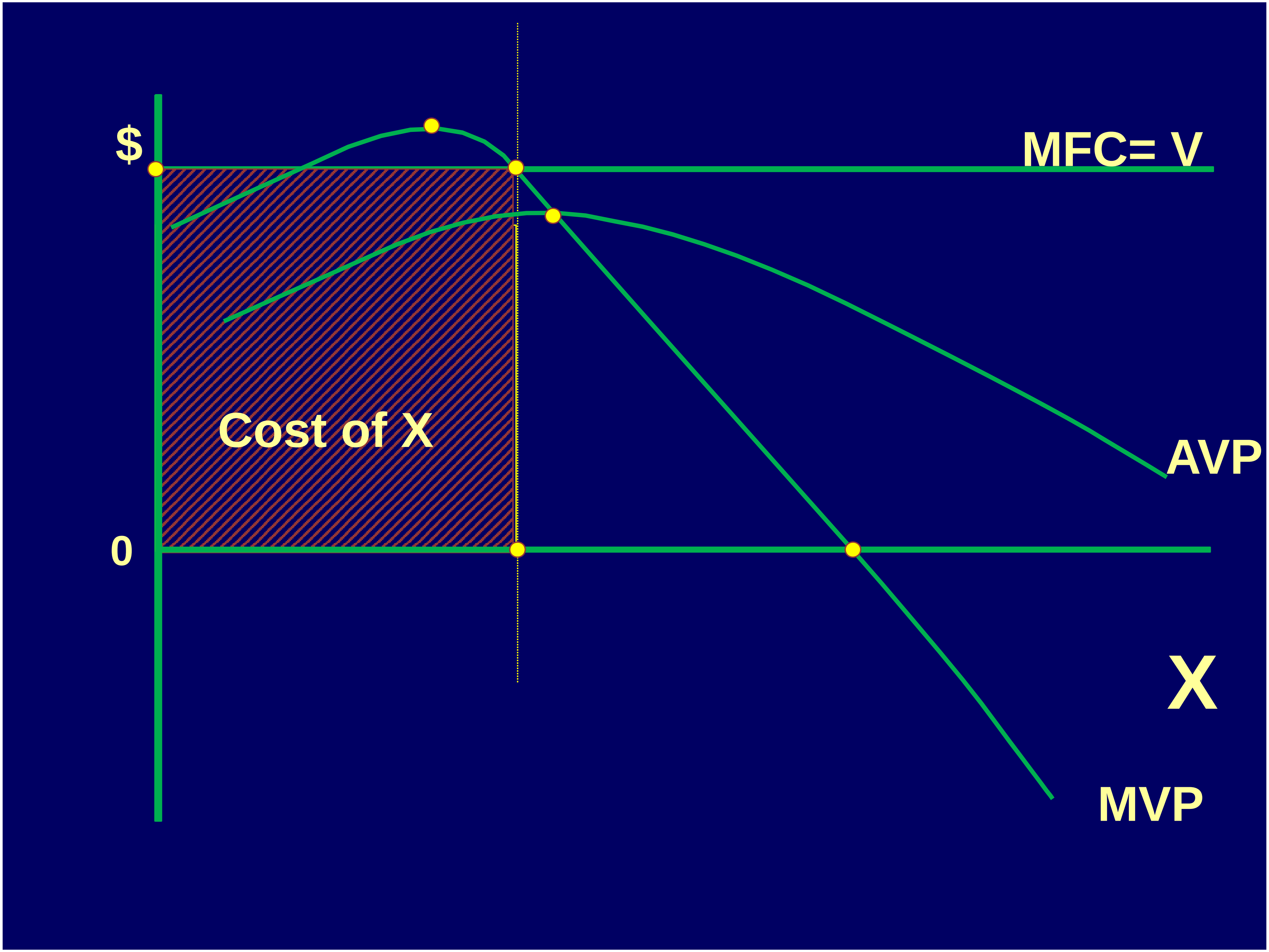
$
AVP=APP·P
MFC=V
Total Revenue
from sale of the product
using profit maximizing
level of X
Maximum Profit
0
X
MVP

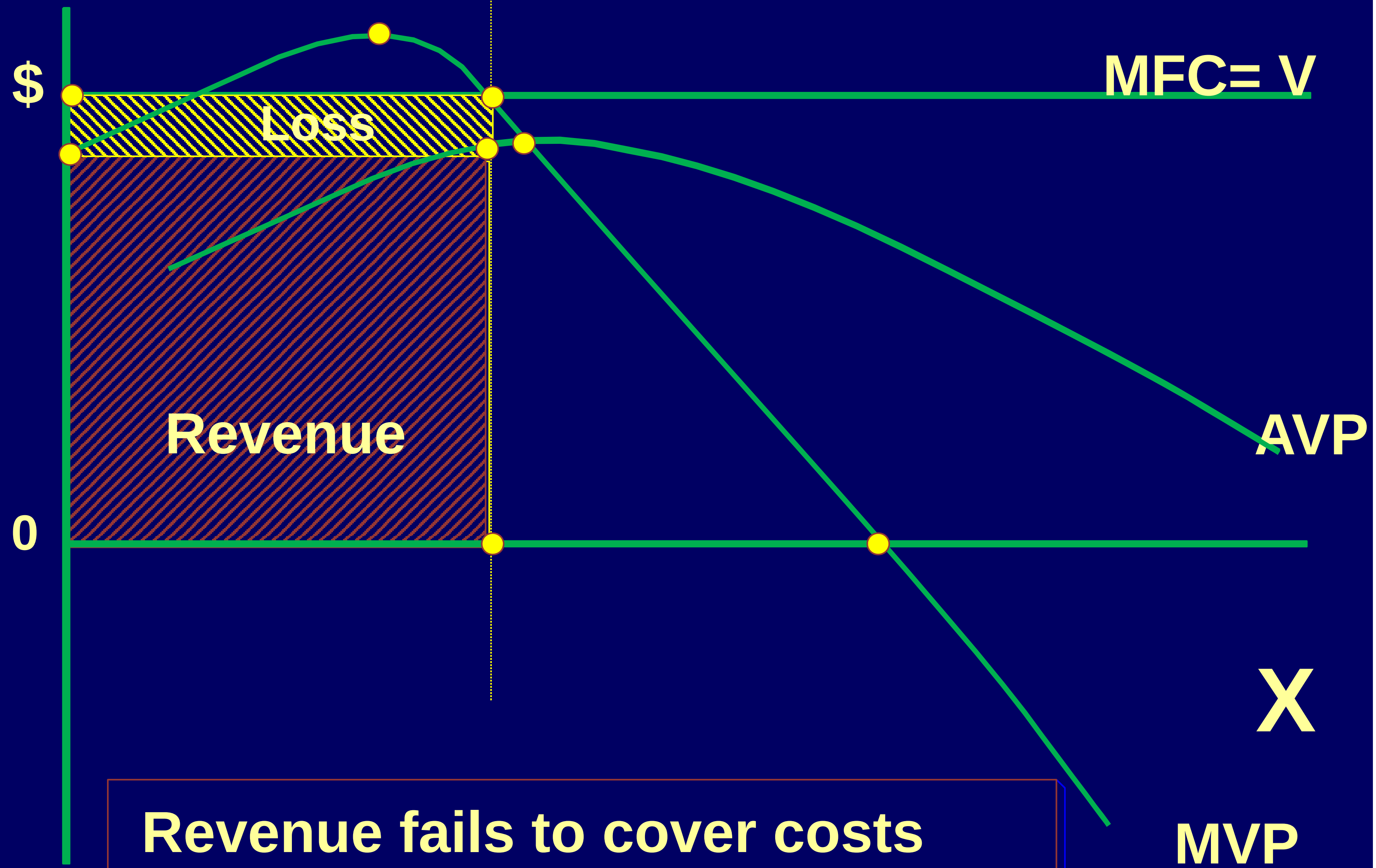

$
AVP=APP·P
MFC=V
Revenue-Cost=Profit
MFC=V
Maximum Profit
Cost of X
0
X
MVP



But if MFC > Maximum AVP

Costs > Revenue
Lose money where MVP=MFC, and shut down instead!


$
MFC= V
Cost of X
AVP
0
X
MVP



Revenue fails to cover costs resulting in a loss as indicated

Stages of Production and Elasticities of Production

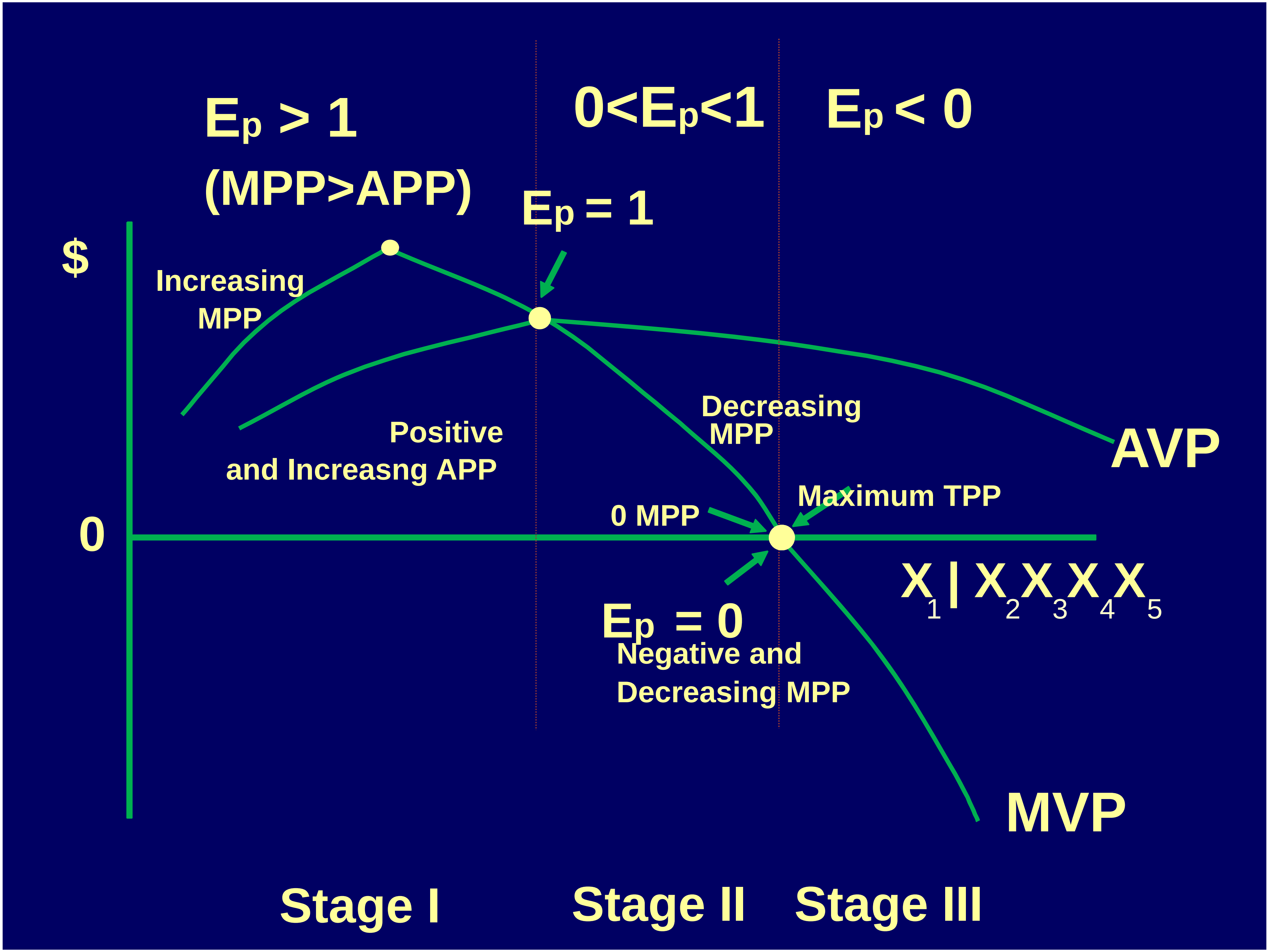
Stage I Ep > 1

Stage II 0 <Ep < 1

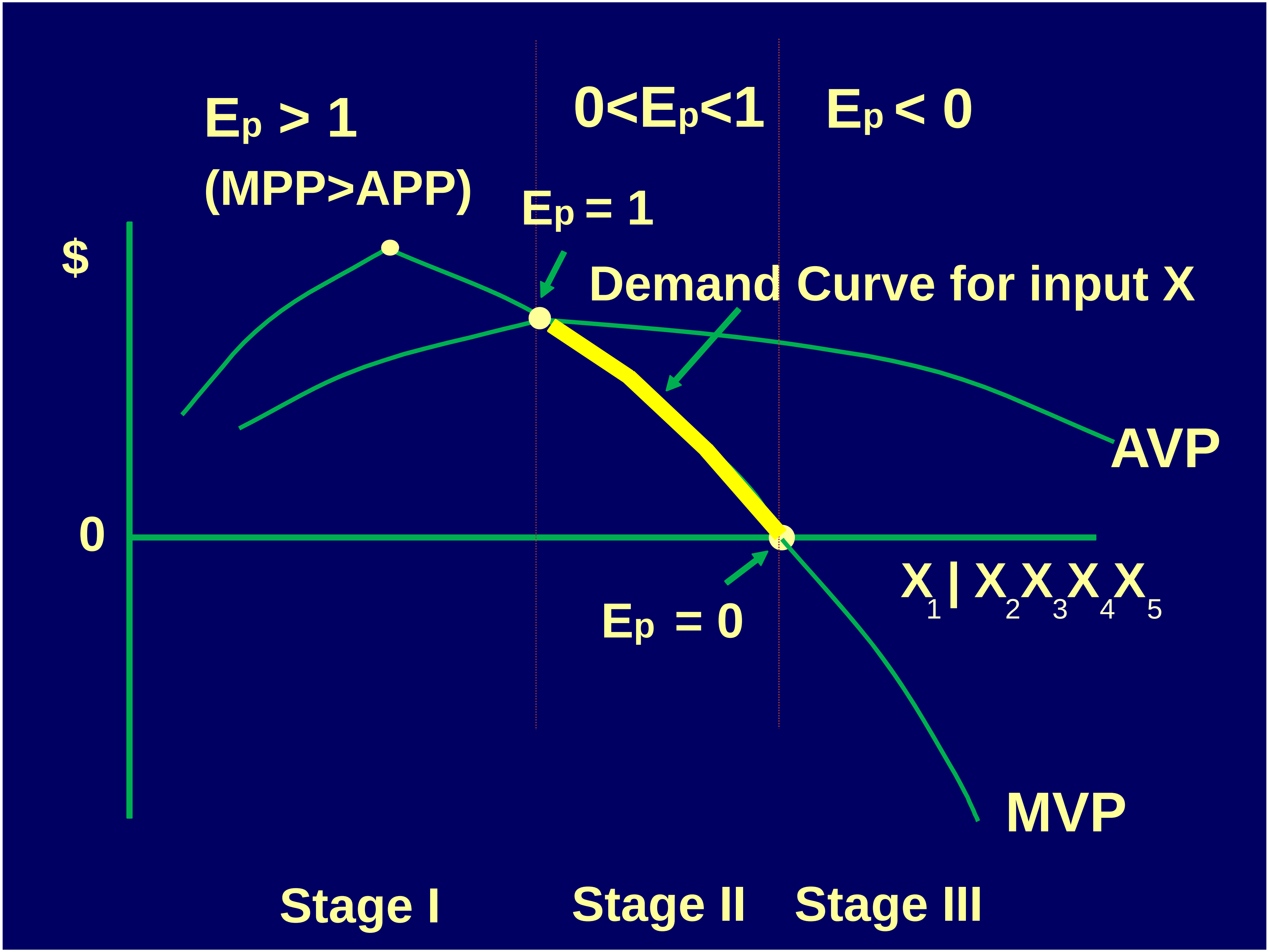
Stage III Ep < 0

Rational Stage where

0 <Ep < 1



Ep > 1
(MPP>APP)
0<Ep<1
Ep < 0
Ep = 1
$
Increasing
MPP
Positive
and Increasng APP
Decreasing
MPP
AVP
Maximum TPP
0 MPP
0
X1 | X2 X3 X4 X5
Ep = 0
Negative and
Decreasing MPP
MVP
Stage I
Stage II
Stage III


Ep > 1
(MPP>APP)
0<Ep<1
Ep < 0
Ep = 1
$
Demand Curve for input X
AVP
0
X1 | X2 X3 X4 X5
Ep = 0
MVP
Stage I
Stage II
Stage III

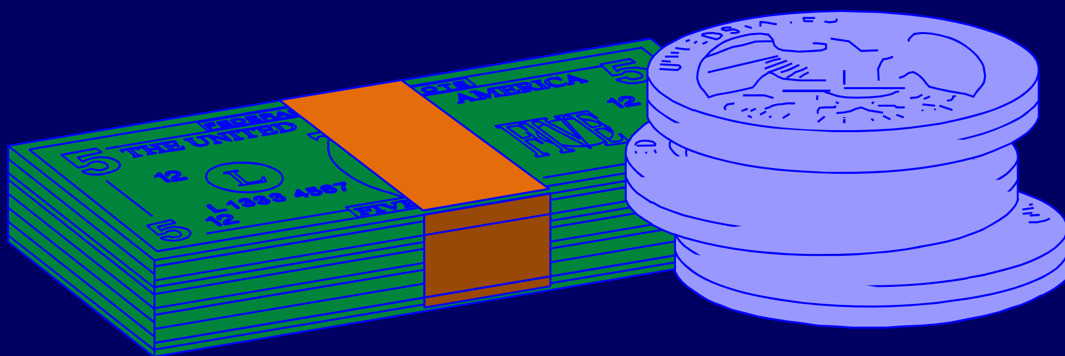
The Demand Curve for a Singe Input

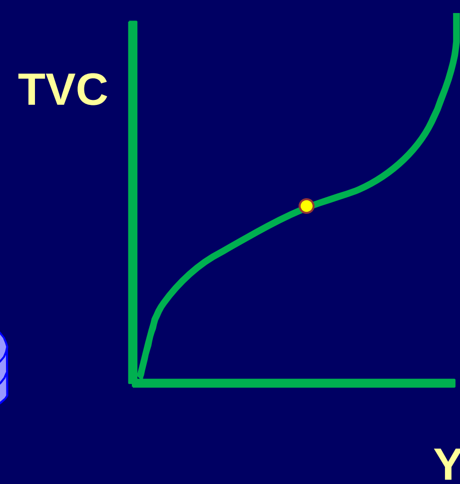
All Points of Intersection Between MFC and MVP that lie in Stage II of Production

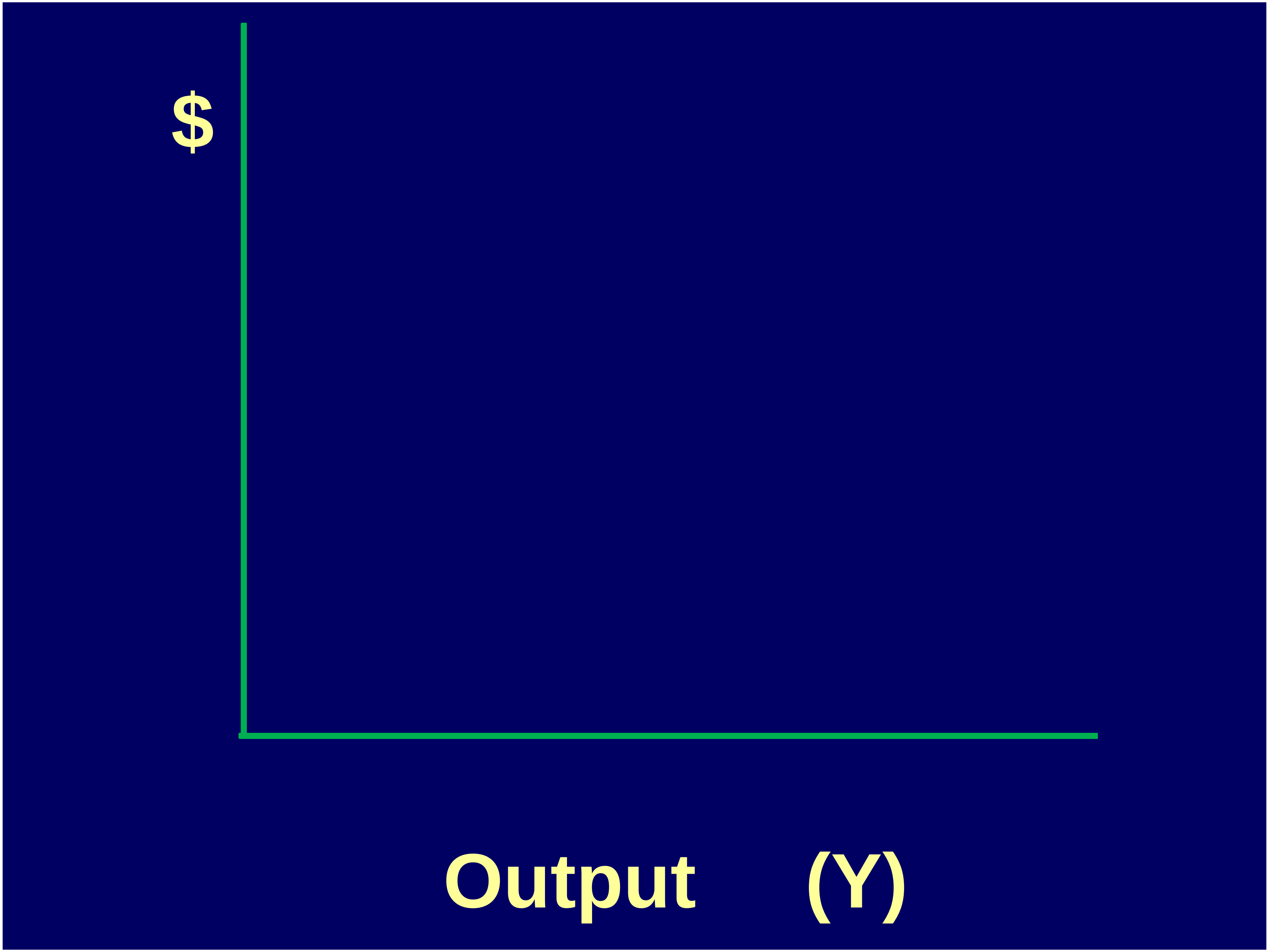
The Quantity of Input the Producer Would Use to Maximize Profits at Each Possible Input Price

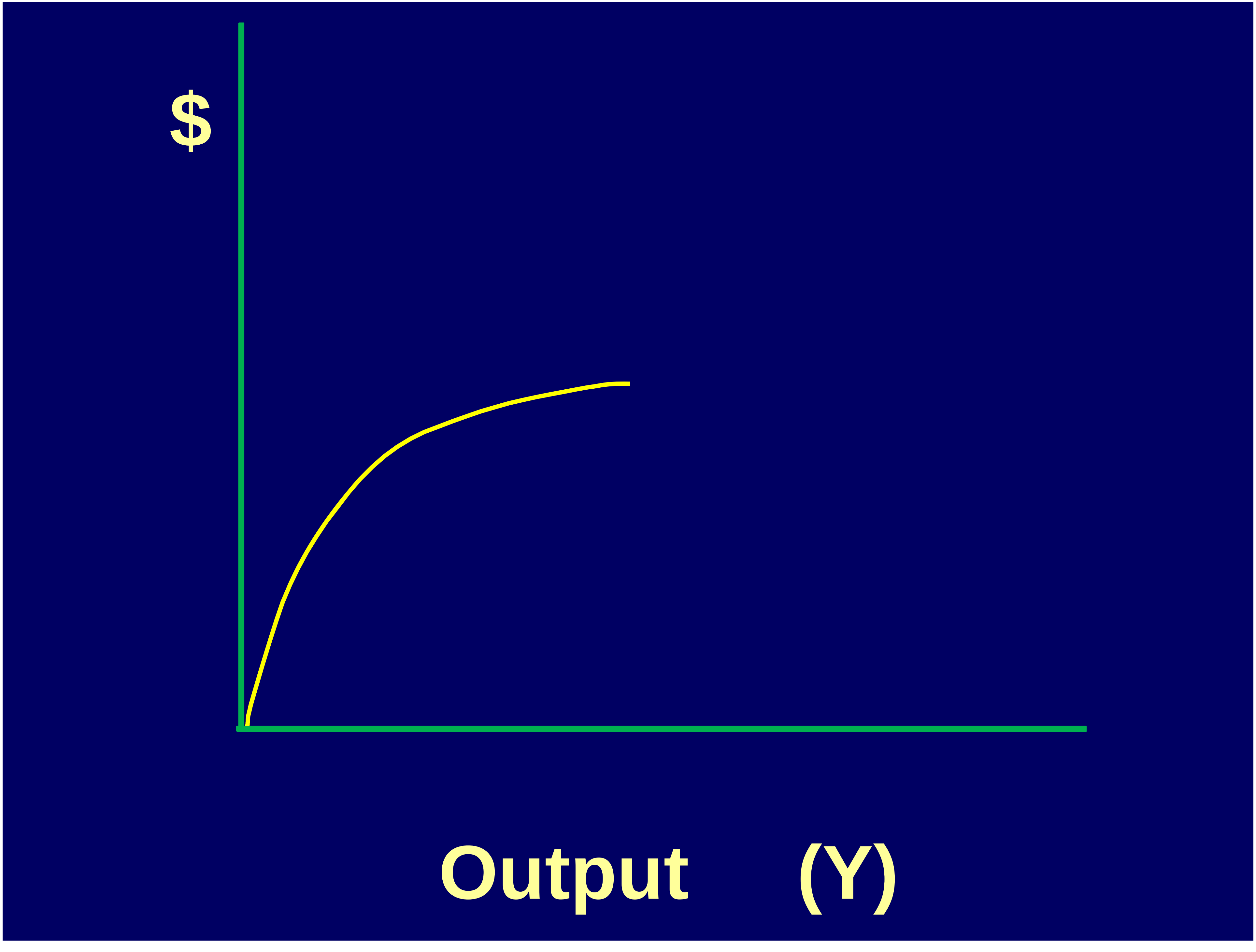
Costs of Production

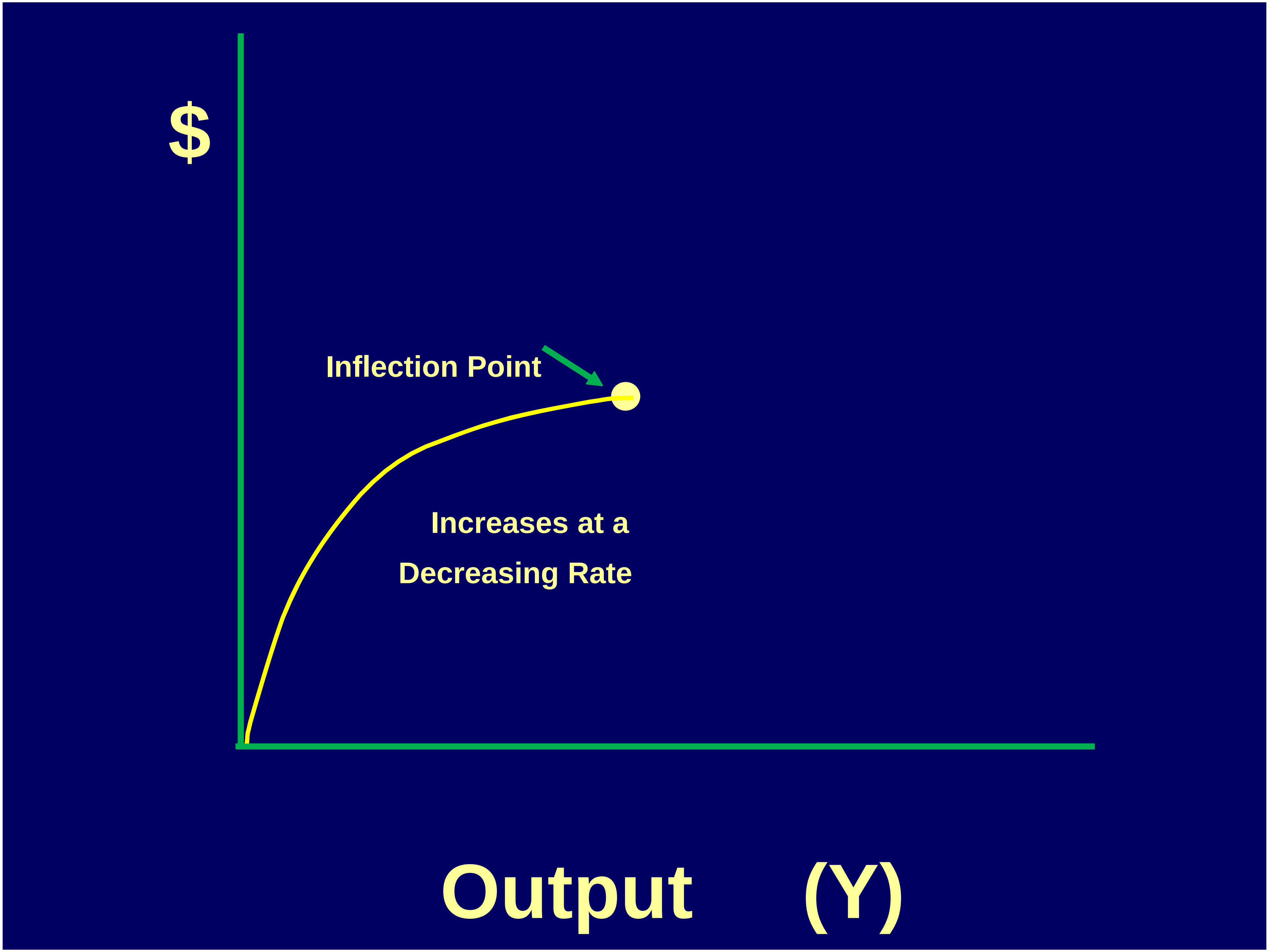
The Total Variable Cost Curve

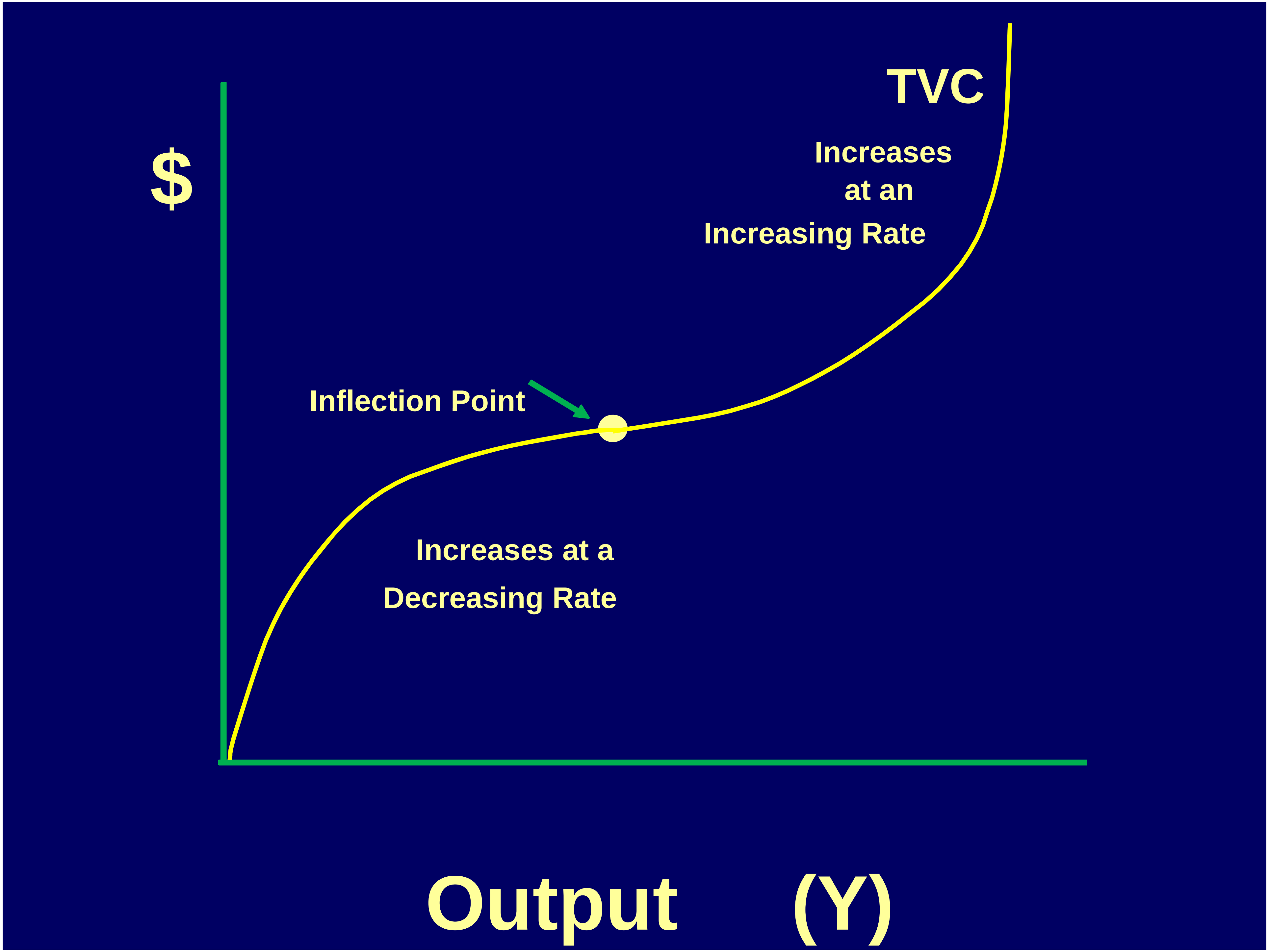




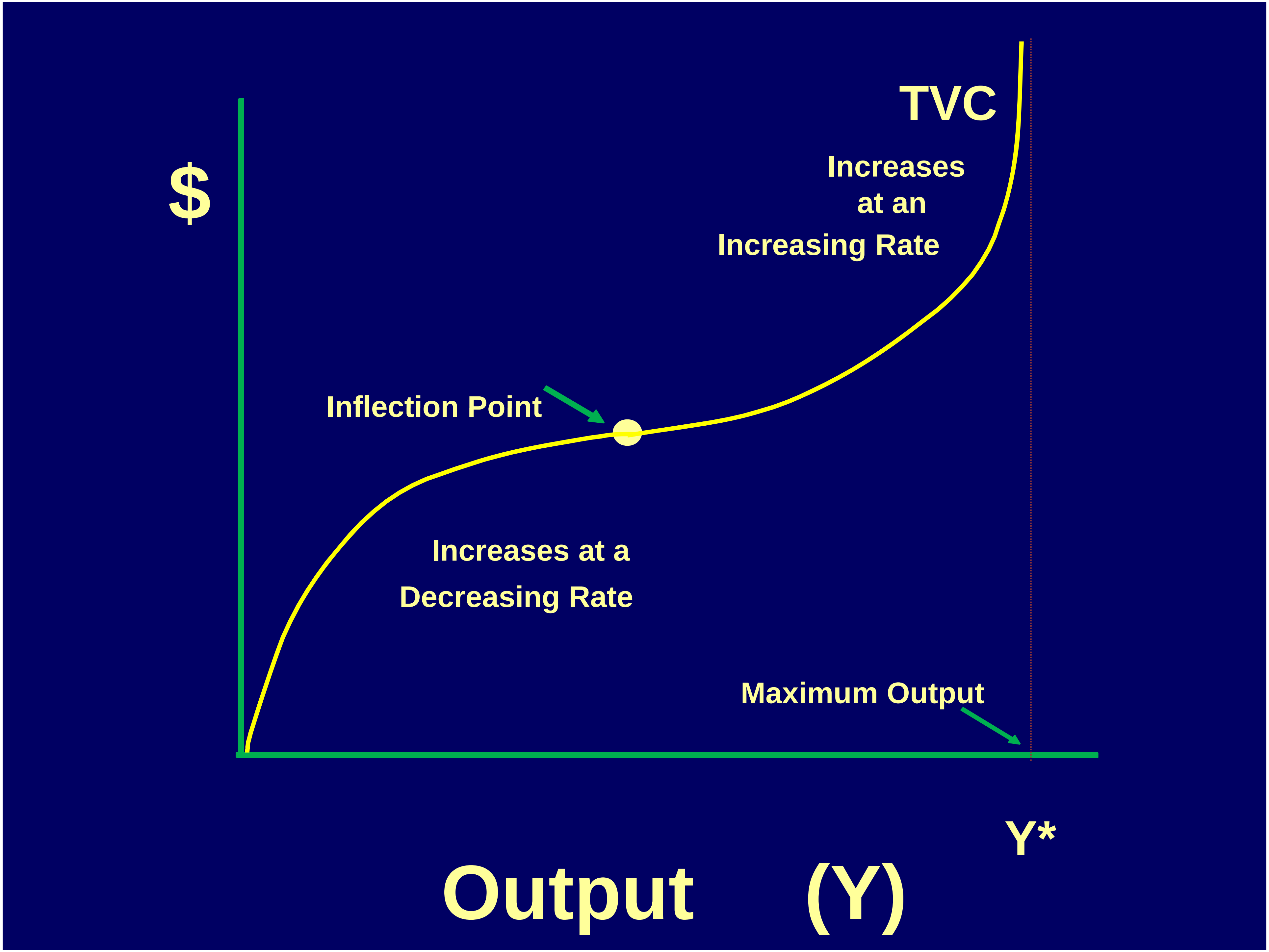

$
Output (Y)


$
Output (Y)

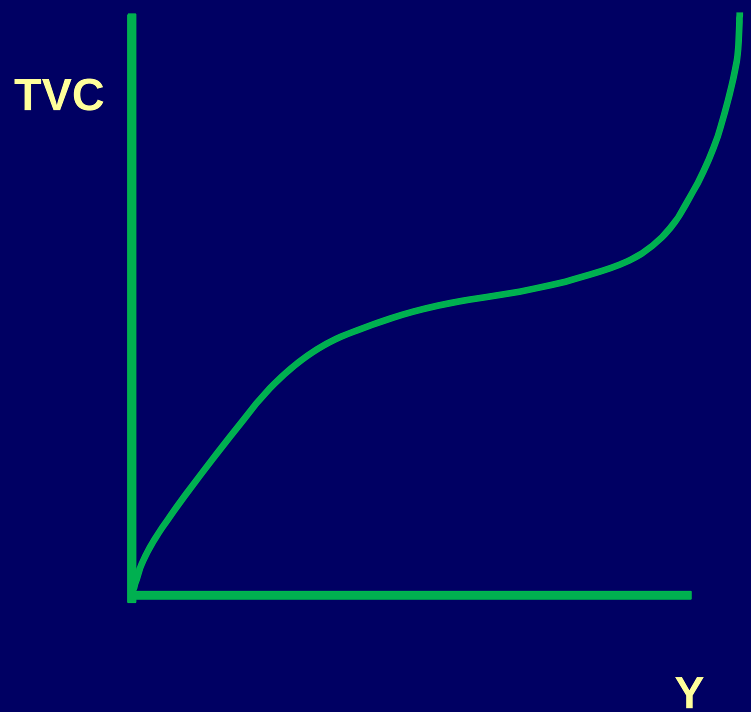

$
Inflection Point
Increases at a
Decreasing Rate
Output (Y)



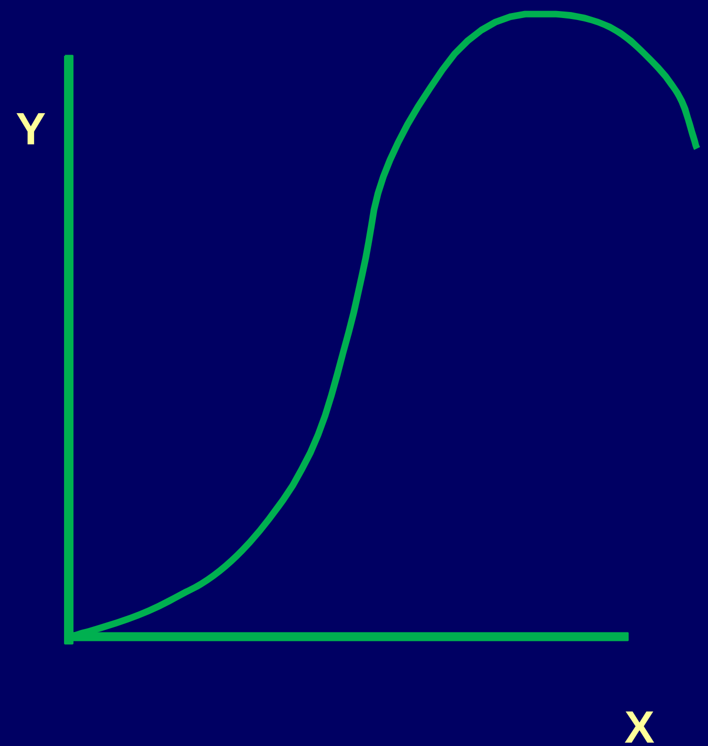
TVC
$
Increases
at an
Increasing Rate
Inflection Point
Increases at a
Decreasing Rate
Output (Y)


TVC
$
Increases
at an
Increasing Rate
Inflection Point
Increases at a
Decreasing Rate
Maximum Output
Y*
Output (Y)

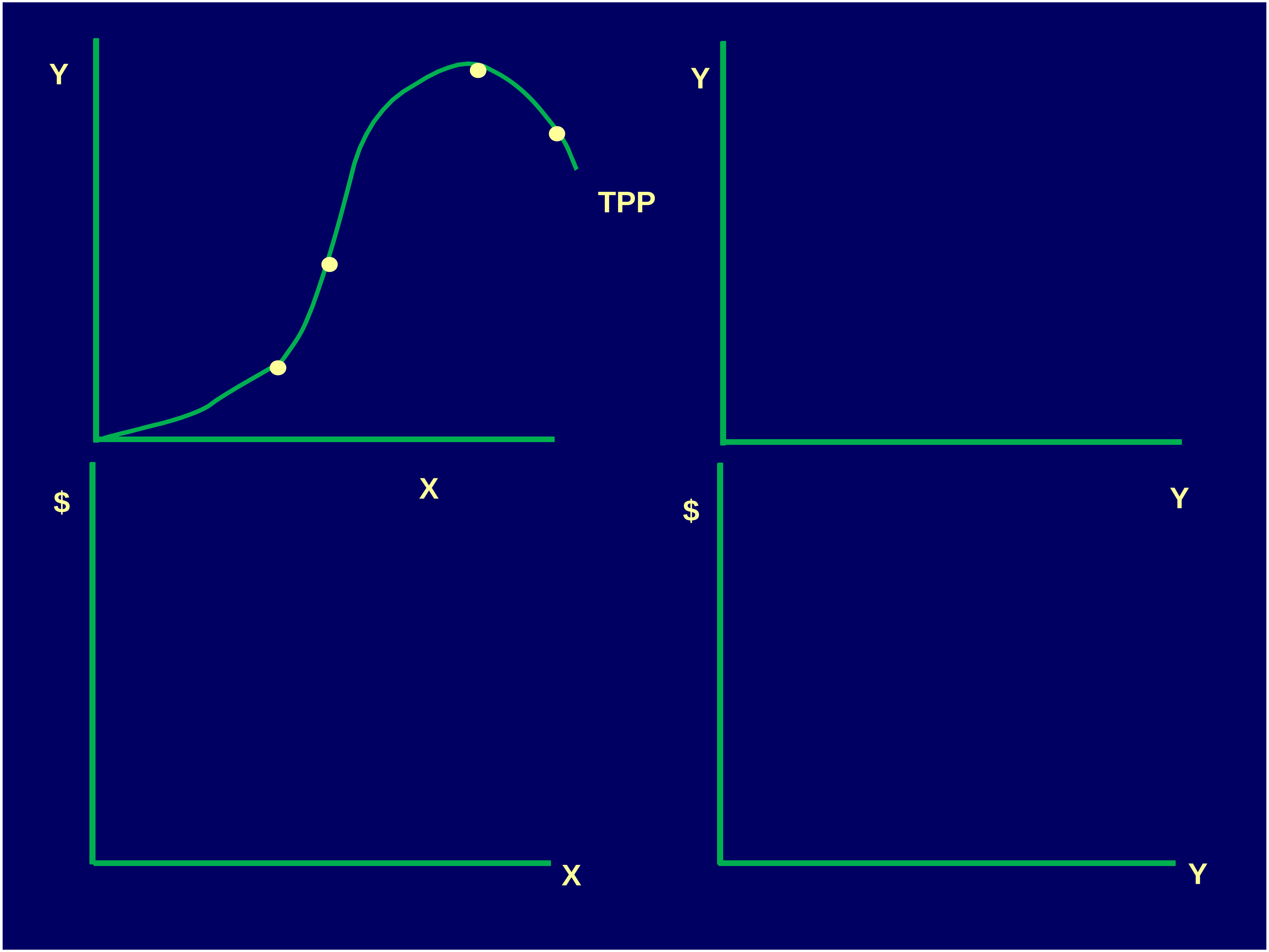
Links between TVC and the Production Function

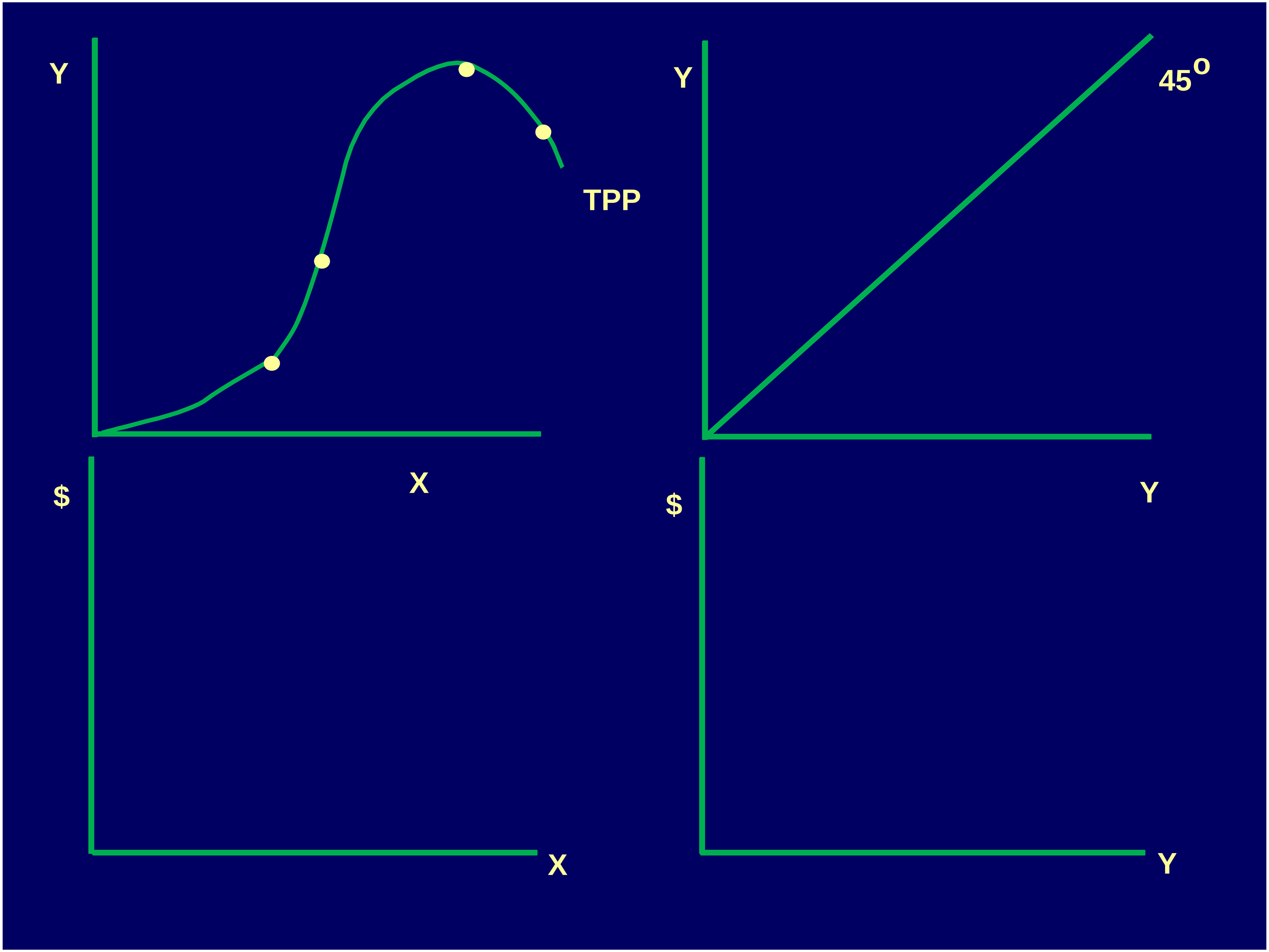


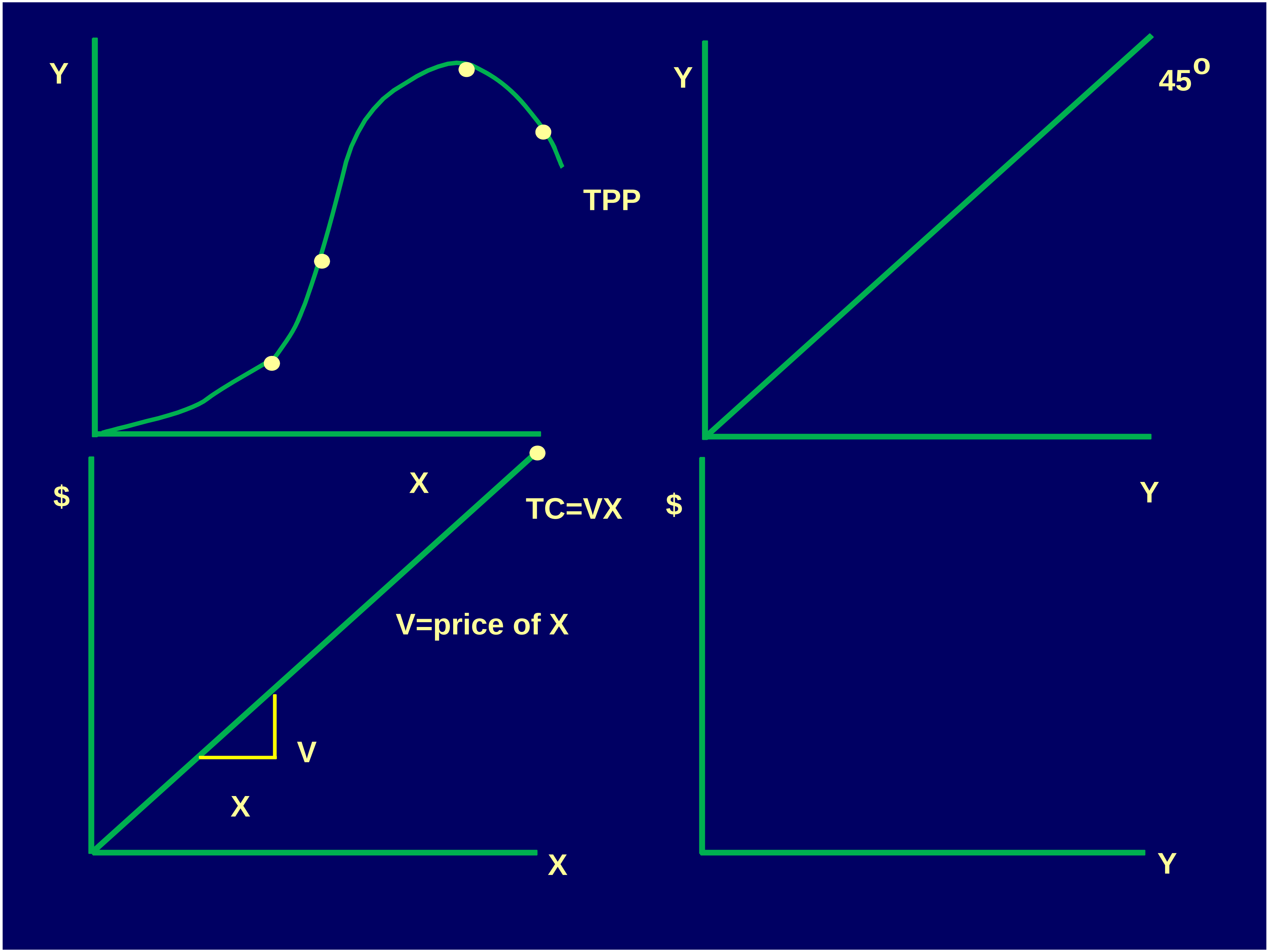
TVC Function

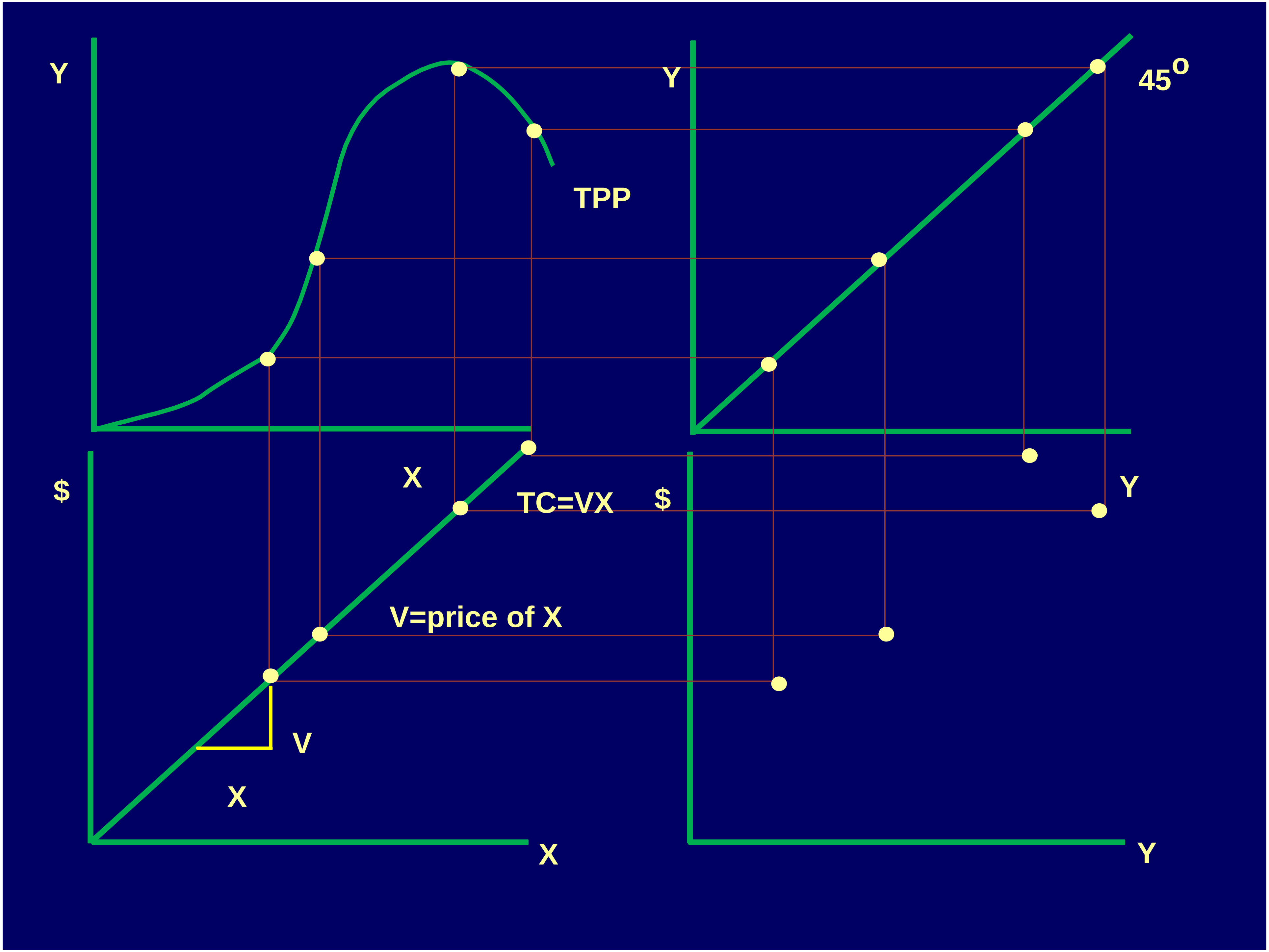


Production Function

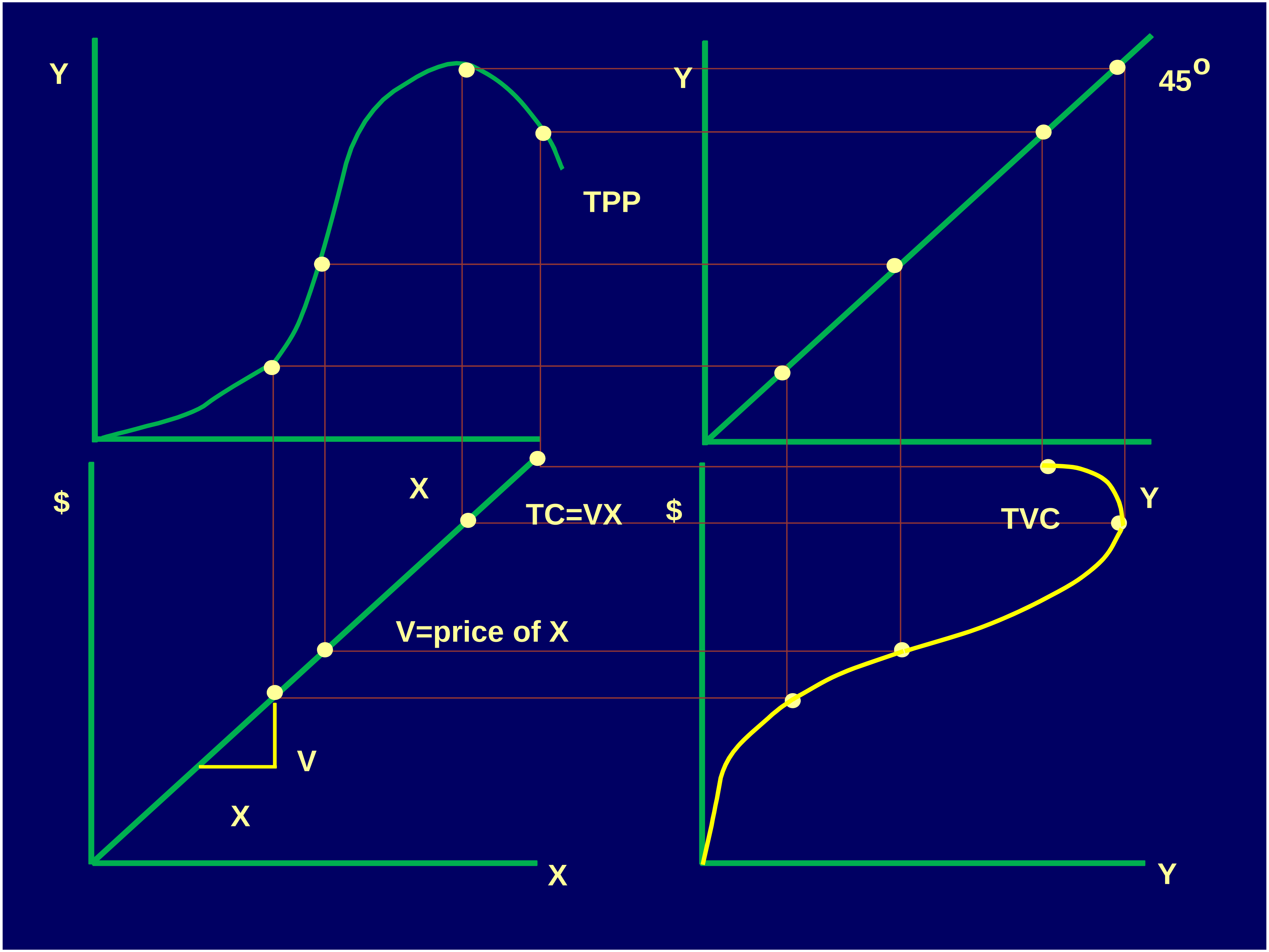

Y
TPP
X
Y
Y
$
X
$
Y


Y
TPP
X
Y
45°
Y
$
X
$
Y


Y
TPP
X
Y
45o
$
TC=VX
V=price of X
V
X
X
$
Y
Y



Y
TPP
Y
45O
X
$
TC=VX
$
Y
V=price of X
V
X
X
Y


Y
TPP
X
Y
45O
$
TC=VX
V=price of X
V
X
X
$
TVC
Y
Y

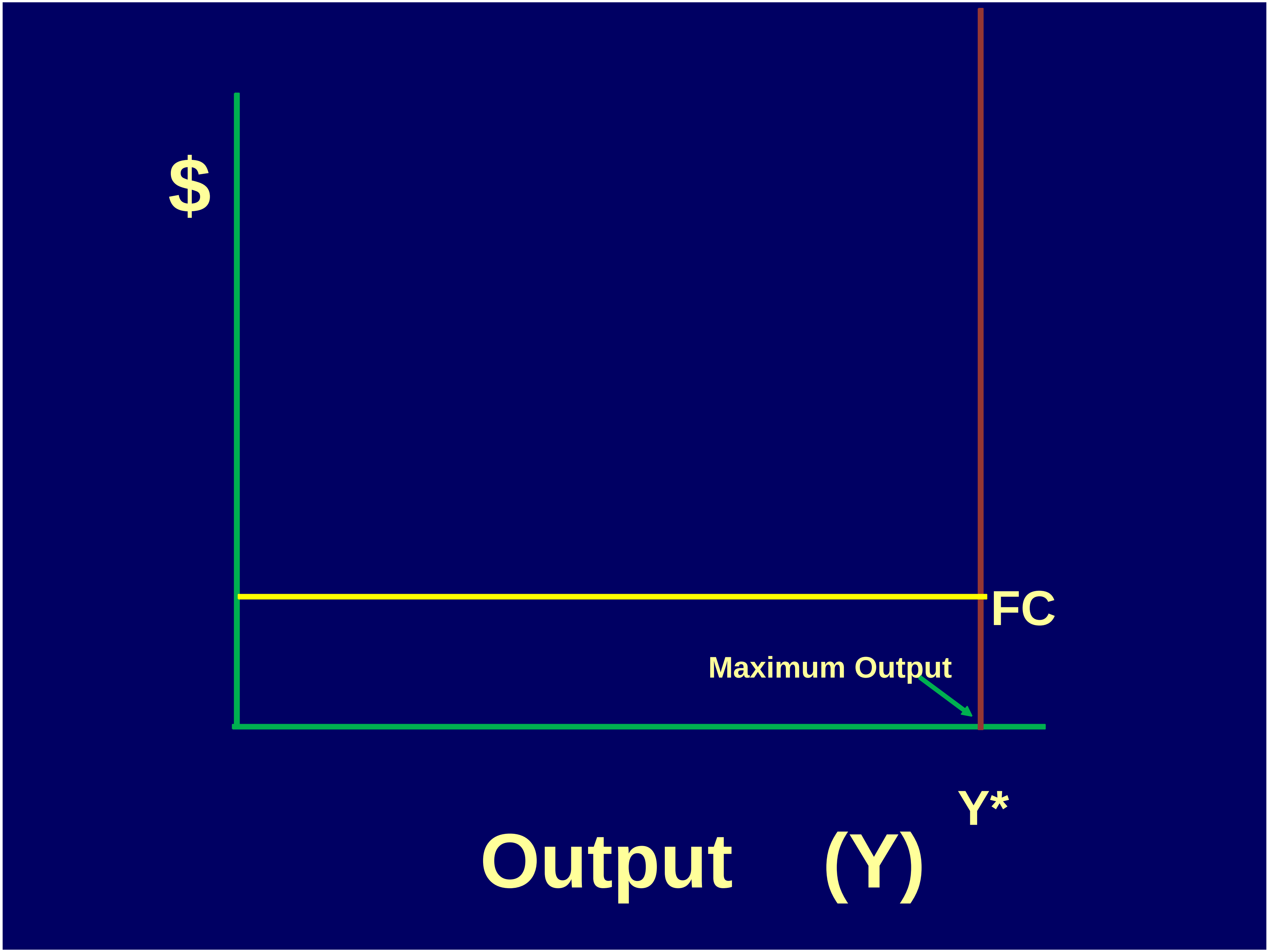
TVC is the Mirror Image of the Production Function

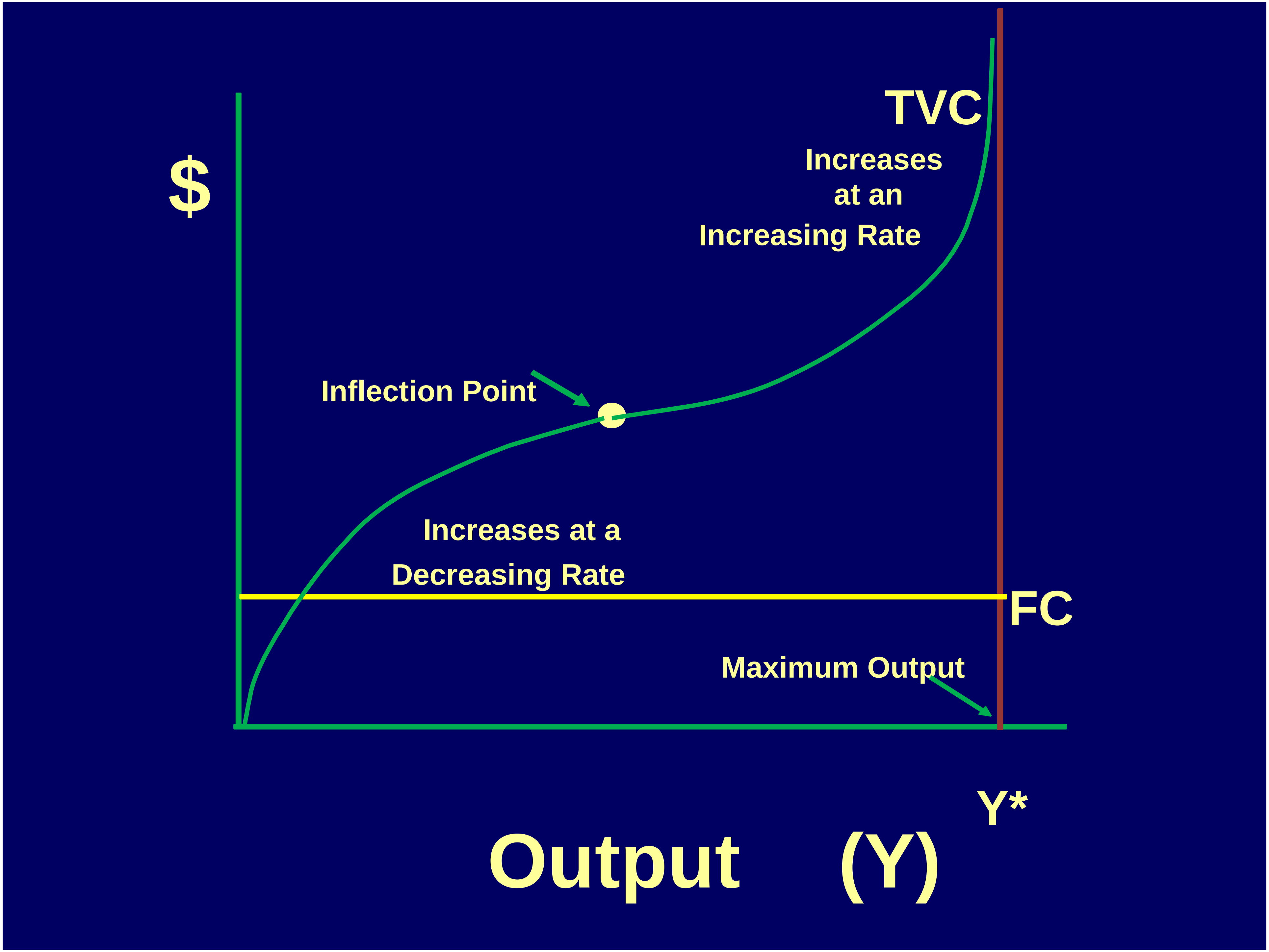
Now introduce Total Fixed Cost

Fixed Costs

Do Not Vary

with output


$
FC
Maximum Output
Y*
Output (Y)



$
TVC
Increases
at an
Increasing Rate
Inflection Point
Increases at a
Decreasing Rate
FC
Maximum Output
Y*
Output (Y)

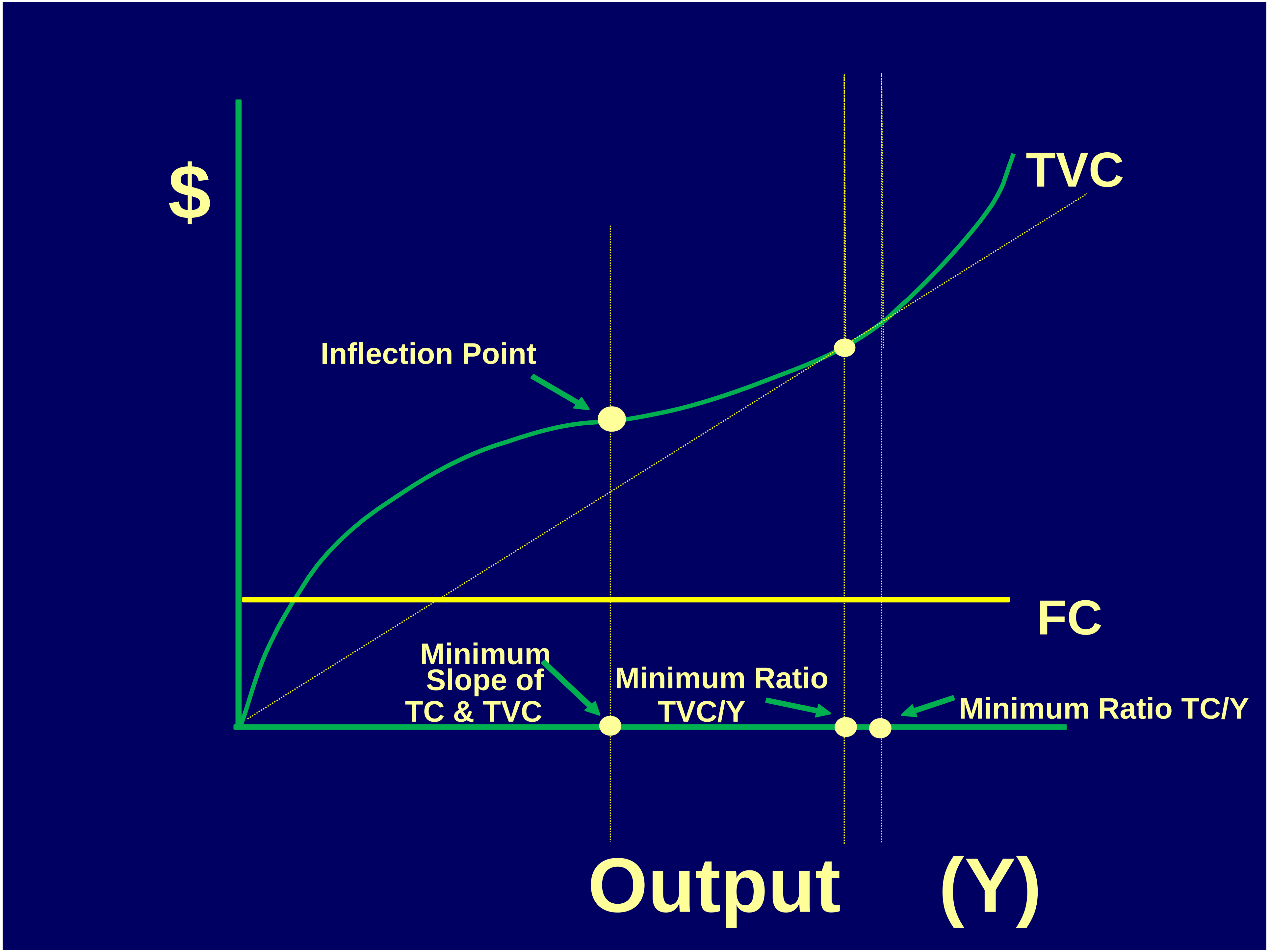
Total Cost =

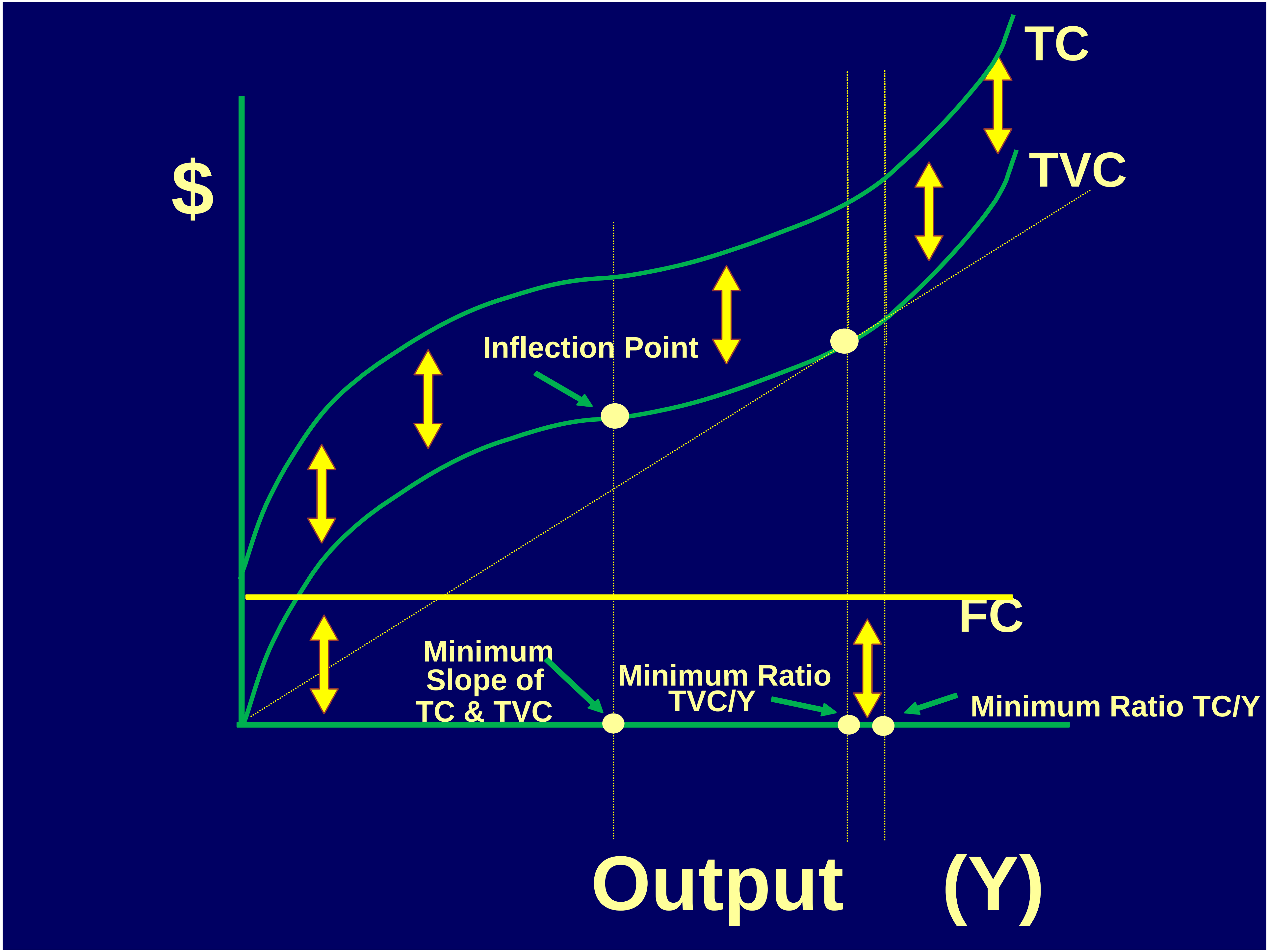
Total Variable Cost

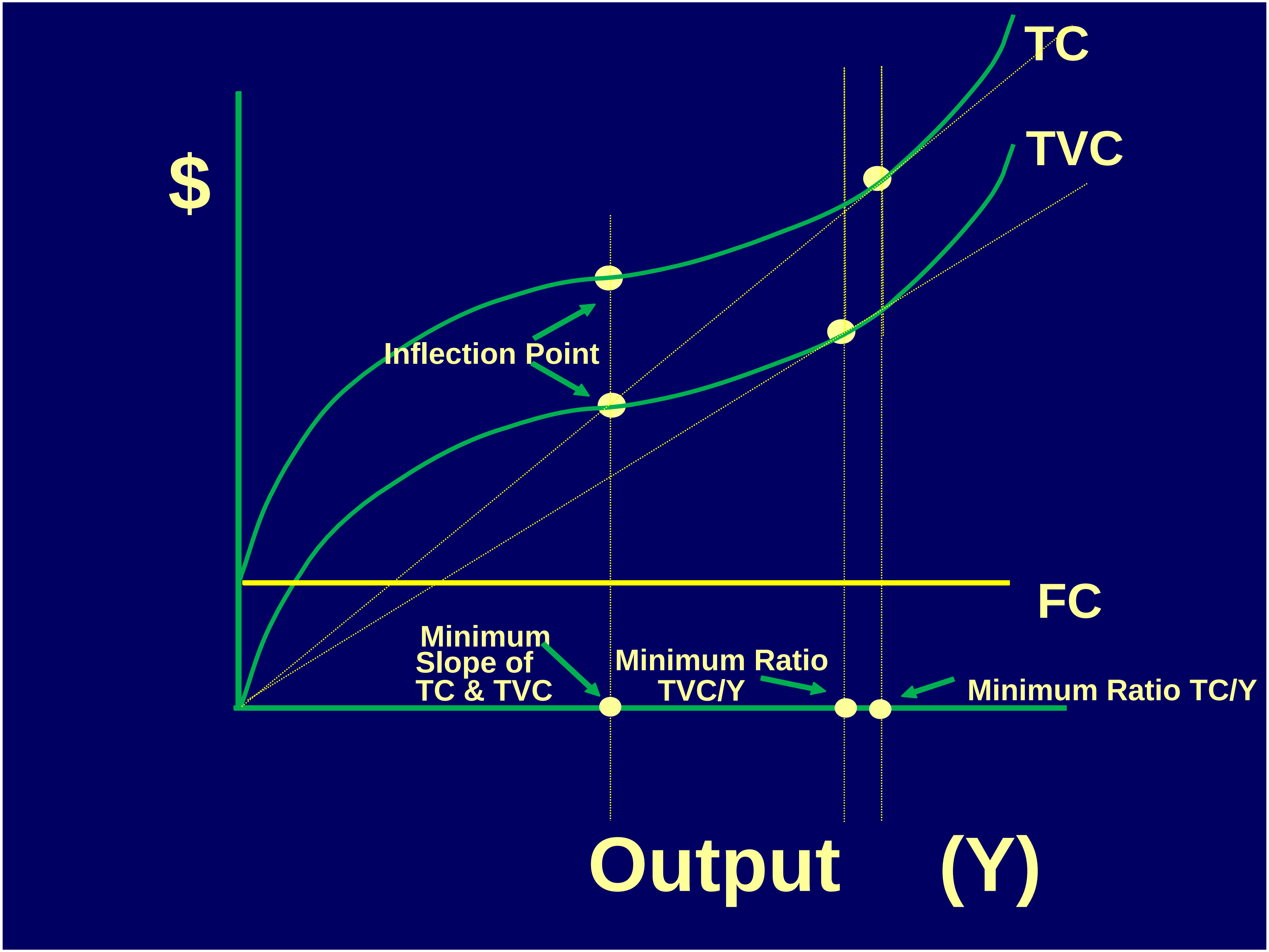
+ (Total) Fixed Cost

TC = TVC + (T)FC*

*leave off the T to avoid confusion with Total FACTOR Cost


$
TVC
Inflection Point
FC
Minimum
Slope of
TC & TVC
Minimum Ratio
TVC/Y
Minimum Ratio TC/Y
Output (Y)


TC
TVC
$
Inflection Point
FC
Minimum
Slope of
TC & TVC
Minimum Ratio
TVC/Y
Minimum Ratio TC/Y
Output (Y)


TC
TVC
$
Inflection Point
FC
Minimum
Slope of
TC & TVC
Minimum Ratio
TVC/Y
Minimum Ratio TC/Y
Output (Y)

TC/Y = Average Cost = AC

TVC/Y =Average Variable Cost = AVC

Slope of TC or Slope of TVC

= Marginal Cost = MC

Marginal Cost (MC) =

Change in TC (or TVC)

divided by

Change in Output

$\Delta TC / \Delta Y$

This is the cost of the Incremental unit of output

Total Revenue (TR) =

Price (P) of output

times the quantity

of output (Y) produced

$$TR = P \cdot Y$$

Marginal Revenue (MR) =

Change in Total Revenue (ΔTR)

divided by

Change in Output (ΔY)

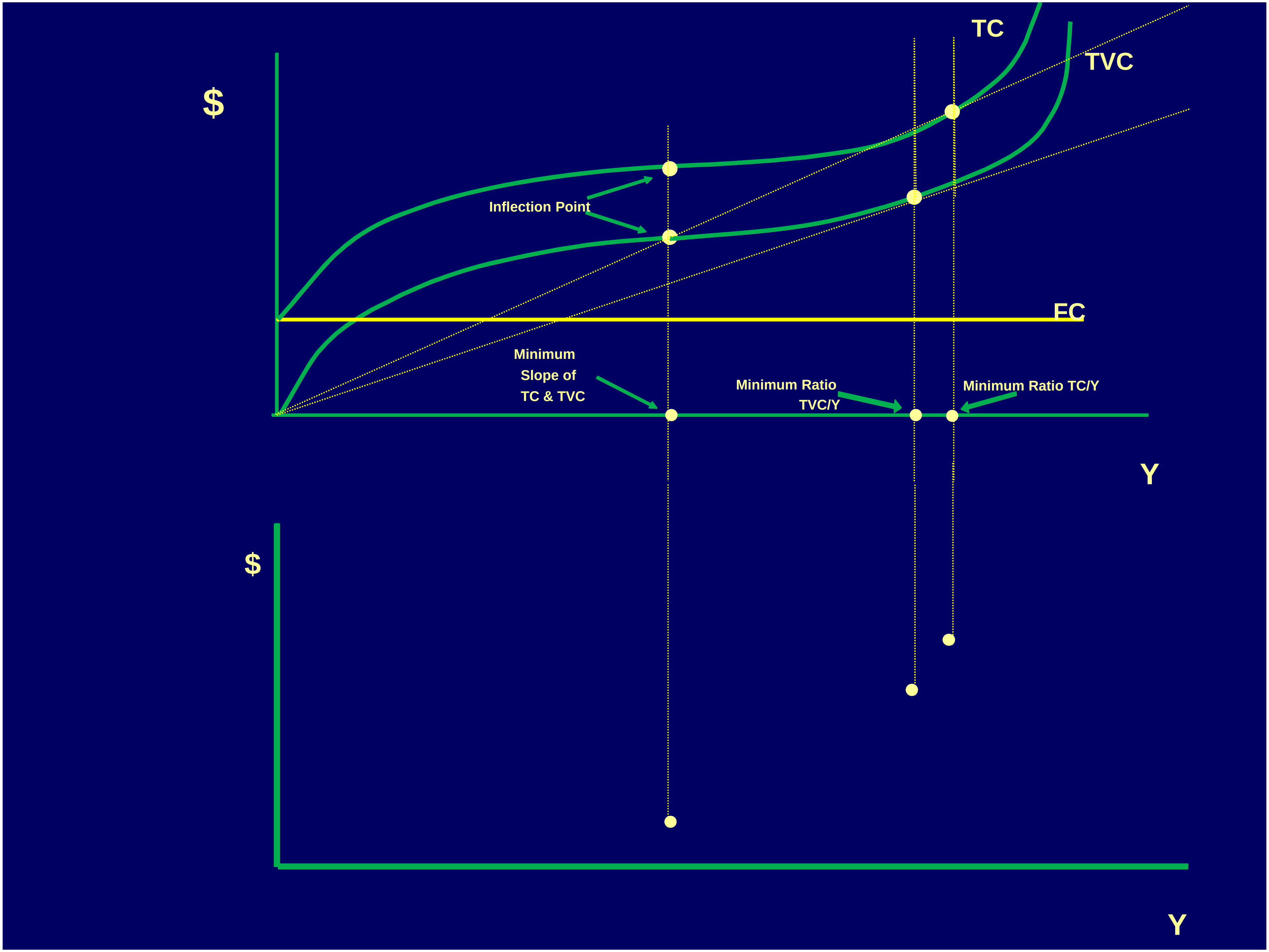
$\Delta TR / \Delta Y$

This is the return from the incremental unit of output

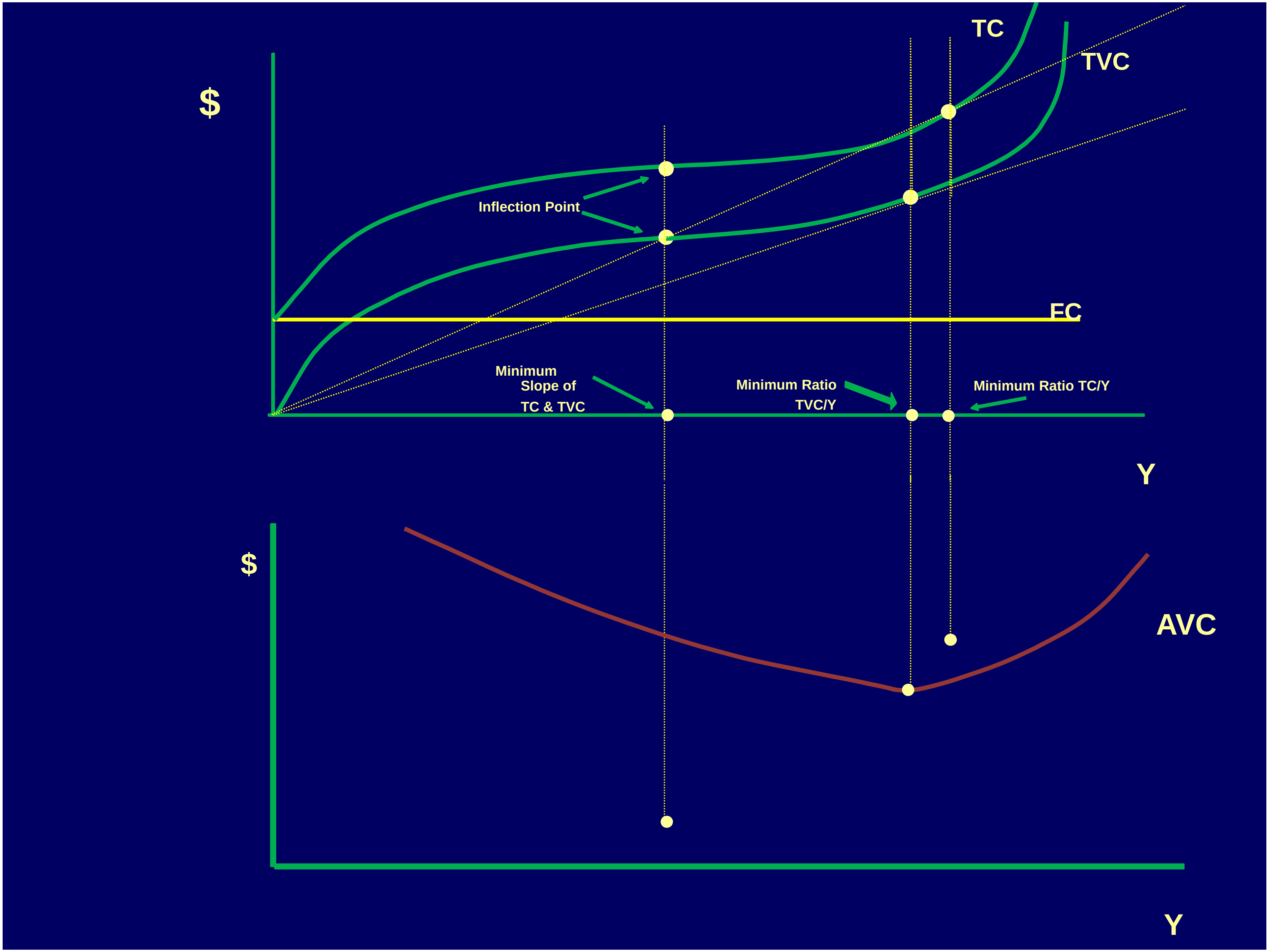
If the Product Price is Constant
then Marginal Revenue is Constant

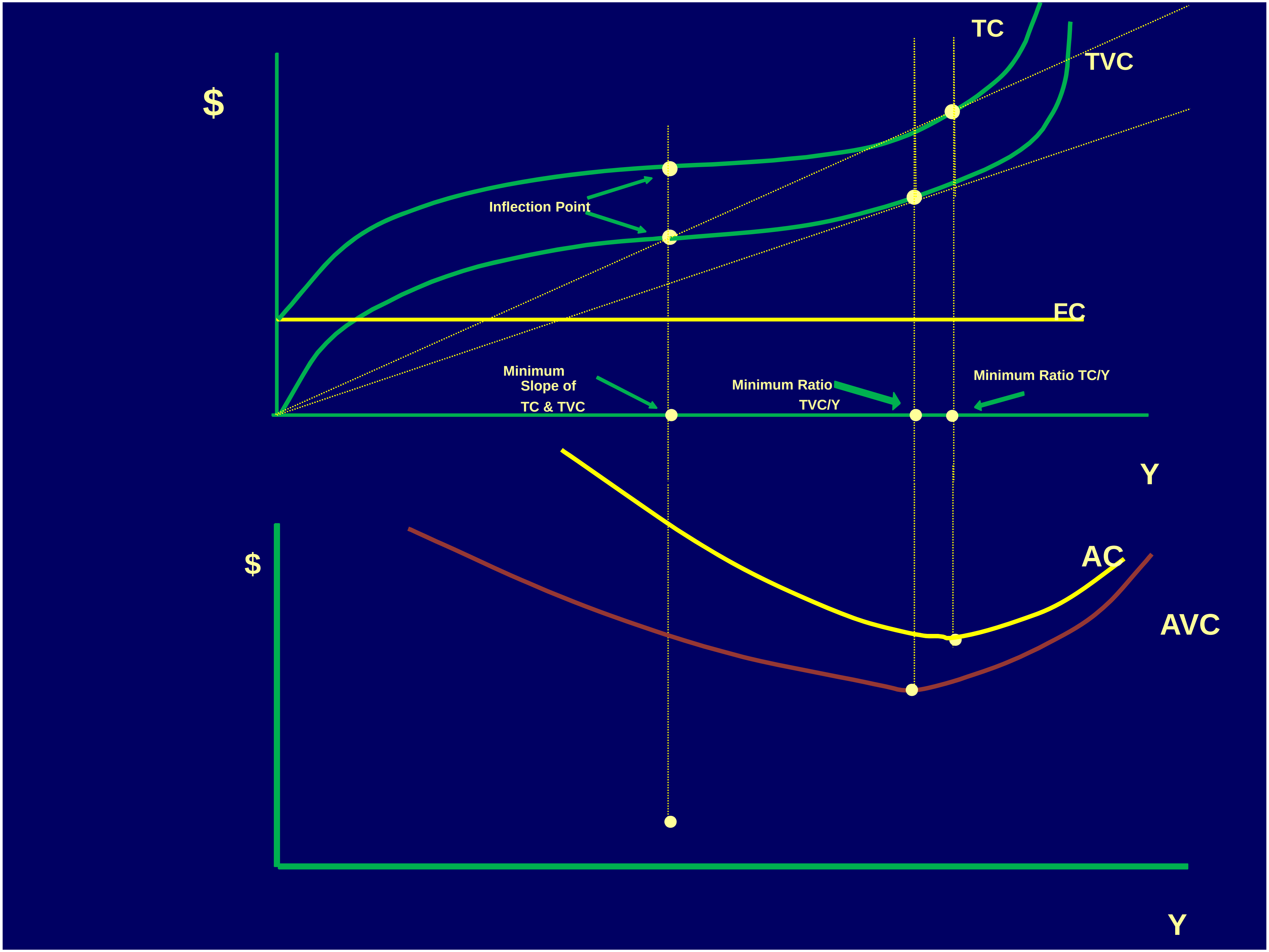
The producer can sell
as much or as little as he wants
at the going market price!

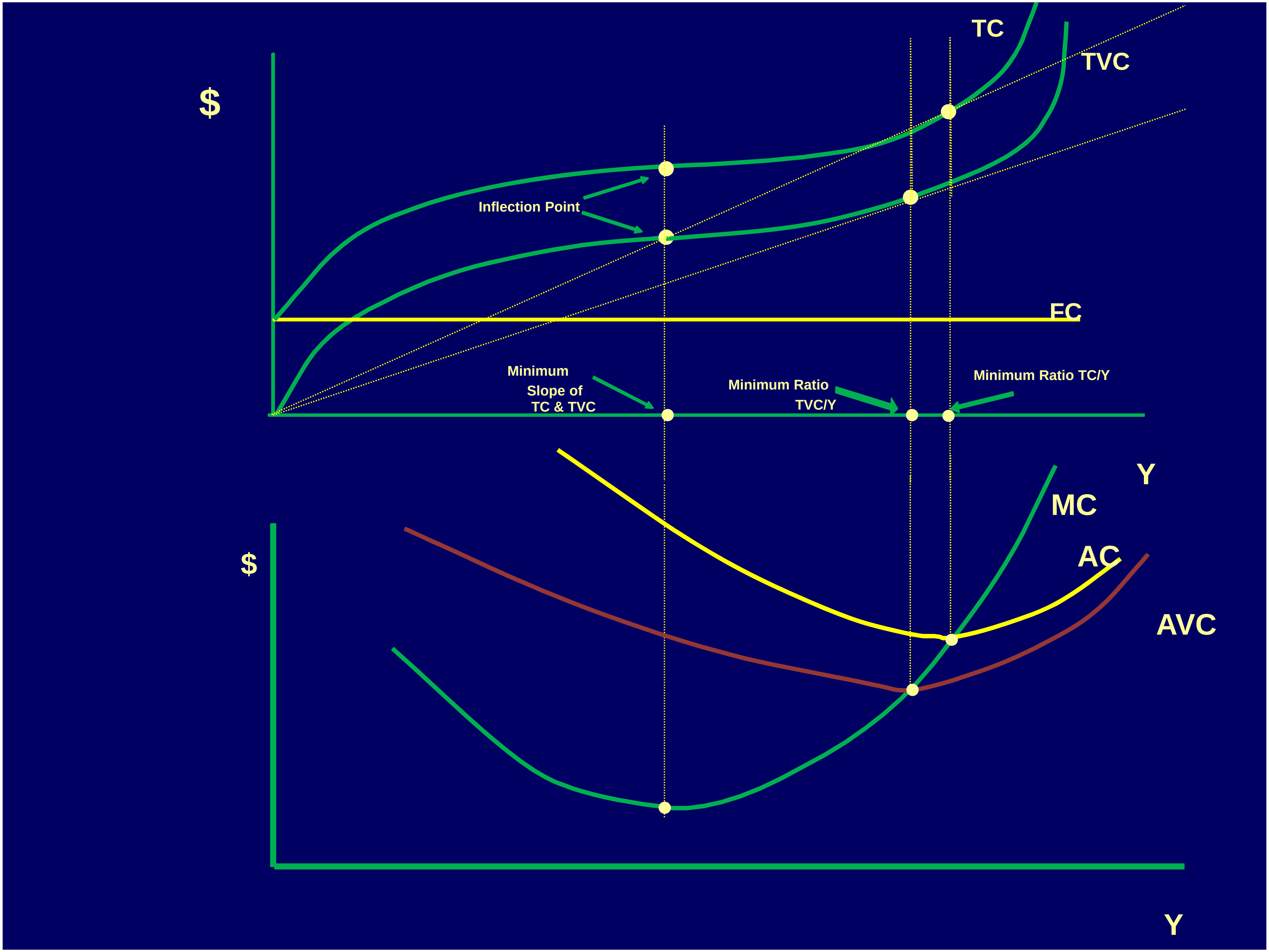
Farmers are Price-Takers



$
TC
TVC
Inflection Point
FC
Minimum
Slope of
TC & TVC
Minimum Ratio
TVC/Y
Minimum Ratio TC/Y
Y
$
Y


TC
TVC
$
Inflection Point
FC
Minimum
Slope of
TC & TVC
Minimum Ratio
TVC/Y
Minimum Ratio TC/Y
Y
$
AVC
Y


TC
TVC
$
Inflection Point
FC
Minimum
Slope of
TC & TVC
Minimum Ratio
TVC/Y
Minimum Ratio TC/Y
Y
$
AC
AVC
Y



$
TC
TVC
Inflection Point
FC
Minimum
Slope of
TC & TVC
Minimum Ratio
TVC/Y
Minimum Ratio TC/Y
Y
$
MC
AC
AVC
Y

Average Fixed Cost (AFC) = Total Fixed Cost (FC) divided by Output (Y)

AFC = FC/Y
FC is constant

As output increases:

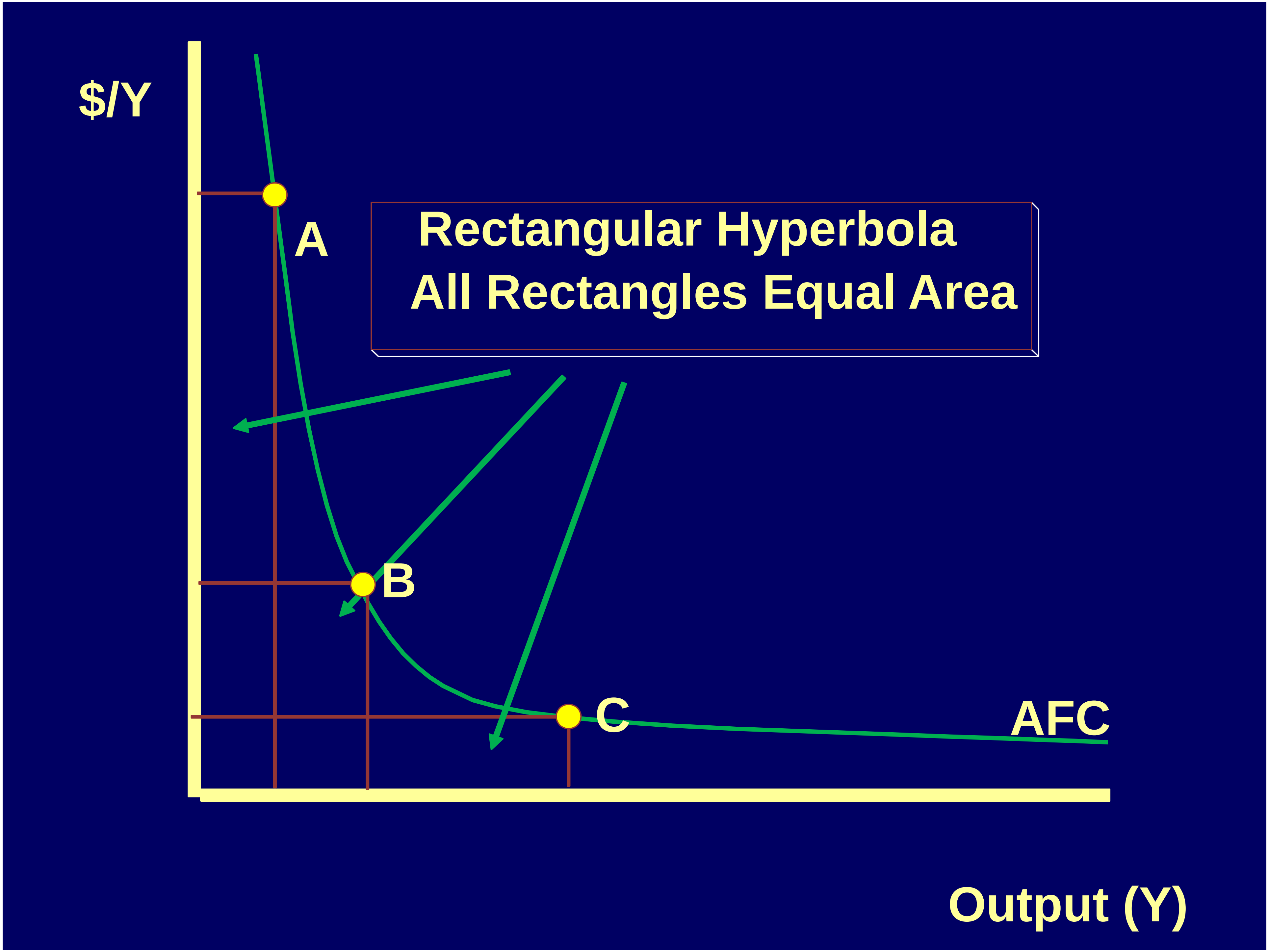
Y becomes larger and larger, and
AFC becomes smaller and smaller

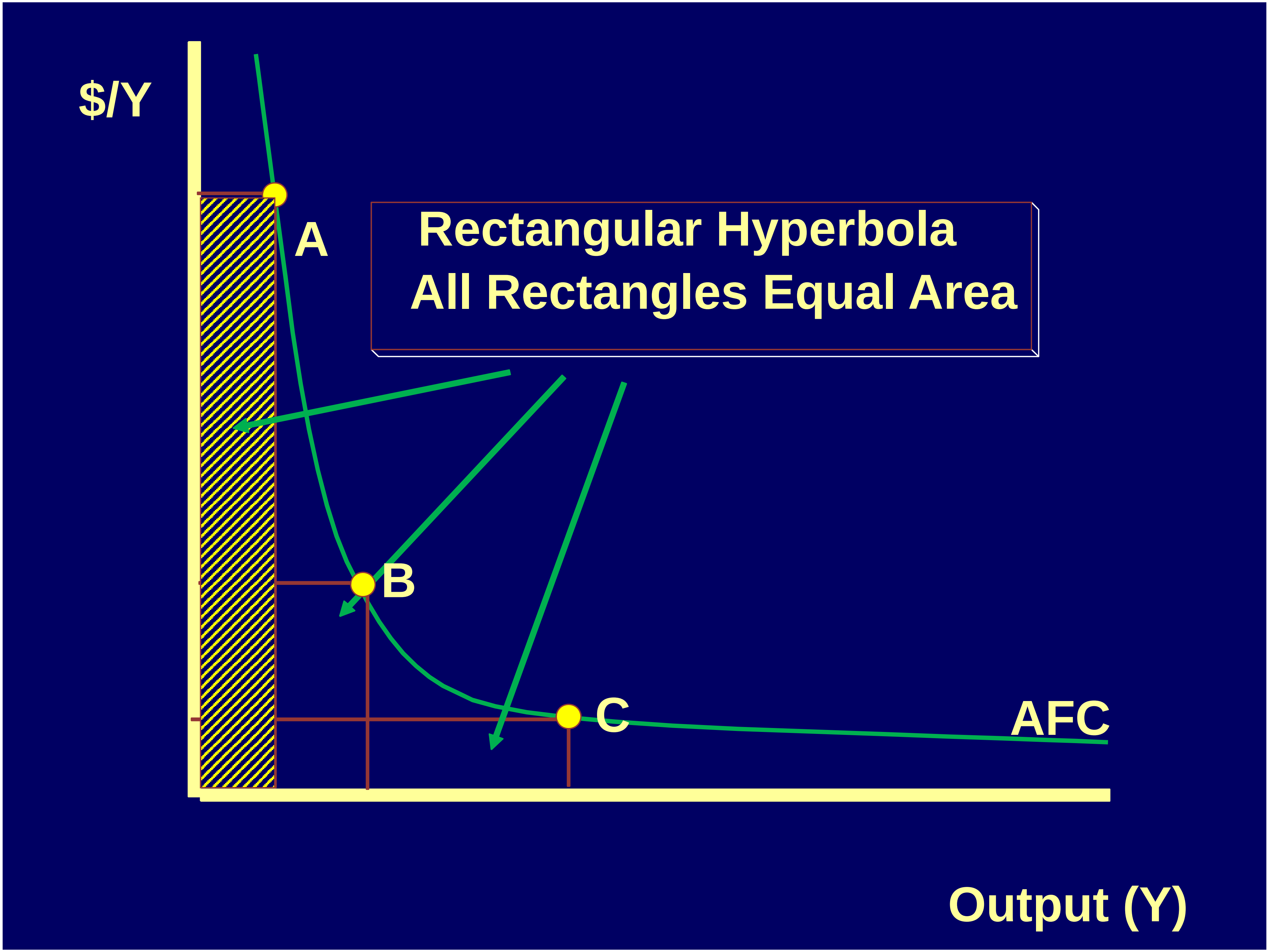
Form a rectangle, beginning with any point on the Average Fixed Cost curve.

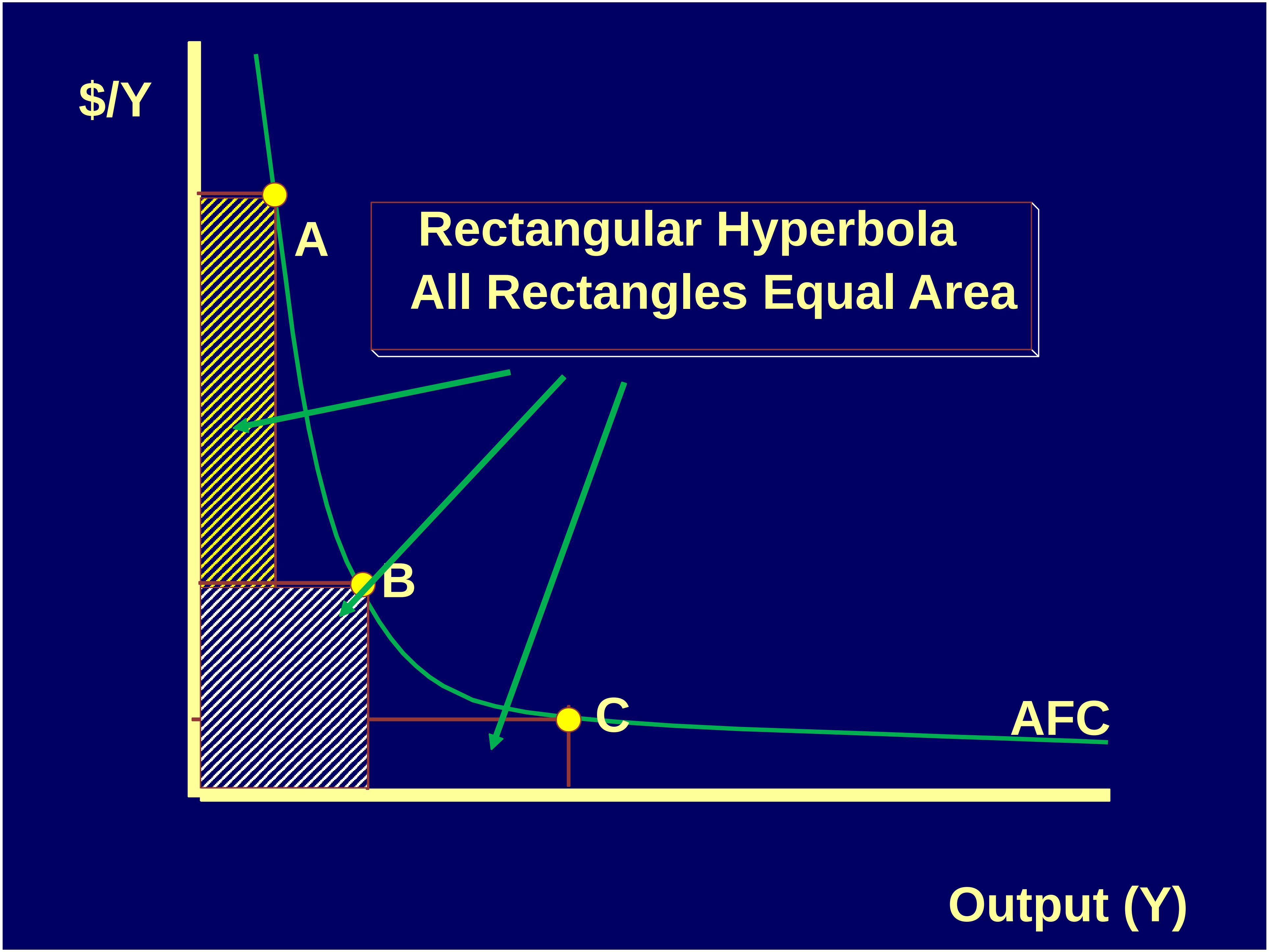
Points A, B, and C are examples.

The areas of each of the three rectangles shown are equal.

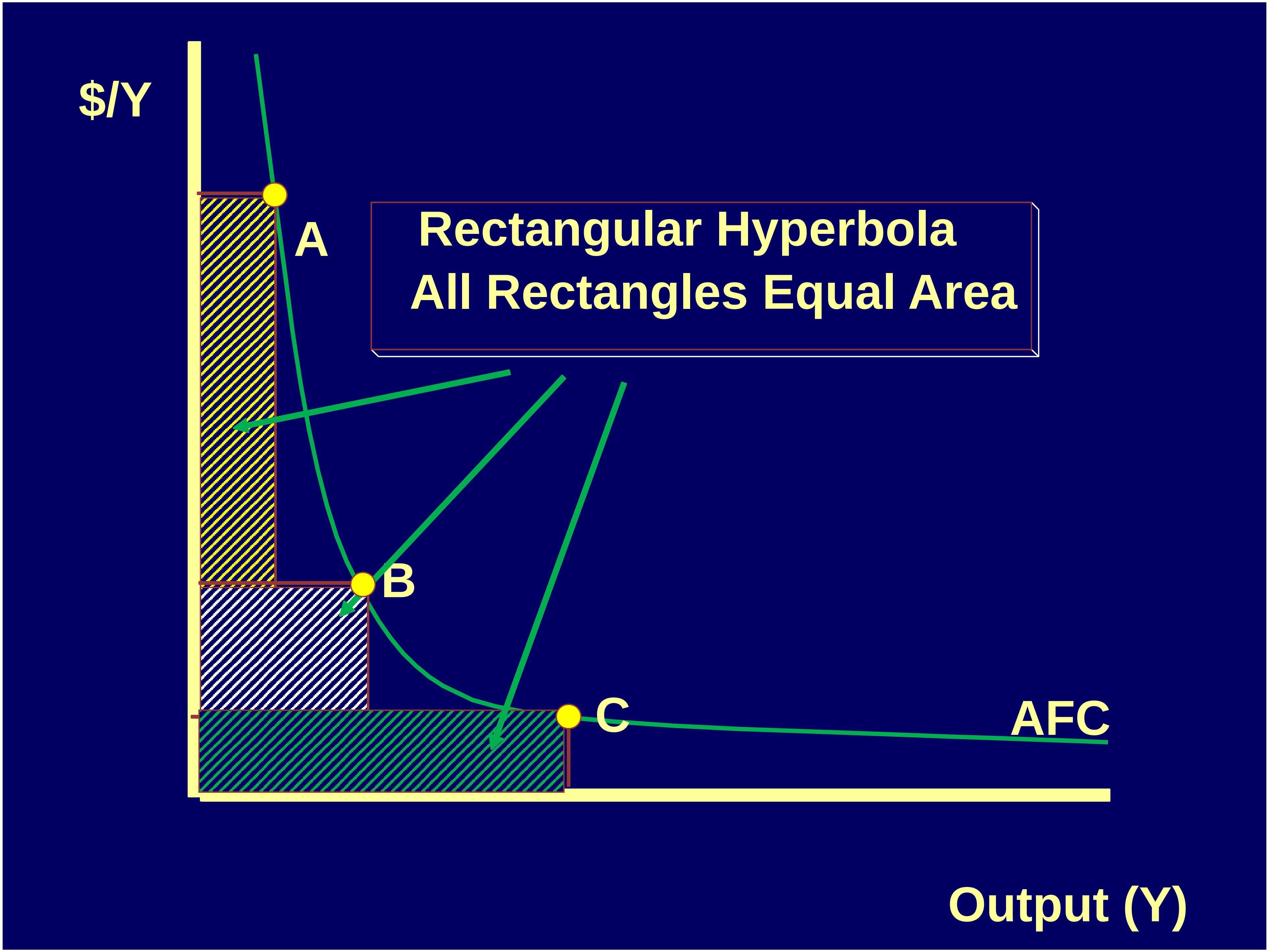
The area of each of these rectangles is equal to total Fixed Cost (FC).


$/Y
Rectangular Hyperbola
All Rectangles Equal Area
A
B
C
AFC
Output (Y)

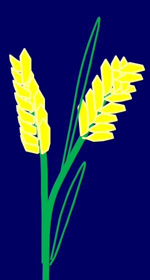

$/Y
Rectangular Hyperbola
All Rectangles Equal Area
A
B
C
AFC
Output (Y)

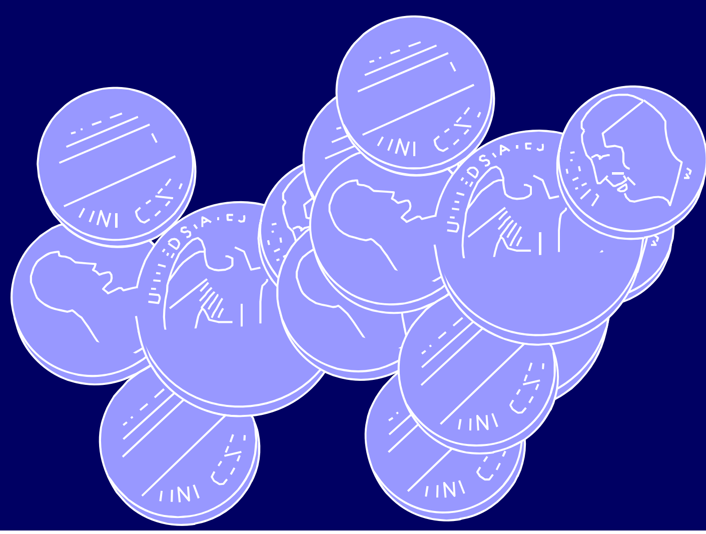


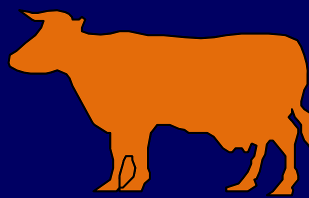
$/Y
Rectangular Hyperbola
All Rectangles Equal Area
A
B
C
AFC
Output (Y)

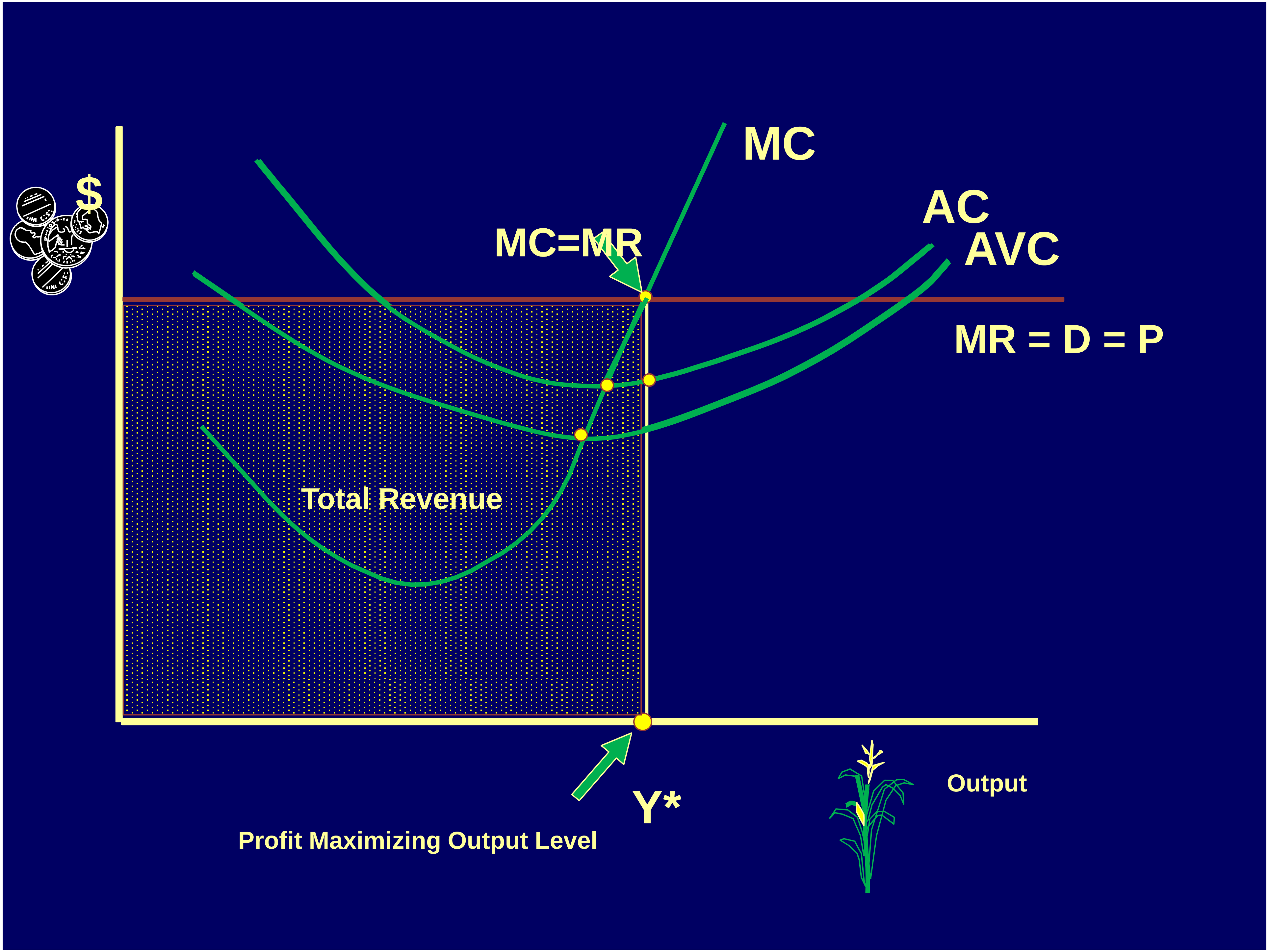

$/Y
Rectangular Hyperbola
All Rectangles Equal Area
A
B
C
AFC
Output (Y)

Profit Maximization: the Output Side

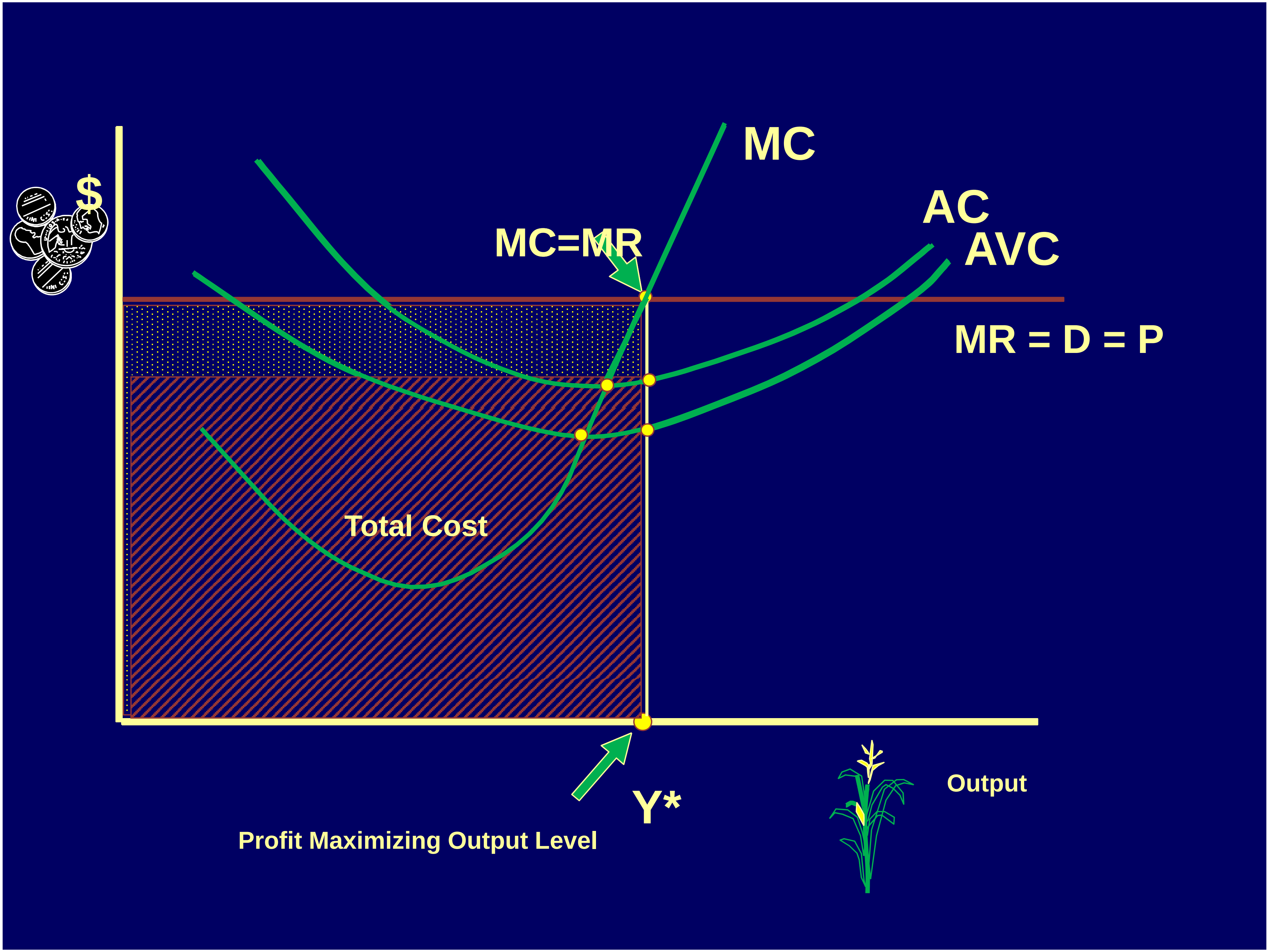


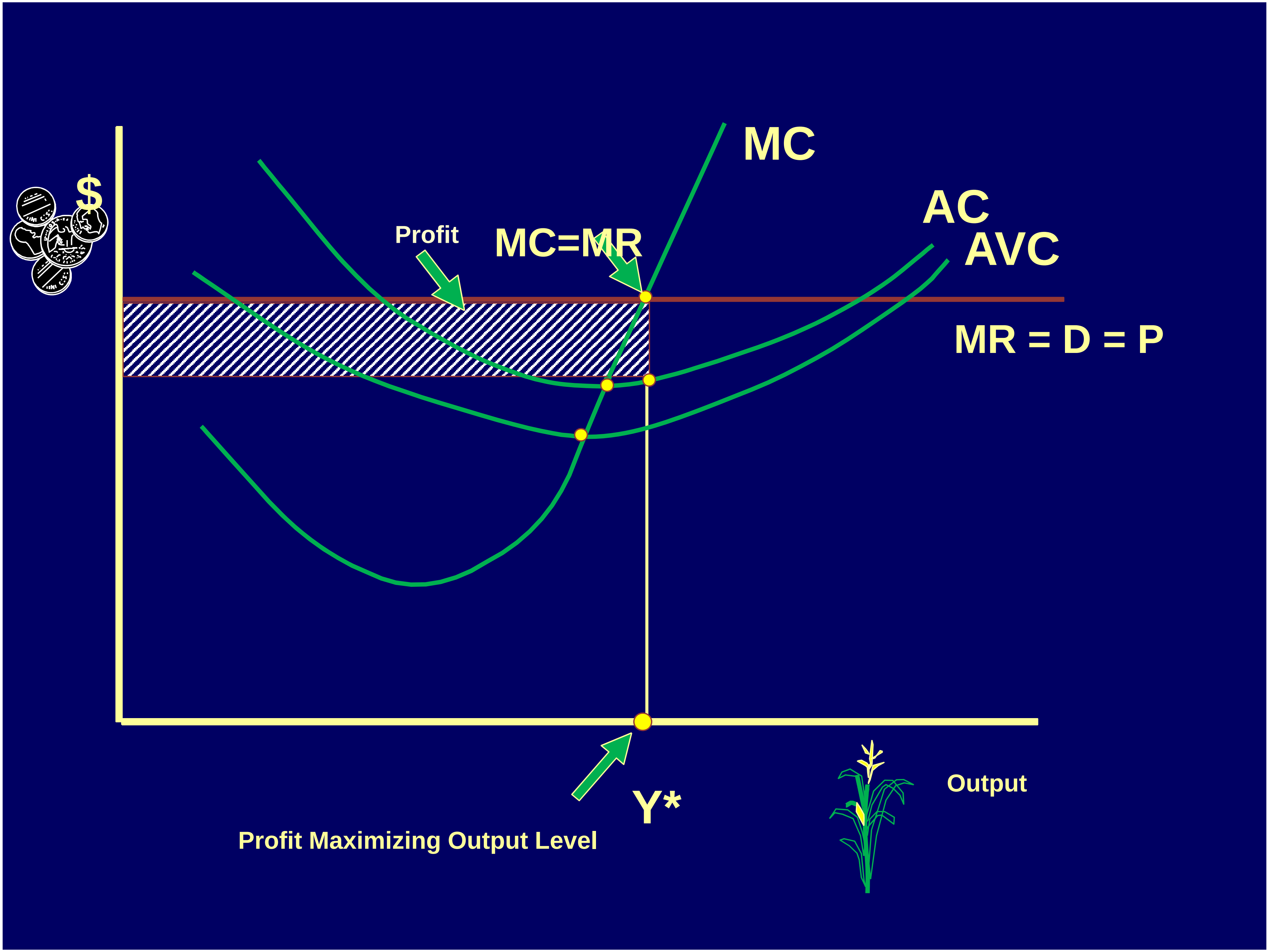






$
MC
AC
AVC
MC=MR
MR = D = P
Total Revenue
Y*
Output
Profit Maximizing Output Level


MC
$
AC
MC=MR
AVC
MR = D = P
Total Cost
Output
Y*
Profit Maximizing Output Level



$
MC
AC
AVC
Profit
MC=MR
MR = D = P
Y*
Output
Profit Maximizing Output Level

Classic Rule:

Profits are *Maximum*

when

Marginal Cost = Marginal Revenue

MC=MR

Profit Maximizing
Level of
Output Y
where
Marginal Cost = Marginal Revenue

MC=MR

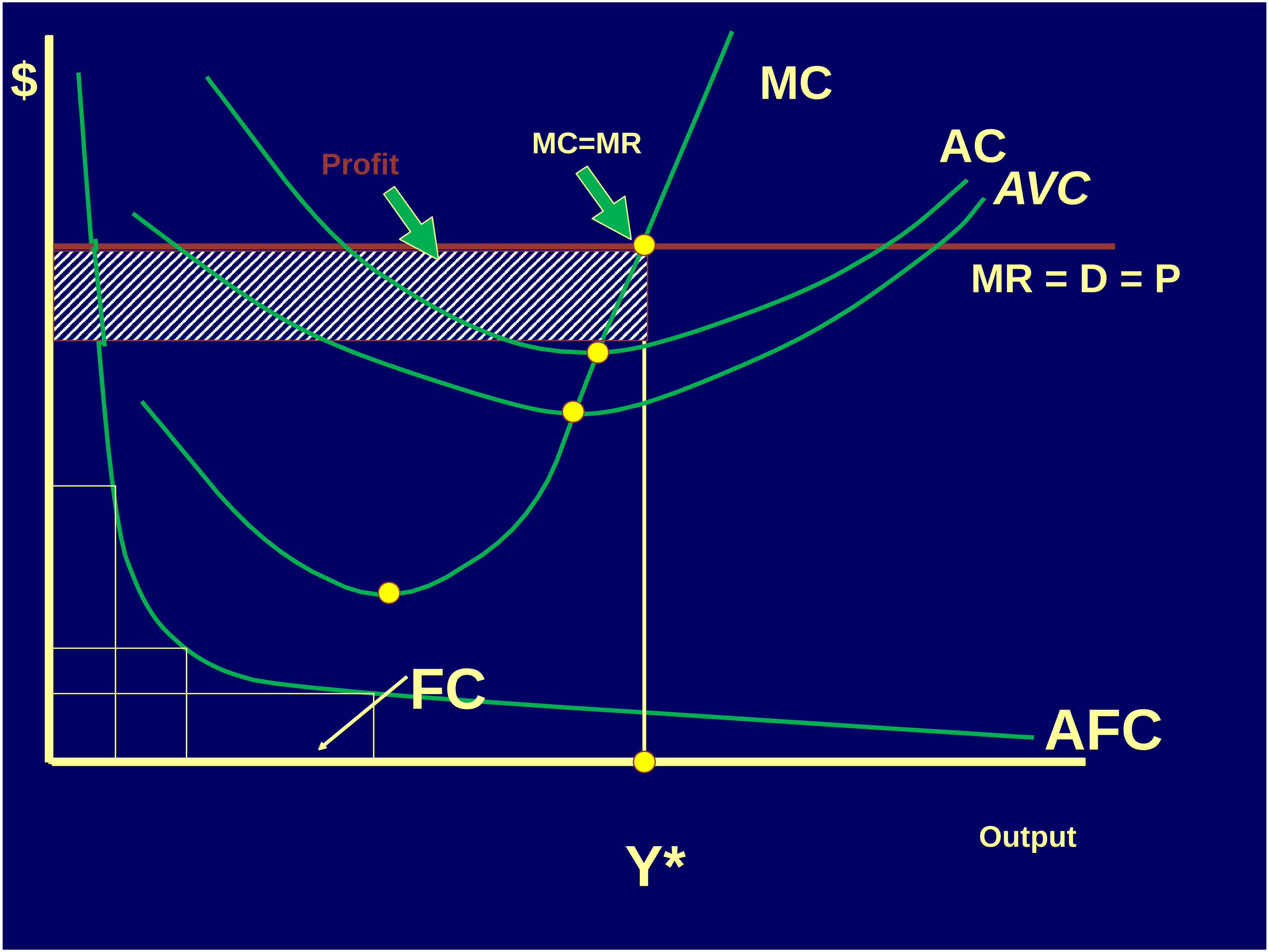
Impacts of Changing Product Prices

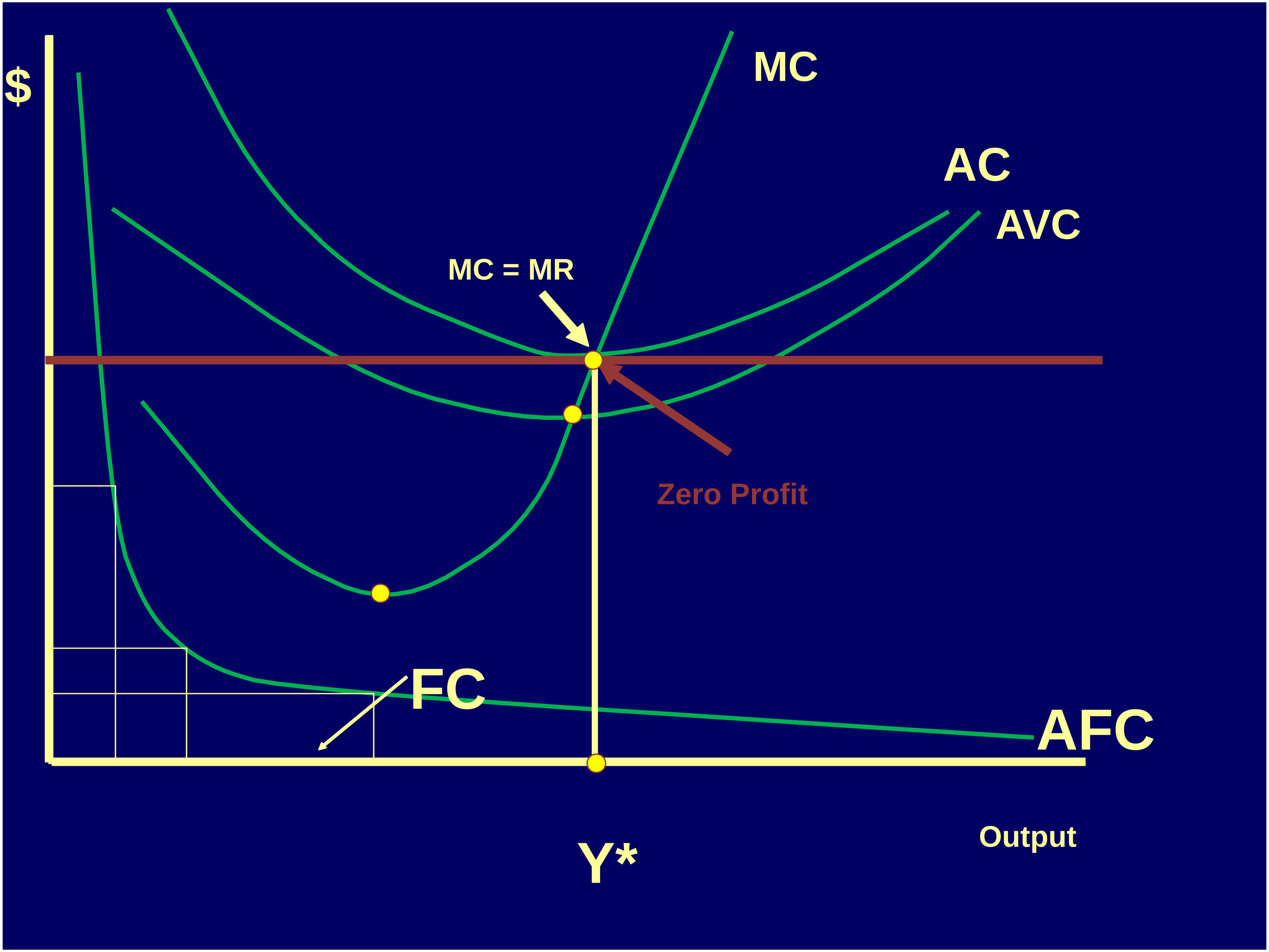
Assumption:

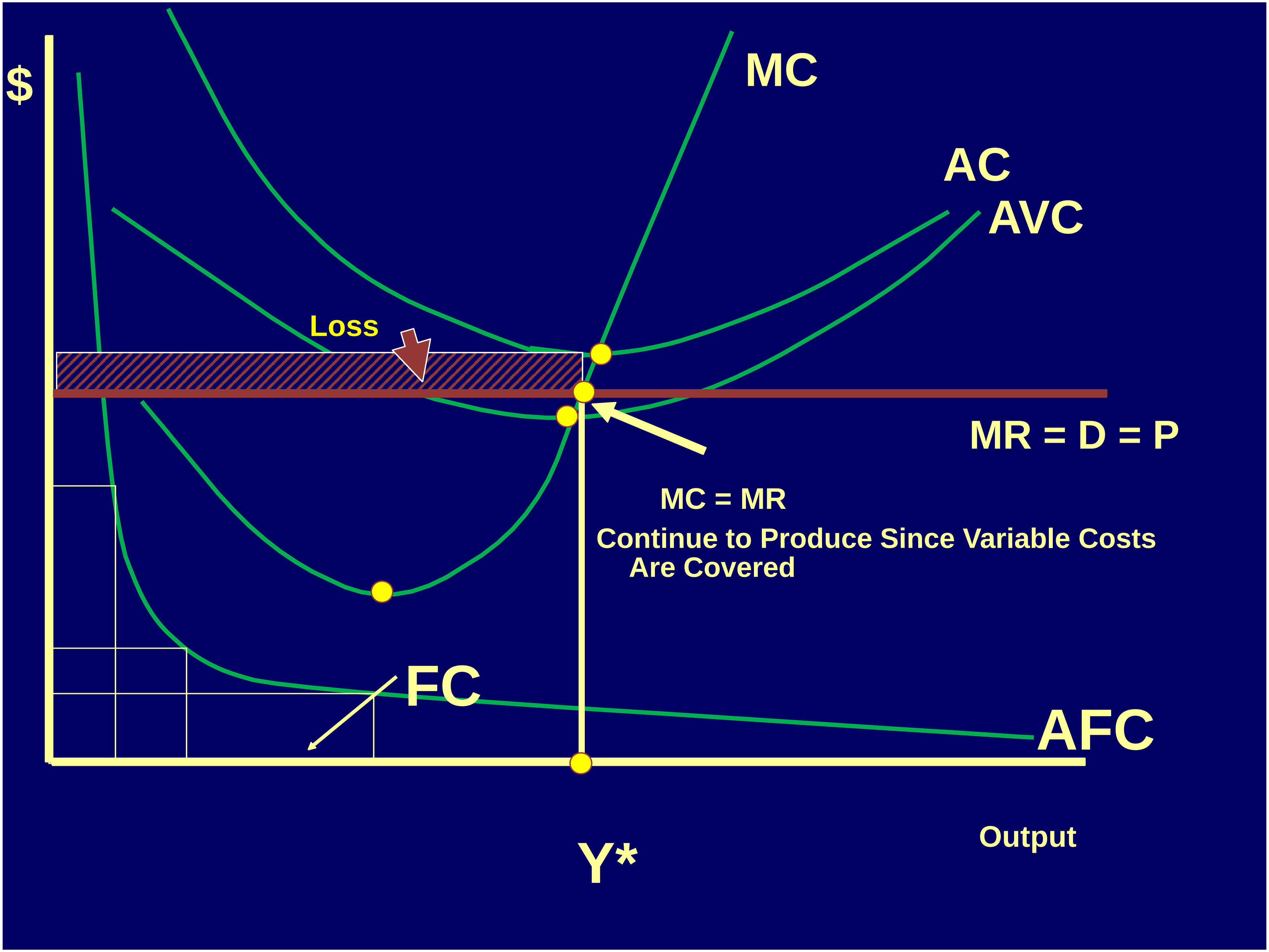
The Demand Curve Faced by the Firm is Horizontal

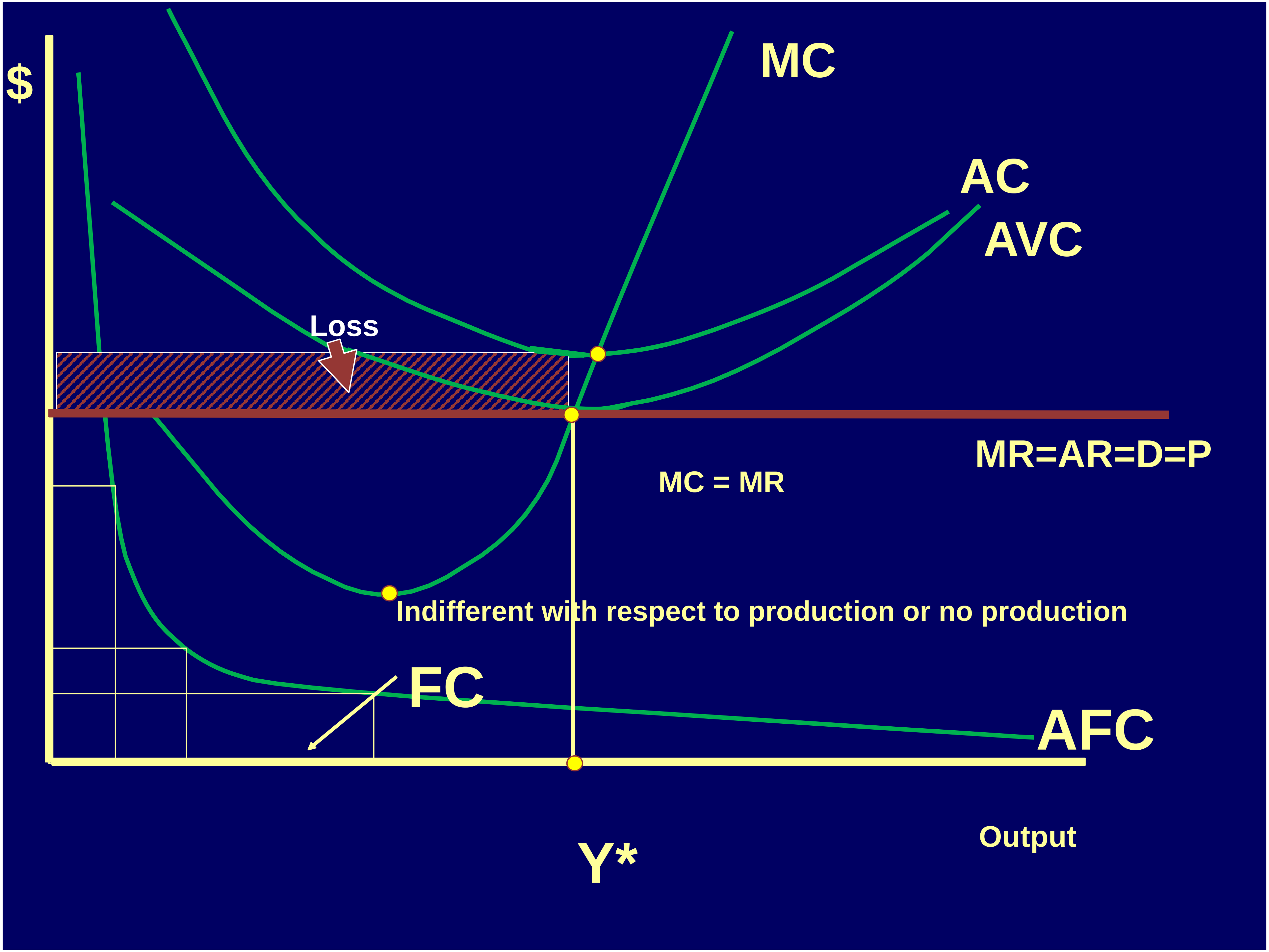
The firm can sell as much or as little as it wants at the going market price

Demand is ***PERFECTLY ELASTIC***

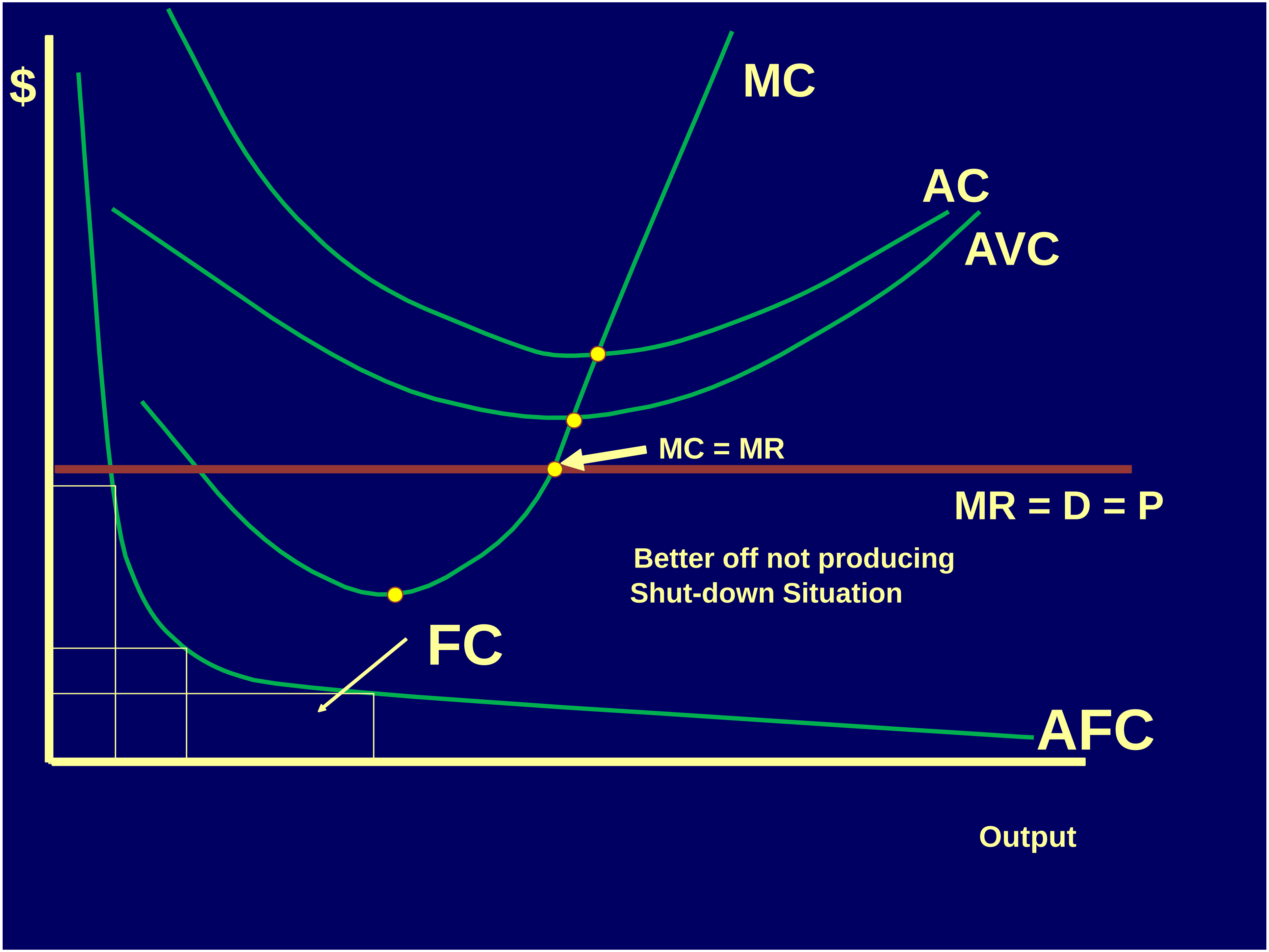

$
MC
MC=MR
Profit
AC
AVC
MR = D = P
FC
AFC
Output
Y*


$
MC
AC
AVC
MC = MR
Zero Profit
FC
AFC
Y*
Output


$
MC
AC
AVC
Loss
MR = D = P
MC = MR
Continue to Produce Since Variable Costs
Are Covered
FC
AFC
Y*
Output



$
MC
AC
AVC
Loss
MR=AR=D=P
MC = MR
Indifferent with respect to production or no production
FC
AFC
Y*
Output


$
MC
AC
AVC
MC = MR
MR = D = P
Better off not producing
Shut-down Situation
FC
AFC
Output

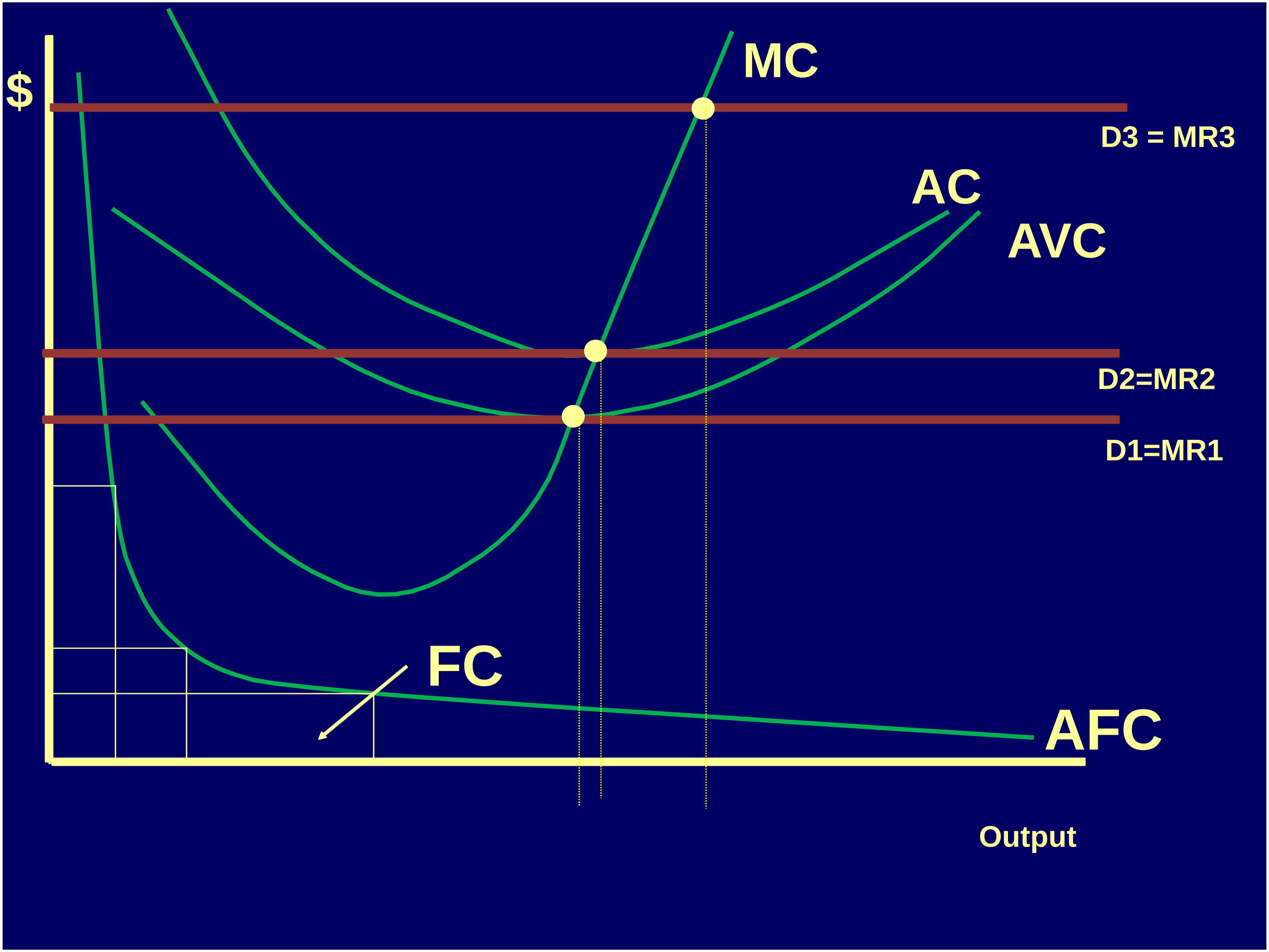
These conditions apply in the

Short Run

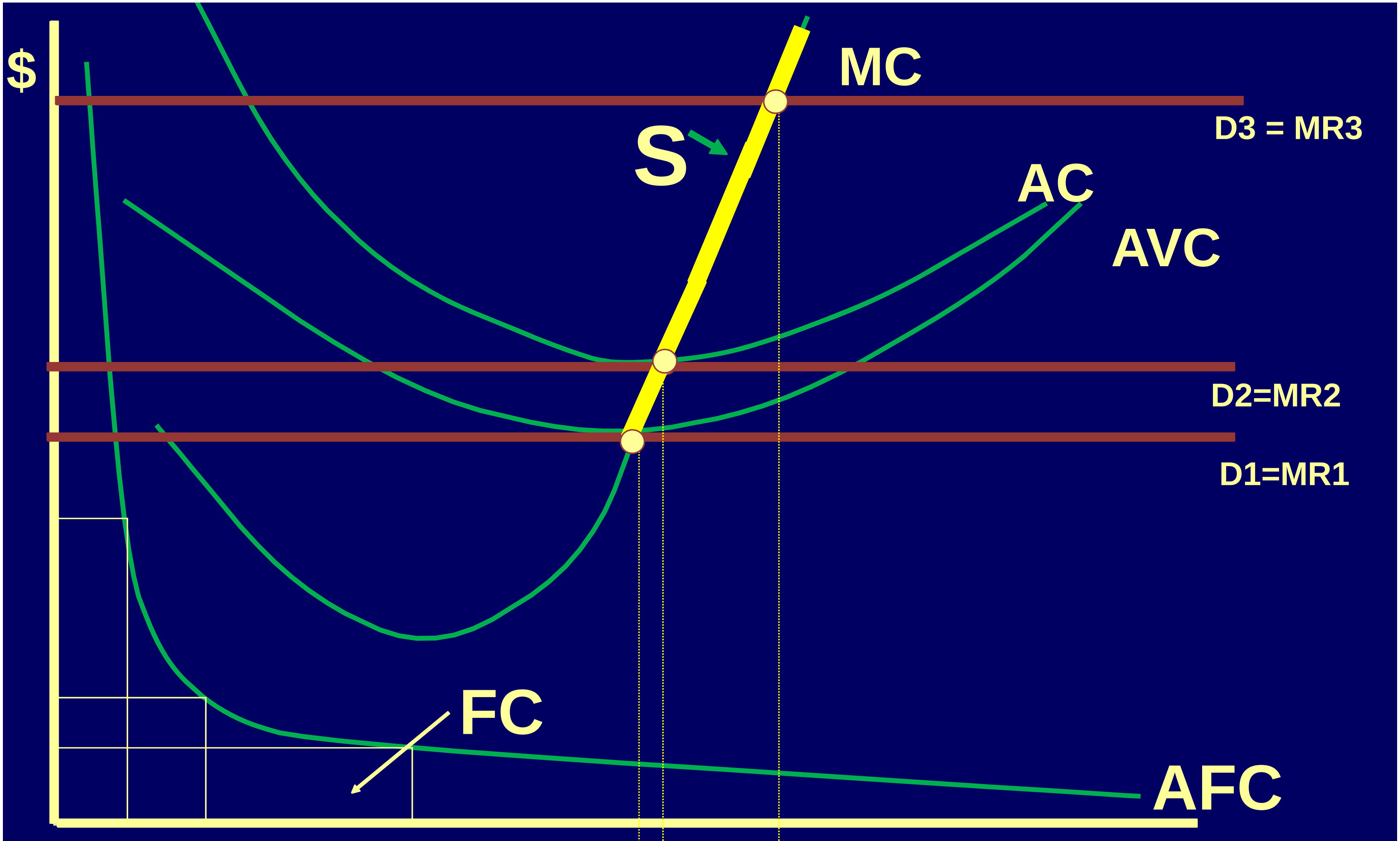
In the long run
all costs are variable, and all costs must be covered

Short Run Supply Curve for the Firm:

That portion of MC above AVC



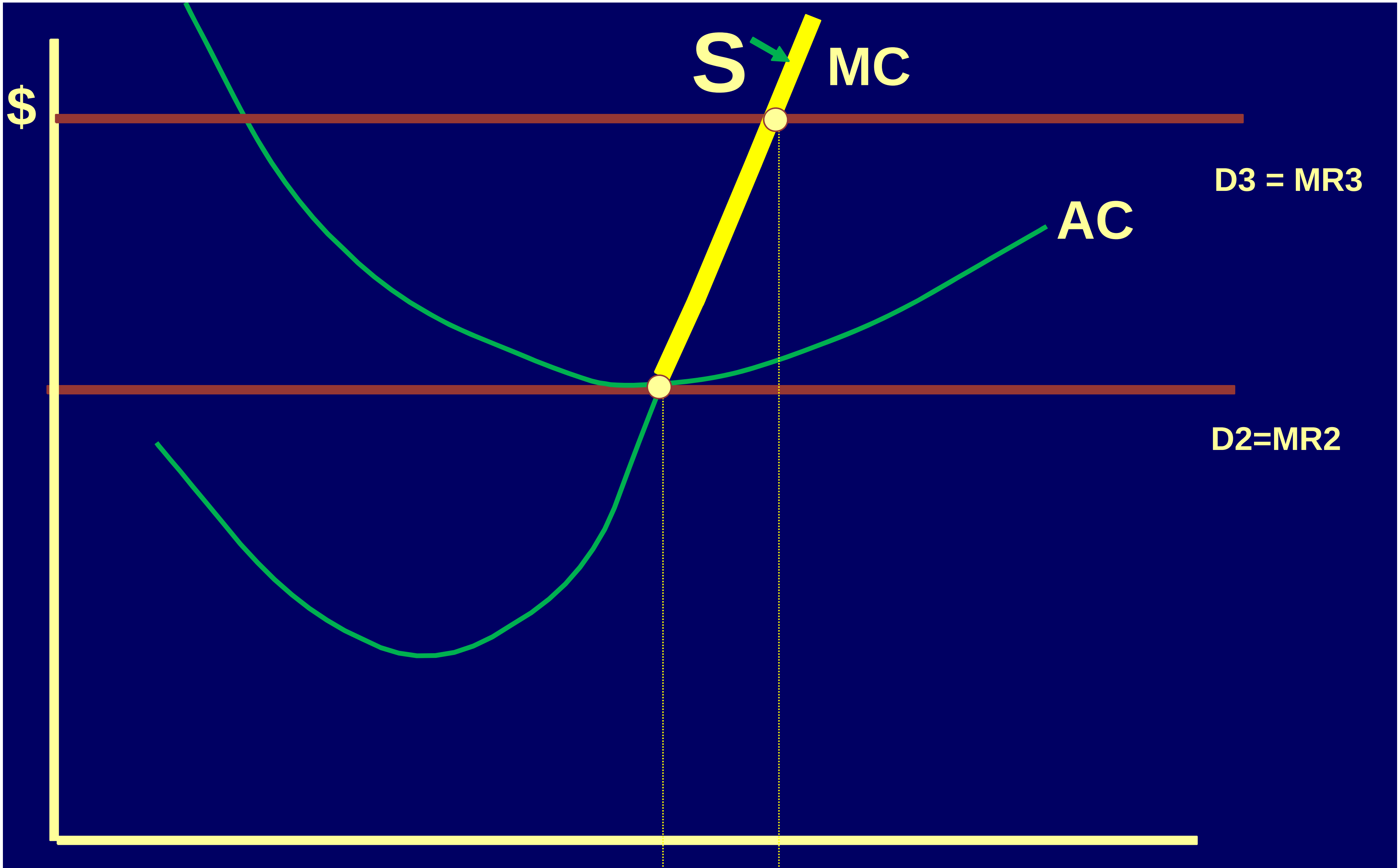
$
MC
D3 = MR3
AC
AVC
D2=MR2
D1=MR1
FC
AFC
Output



Short Run Supply
MC above AVC

Output

(Producer's willingness to Supply at Possible Prices)

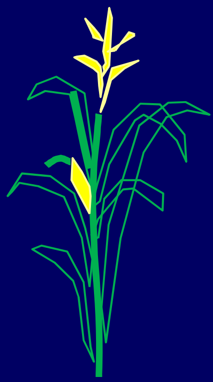


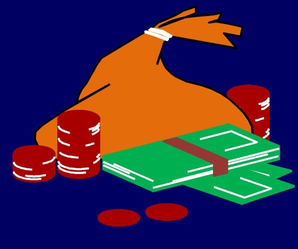
Long Run Supply: Supply is MC above AC

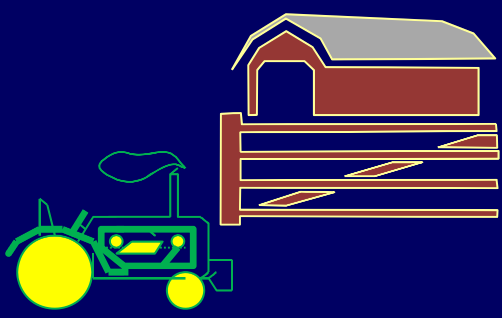
AC= AVC since all costs variable

No FC or AFC

Length of Run, Costs, and Supply for the Firm







Very Long Run:

All Costs Variable

Supply Curve is MC above AVC

AVC = AC since FC = 0

Long Run:

Most Costs Variable

A Few Fixed Costs

Supply is MC Curve above AVC

AC not equal to AVC

Short Run:

Most Costs Fixed

A Few Variable Costs

AC not equal to AVC

Supply is MC

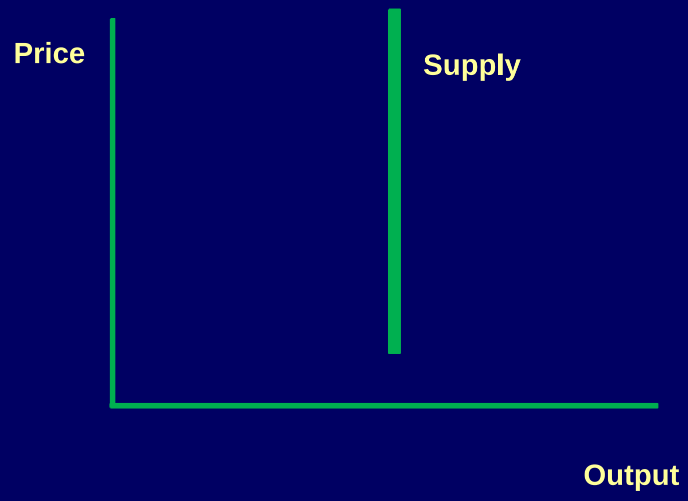
above AVC

Very Short Run:

All Costs Fixed

AC = AFC

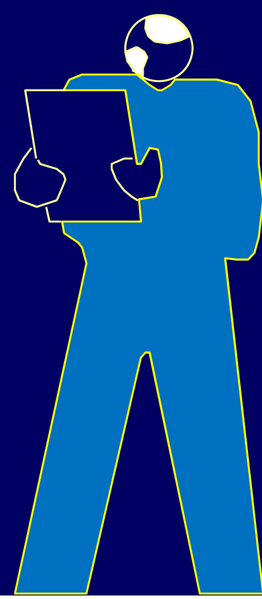
Perfectly Inelastic Supply



Fixed/Variable cost distinction

exists

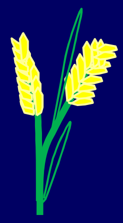
in the mind of the decisionmaker



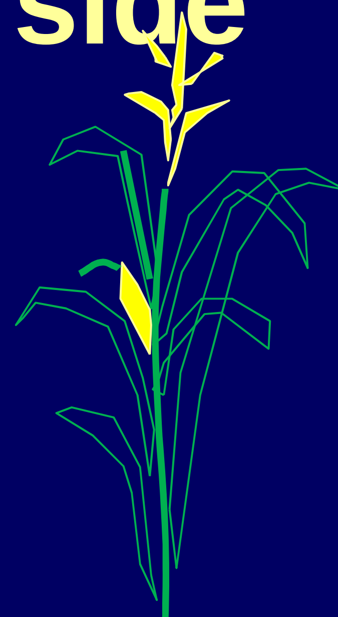
Sunk Cost

a cost which cannot be recovered

Seed in the ground

can't be taken out again 

Links between profit maximization on the input and on the output side



1. The input level where MVP=MFC produces the output level where MR=MC.

2. The input level on the inflection point of the TPP (TVP) curve produces the output level on the inflection point of the TVC curve.

3. The input level that maximizes APP (AVP) produces the output level that minimizes AVC.

4. The input level that maximizes MPP (MVP) produces the output level that minimizes MC.

Agricultural Production Economics:

Two Inputs

or

Two Outputs

Factor-Factor Relationships

Two Inputs,

One Output

Production Function:

$$Y = f(X_1, X_2 | X_3, X_4, X_5)$$

Variable inputs

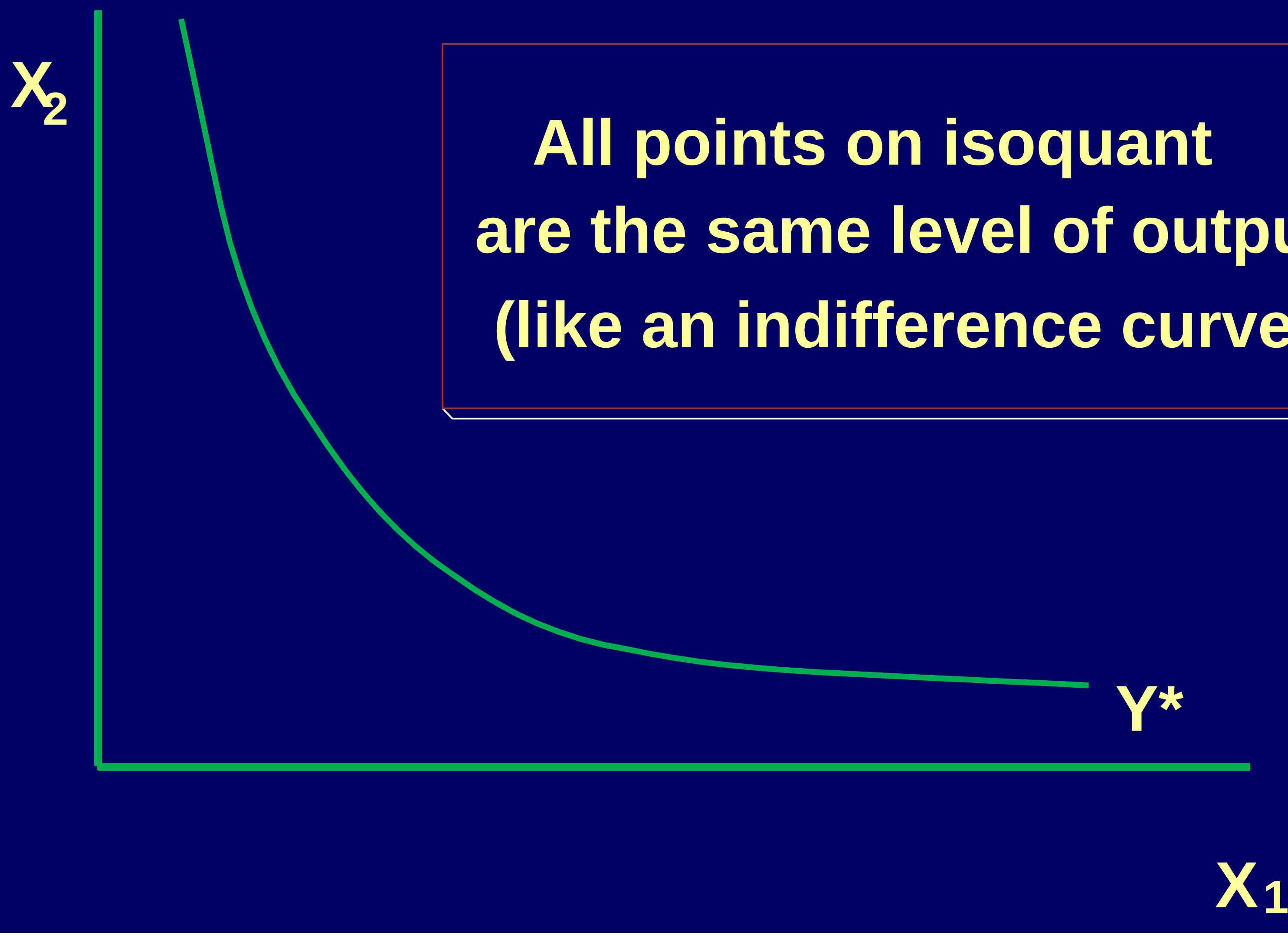
Fixed inputs

Output (TPP) *

*Total Physical Product

Isoquant
(equal quantity)

All points on isoquant are the same level of output (like an indifference curve)



Isoquants are

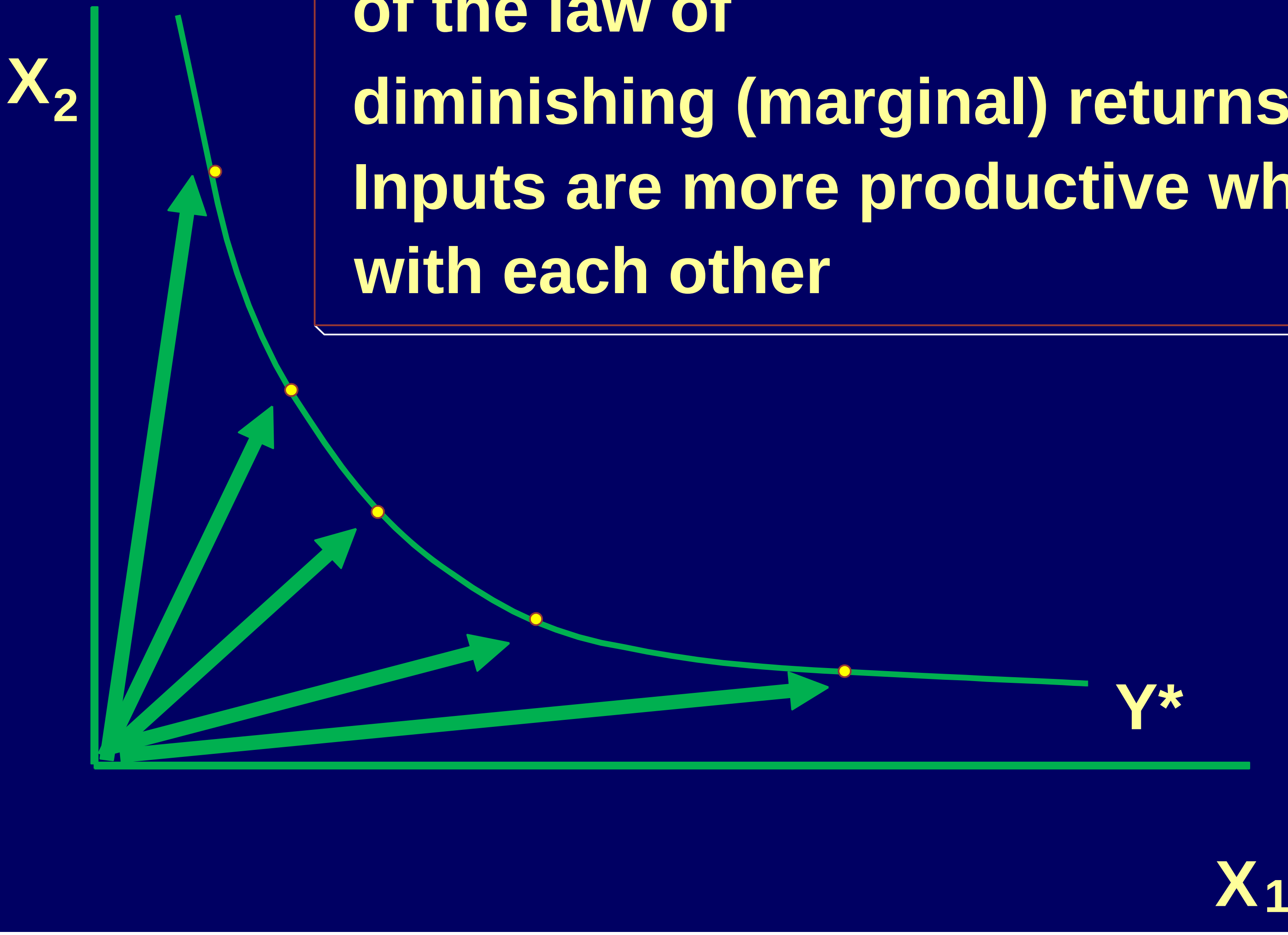
bowed inward because

of the law of

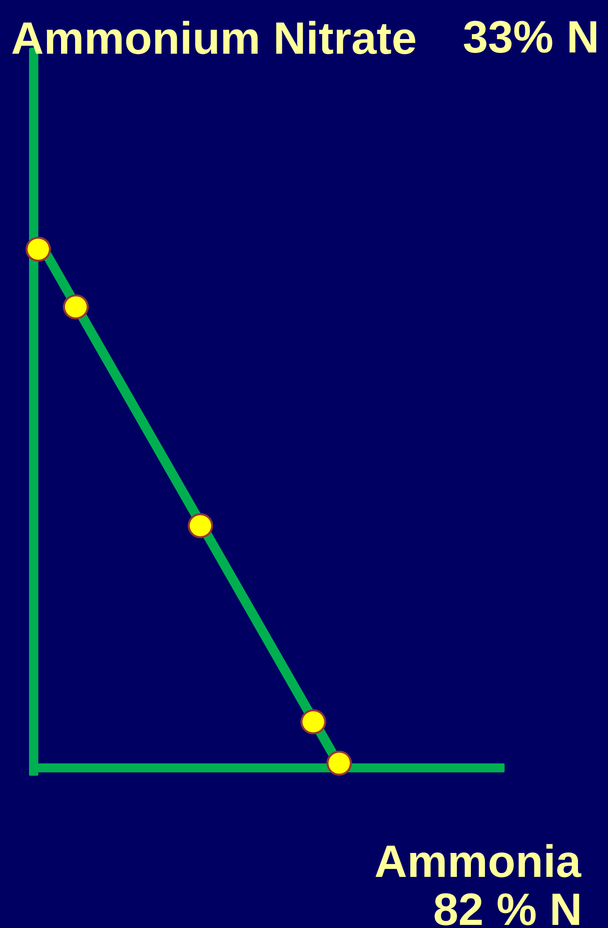
diminishing (marginal) returns

Inputs are more productive when used

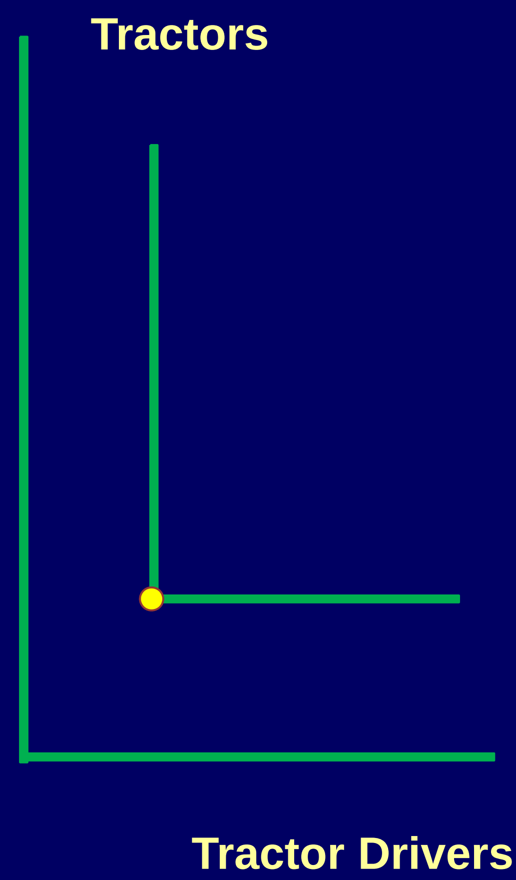
with each other



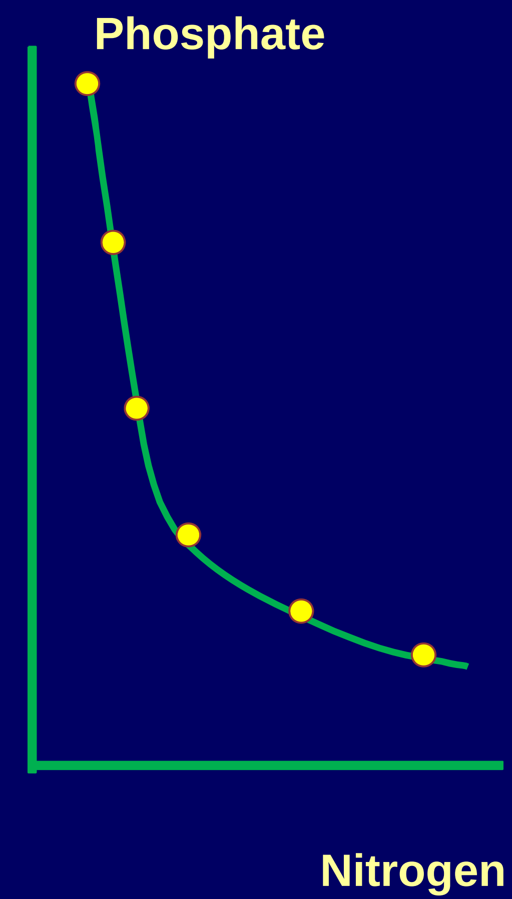
Types of Isoquants:



Perfect Substitutes



Fixed Proportion

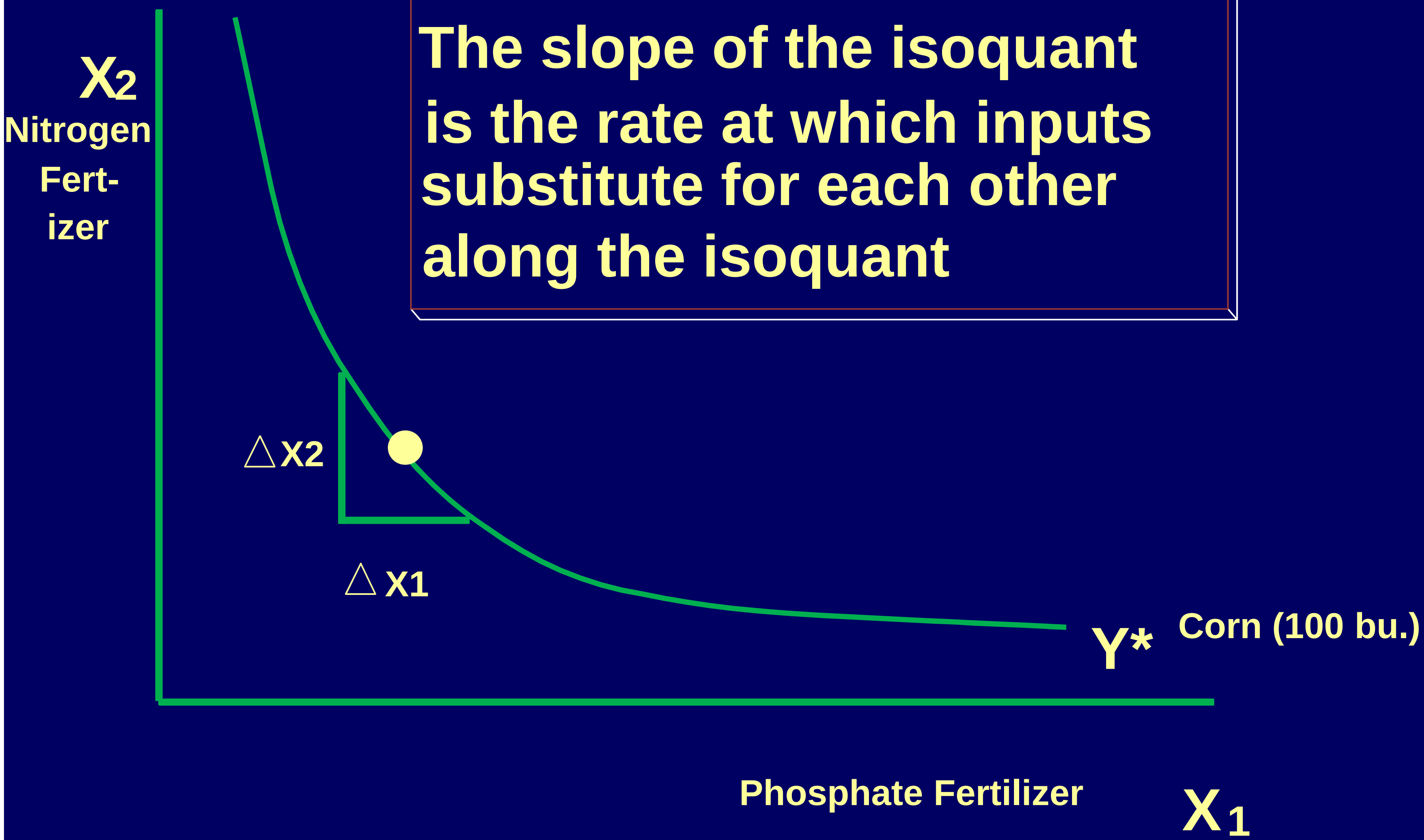


Imperfect Substitutes
(the normal case)

Marginal Rate of Substitution

$$MRS_{x_1x_2} = \Delta x_2 / \Delta x_1$$

The slope of the isoquant is the rate at which inputs substitute for each other along the isoquant



Marginal Rate of Substitution

$MRS_{x_1 x_2} = \Delta x_2 / \Delta x_1$

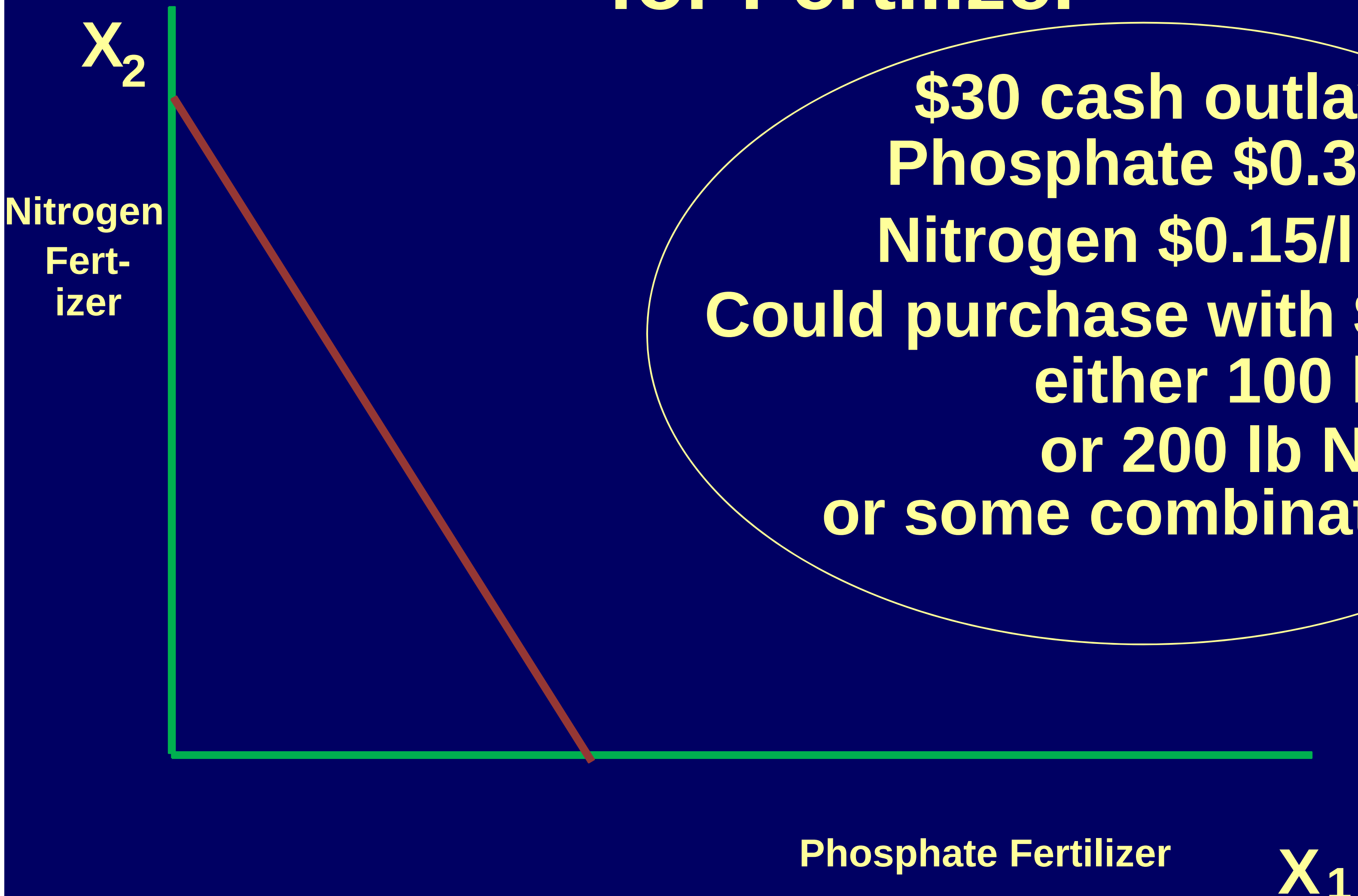
Not constant, but the

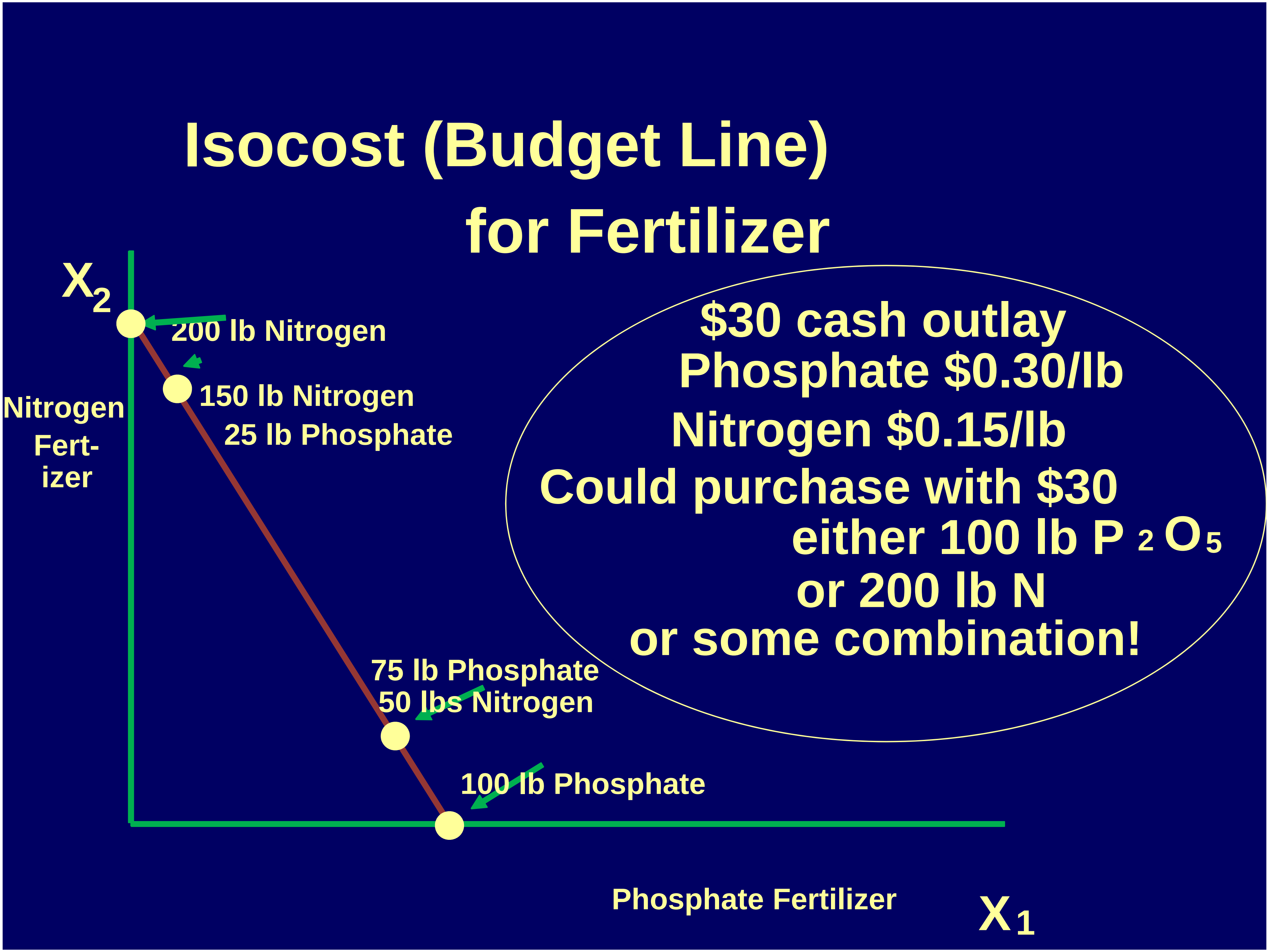
slope varies along the isoquant:

nitrogen and phosphate fertilizers are not perfect substitutes!

Isocost (Budget Line) for Fertilizer

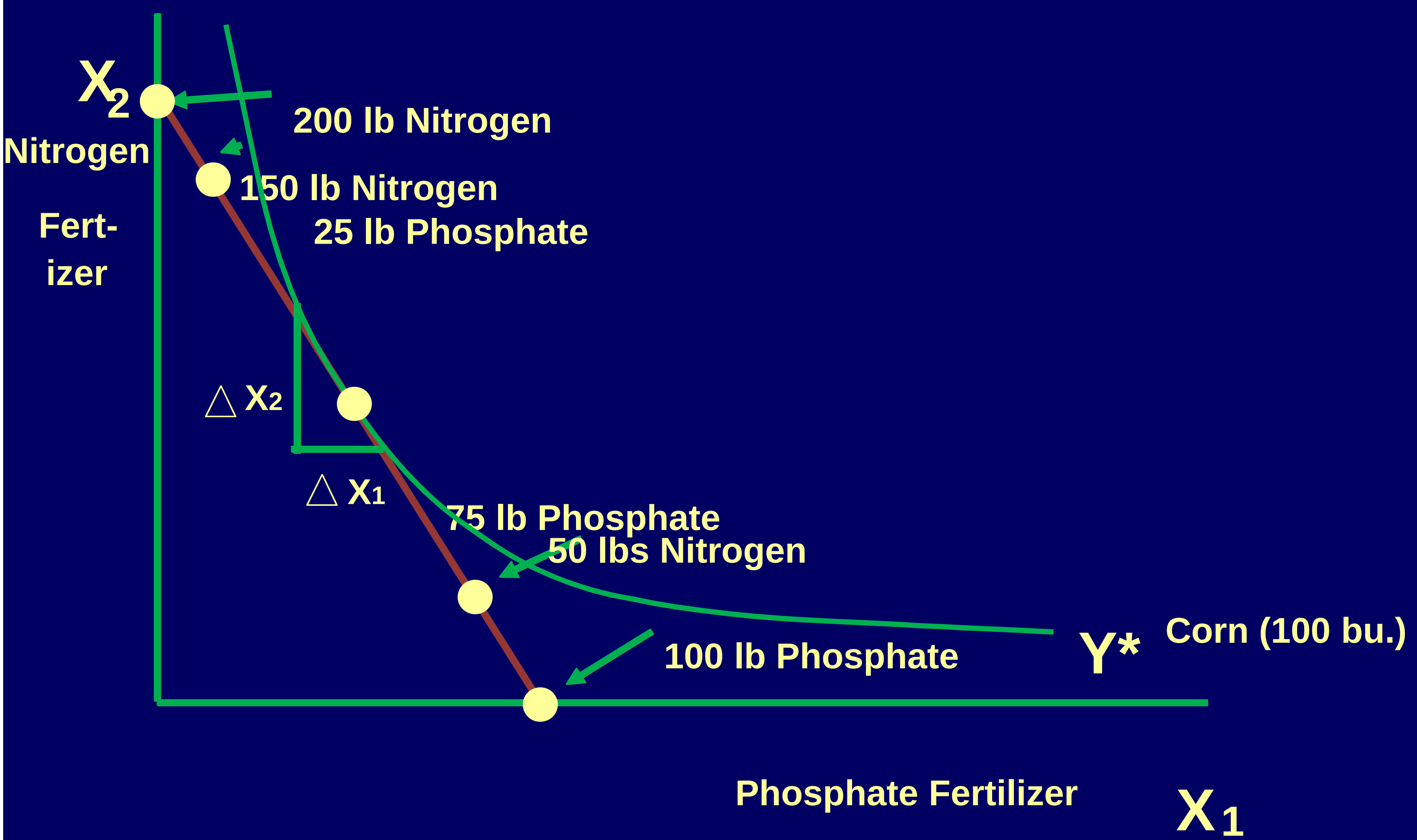
$30 cash outlay
Phosphate $0.30/lb
Nitrogen $0.15/lb
Could purchase with $30
either 100 lb P_2O_5
or 200 lb N
or some combination!





Isocost (Budget Line)
for Fertilizer
X2
200 lb Nitrogen
150 lb Nitrogen
25 lb Phosphate
Nitrogen
Fert-
izer
75 lb Phosphate
50 lbs Nitrogen
100 lb Phosphate
Phosphate Fertilizer
X1
$30 cash outlay
Phosphate $0.30/lb
Nitrogen $0.15/lb
Could purchase with $30
either 100 lb P2O5
or 200 lb N
or some combination!

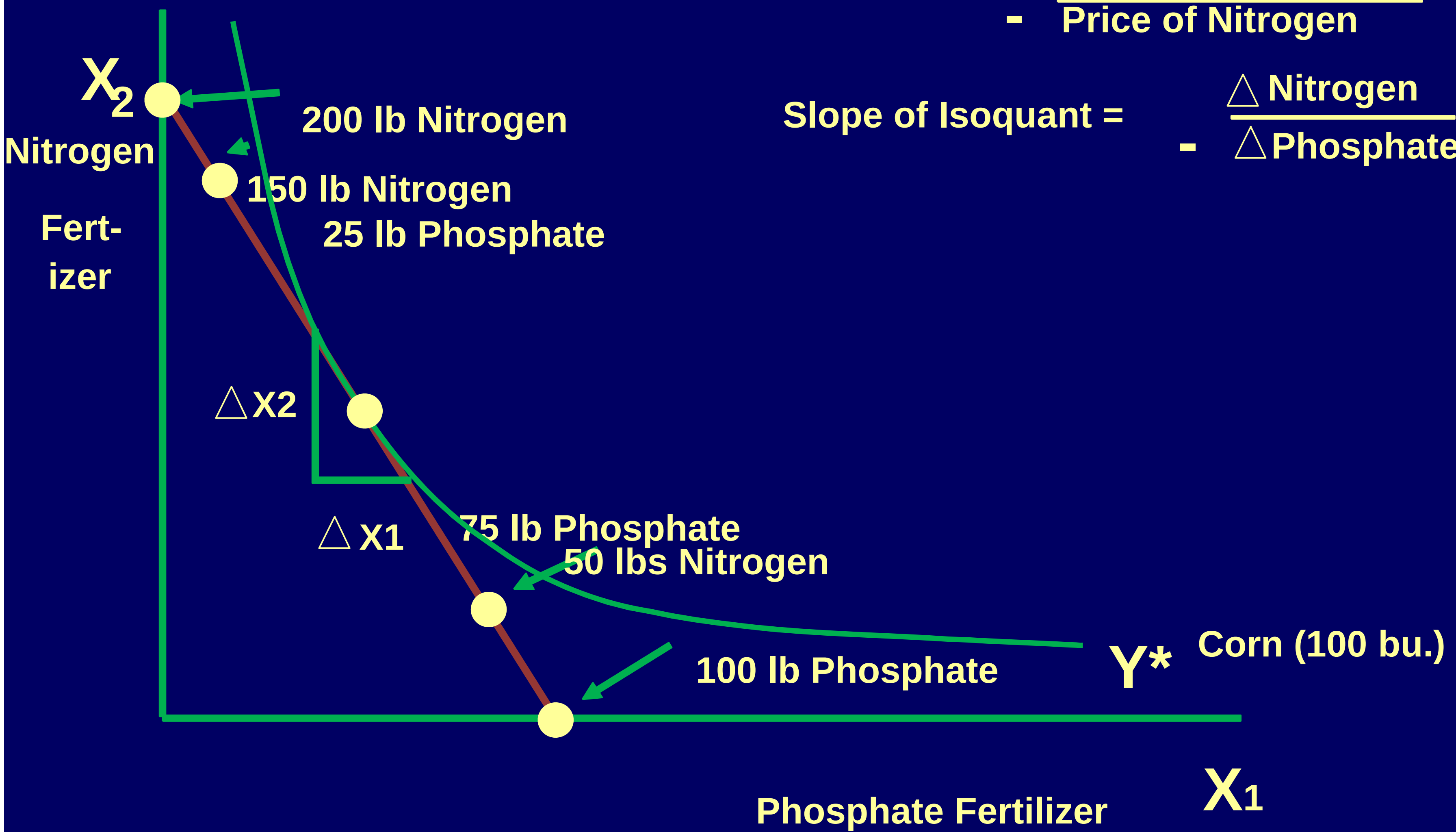
Superimposing the Isoquant on the Budget Line:



Superimposing the Isoquant on the Budget Line:

Slope of Isocost = $-\dfrac{\text{Price of Phosphate}}{\text{Price of Nitrogen}}$

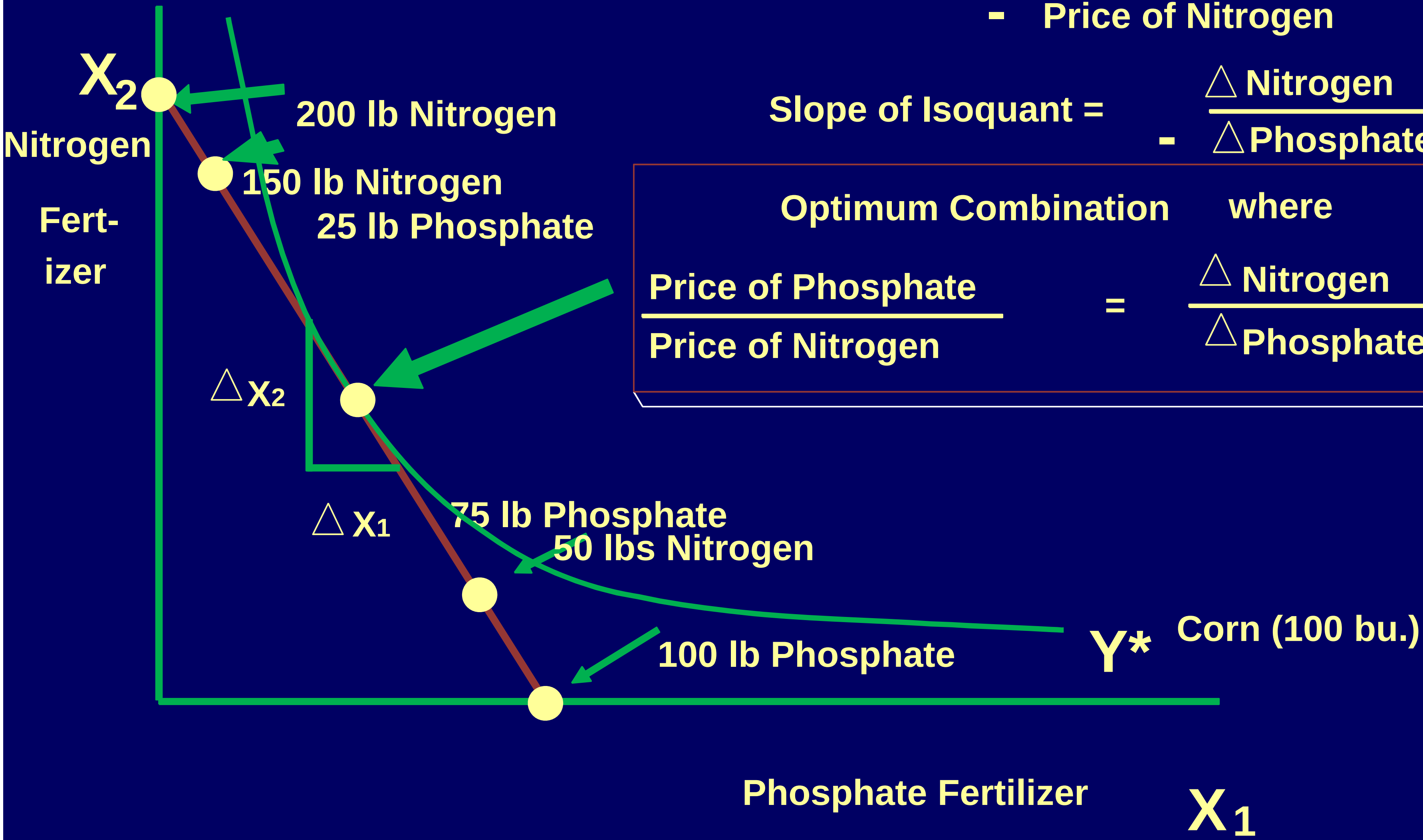
Slope of Isoquant = $-\dfrac{\triangle\,\text{Nitrogen}}{\triangle\,\text{Phosphate}}$



Superimposing the Isoquant on the Budget Line:

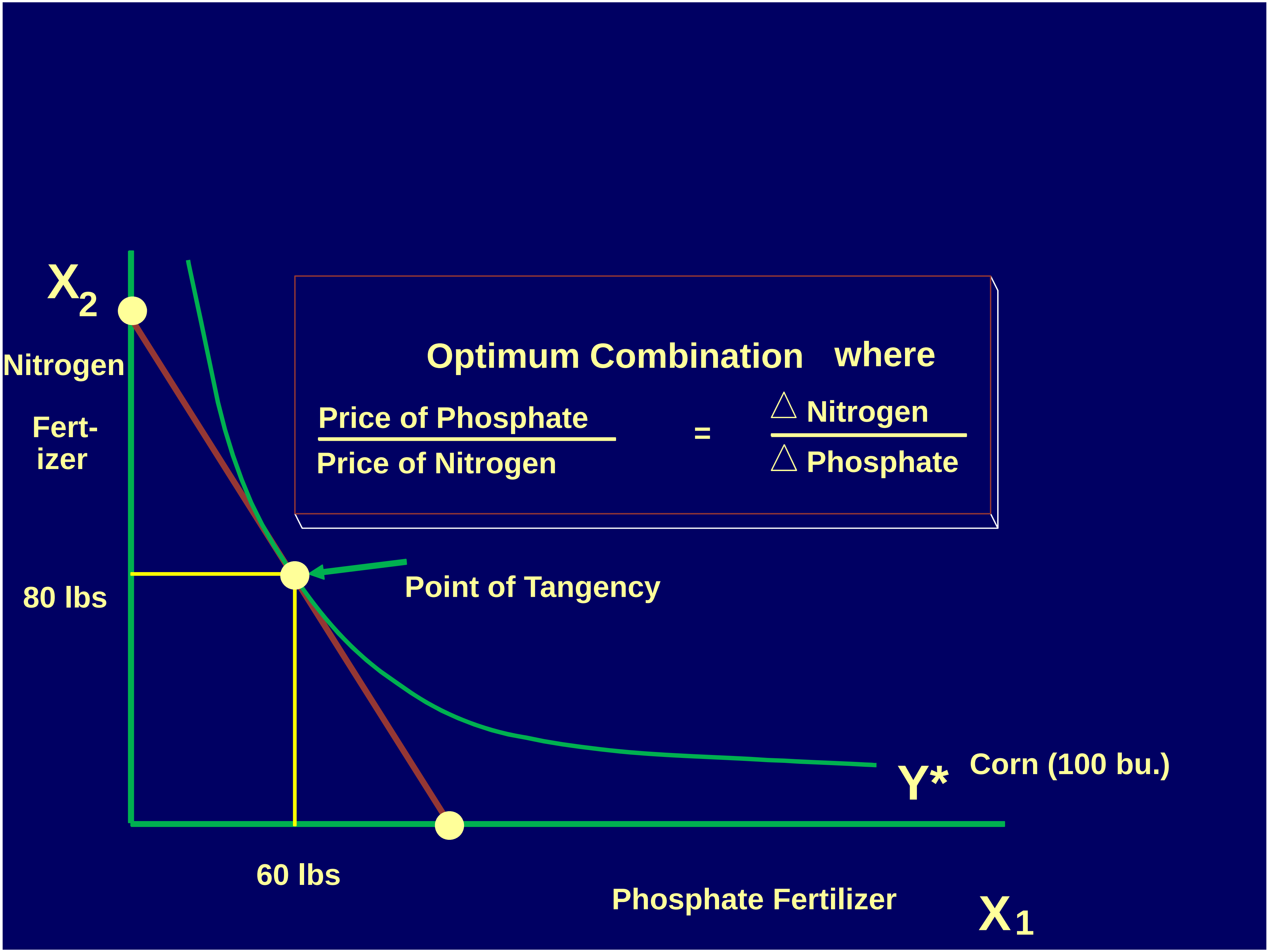
Slope of Isocost = $-\dfrac{\text{Price of Phosphate}}{\text{Price of Nitrogen}}$

Slope of Isoquant = $-\dfrac{\triangle \text{Nitrogen}}{\triangle \text{Phosphate}}$

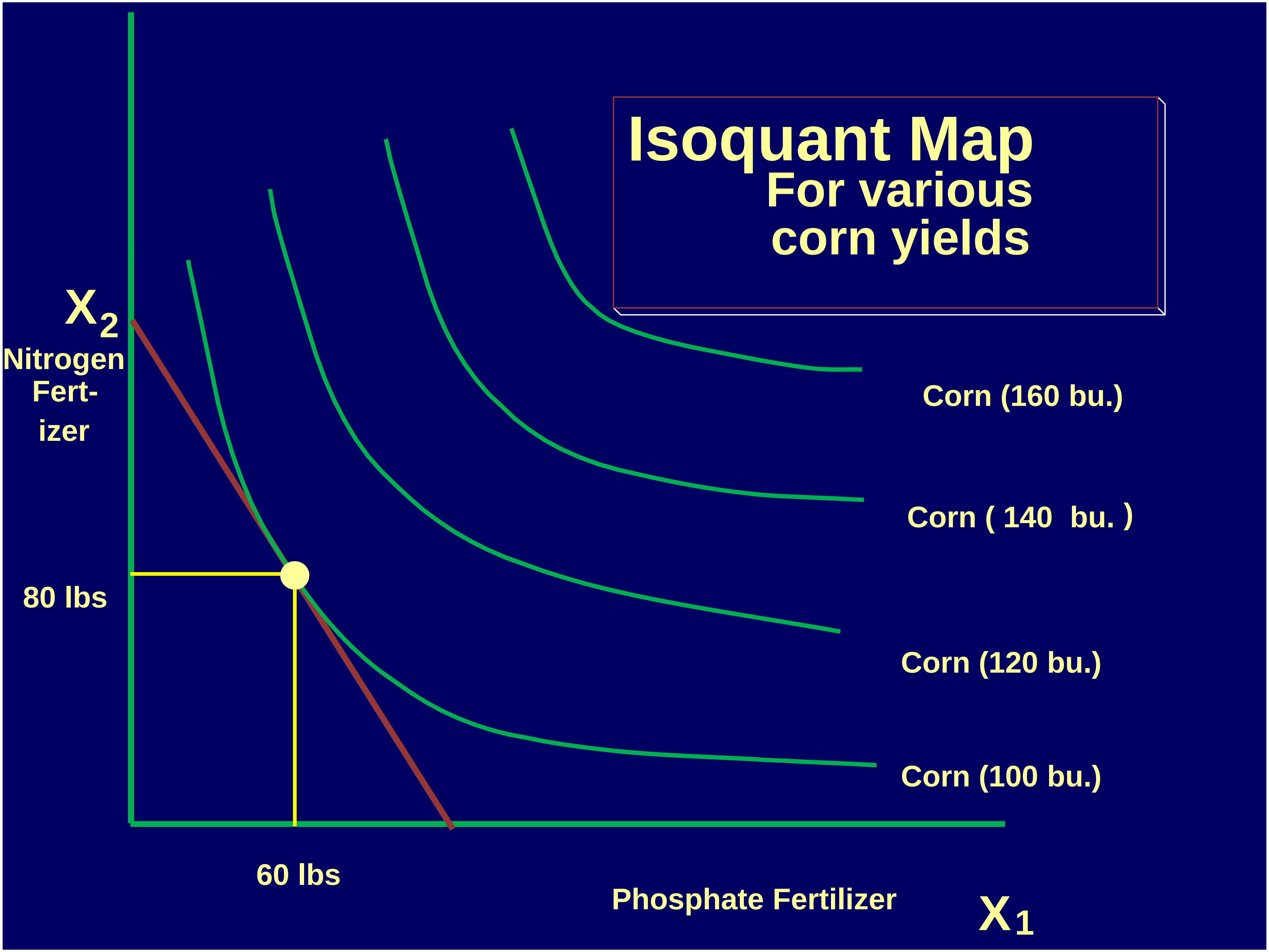


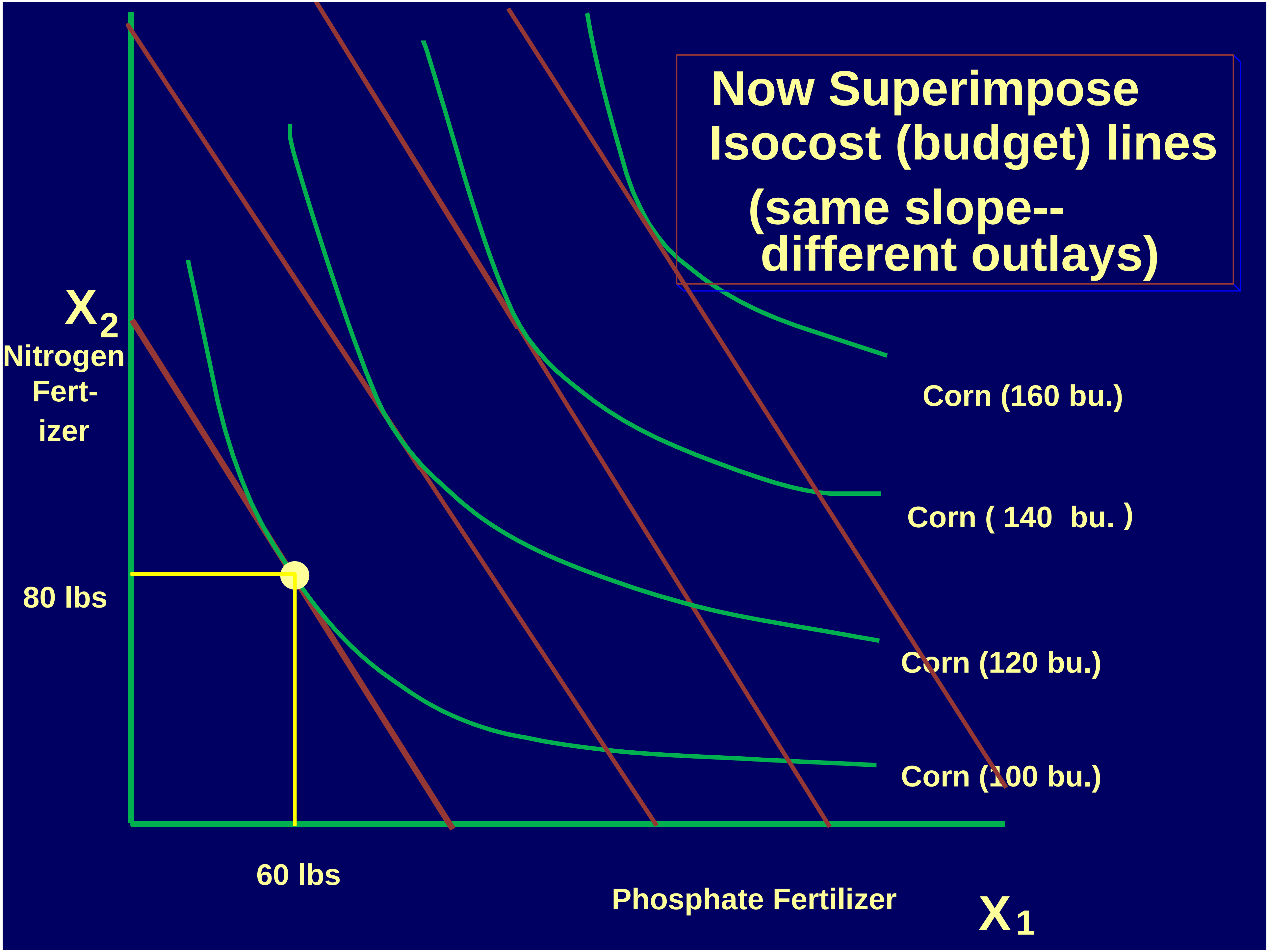
Optimum Combination where

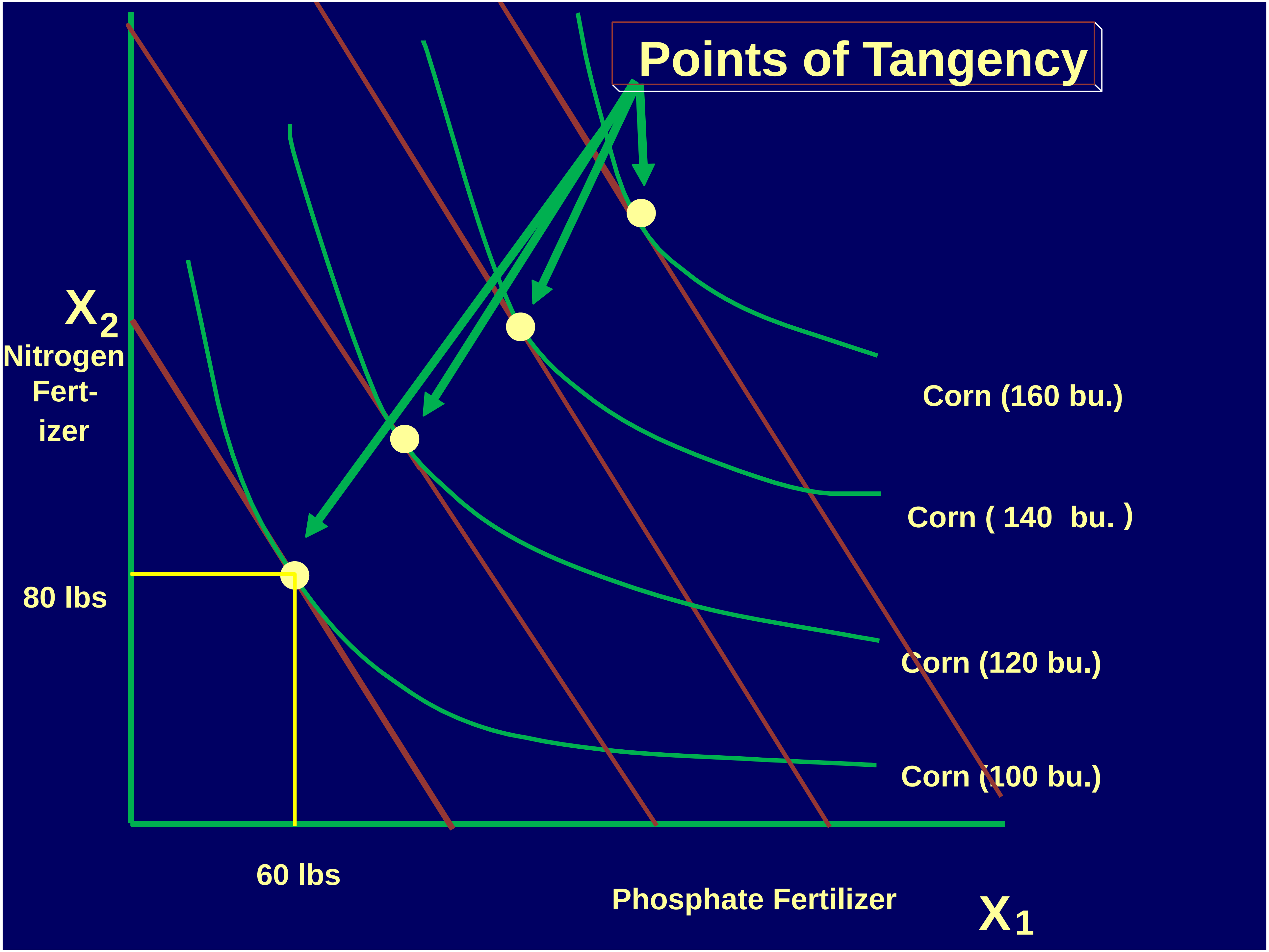
$$\frac{\text{Price of Phosphate}}{\text{Price of Nitrogen}} = \frac{\triangle \text{Nitrogen}}{\triangle \text{Phosphate}}$$

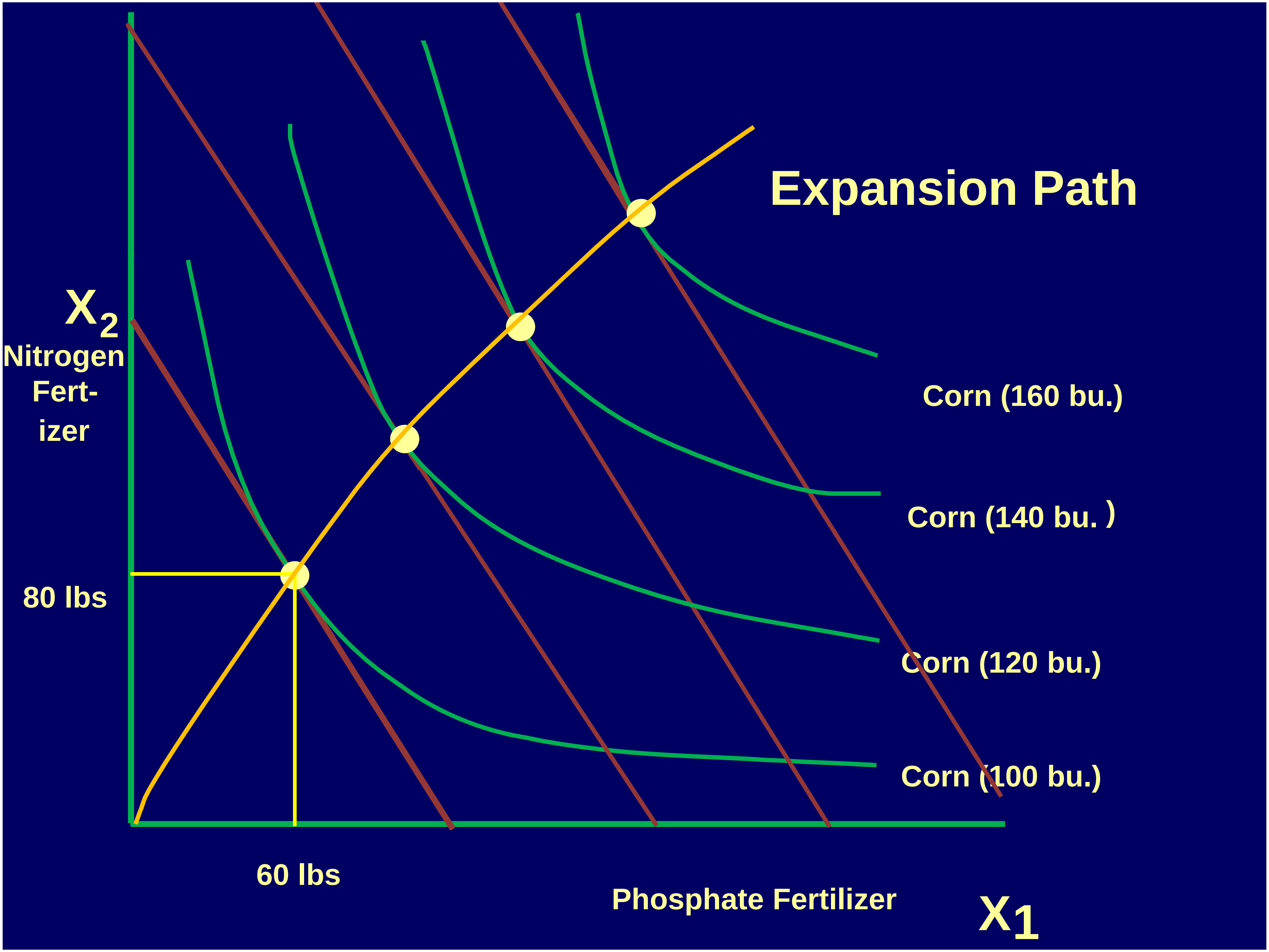


Optimum Combination where
Price of Phosphate
Price of Nitrogen
=
△ Nitrogen
△ Phosphate
X2
Nitrogen
Fert-
izer
80 lbs
Point of Tangency
Y*
Corn (100 bu.)
60 lbs
Phosphate Fertilizer
X1


Isoquant Map
For various
corn yields
X2
Nitrogen
Fert-
izer
80 lbs
60 lbs
Corn (160 bu.)
Corn (140 bu.)
Corn (120 bu.)
Corn (100 bu.)
Phosphate Fertilizer
X1

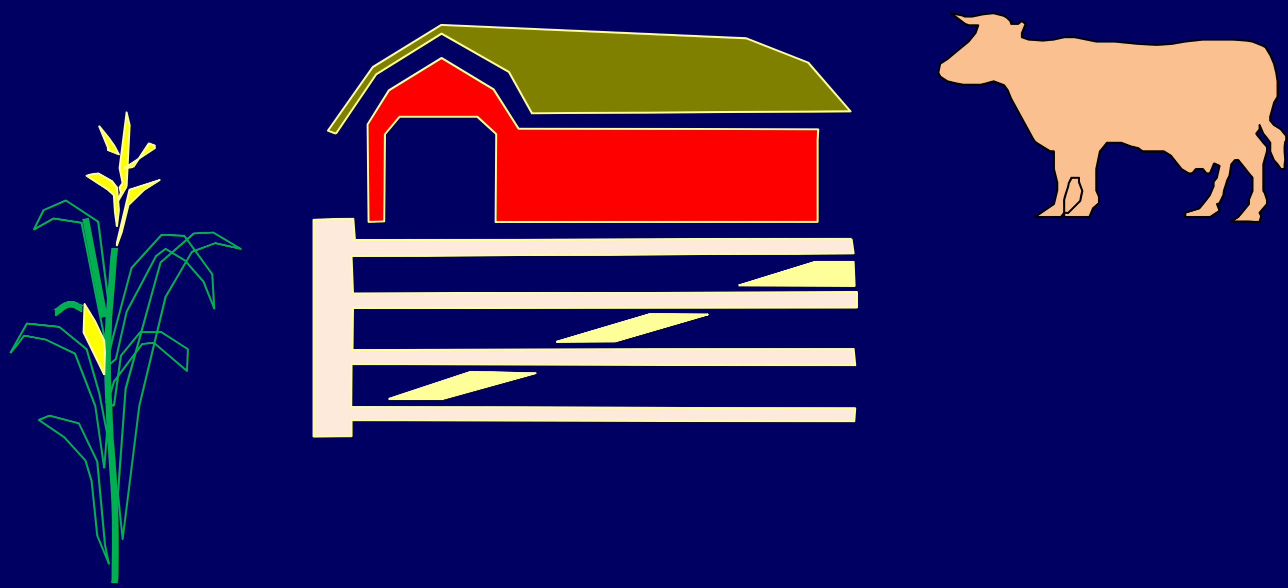

Now Superimpose
Isocost (budget) lines
(same slope--
different outlays)
X_2
Nitrogen
Fert-
izer
80 lbs
60 lbs
Corn (160 bu.)
Corn (140 bu.)
Corn (120 bu.)
Corn (100 bu.)
Phosphate Fertilizer
X_1


Points of Tangency
X2
Nitrogen
Fert-
izer
80 lbs
60 lbs
Corn (160 bu.)
Corn (140 bu.)
Corn (120 bu.)
Corn (100 bu.)
Phosphate Fertilizer
X1



Expansion Path
X2
Nitrogen
Fert-
izer
80 lbs
60 lbs
Corn (160 bu.)
Corn (140 bu.)
Corn (120 bu.)
Corn (100 bu.)
Phosphate Fertilizer
X1

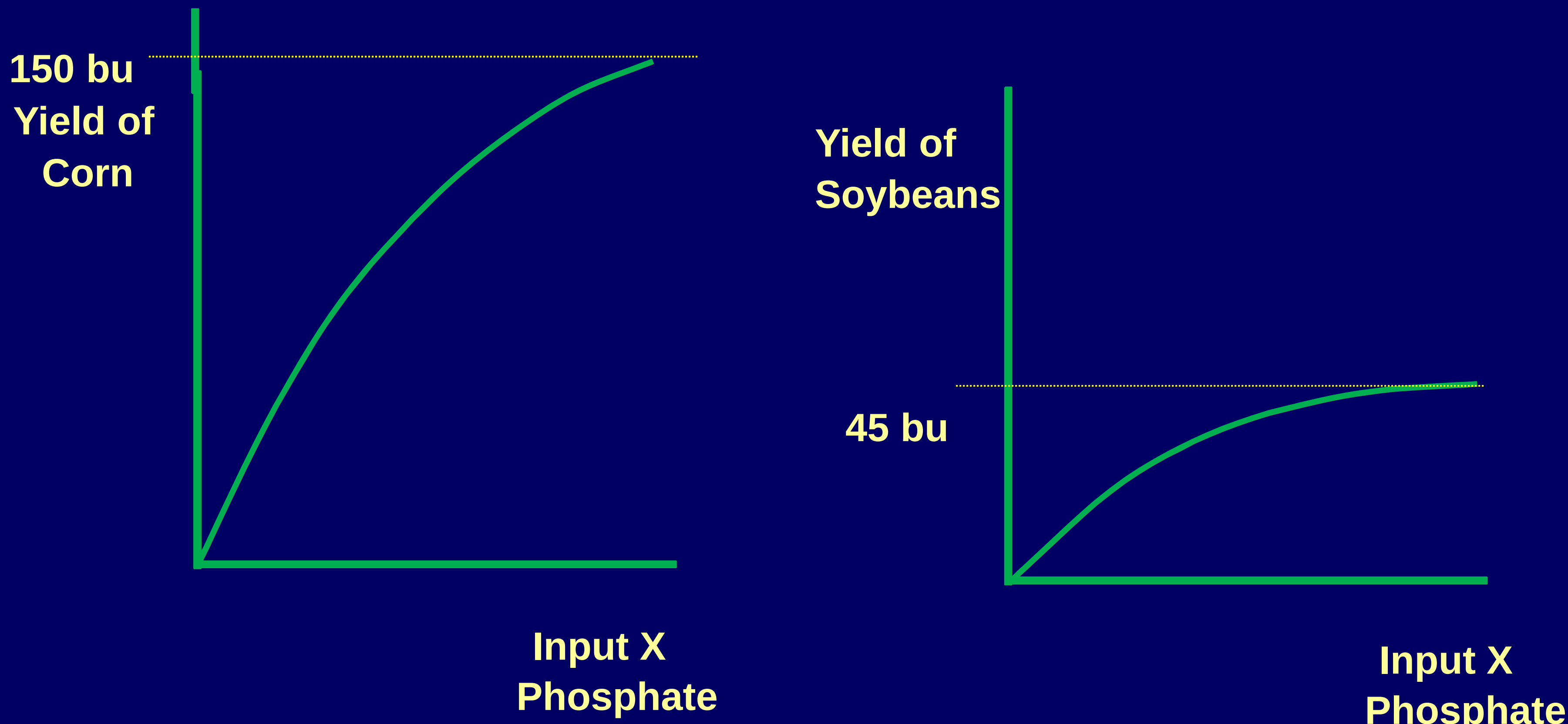
Selection of Combinations of Farm Enterprises



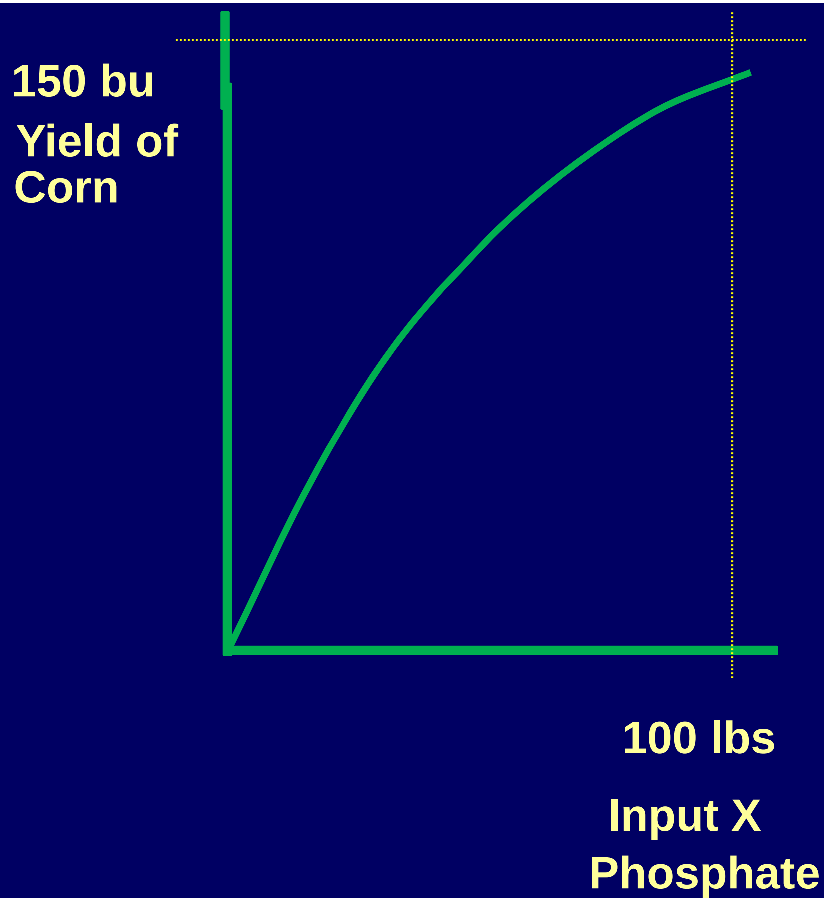
Product-Product Relationships

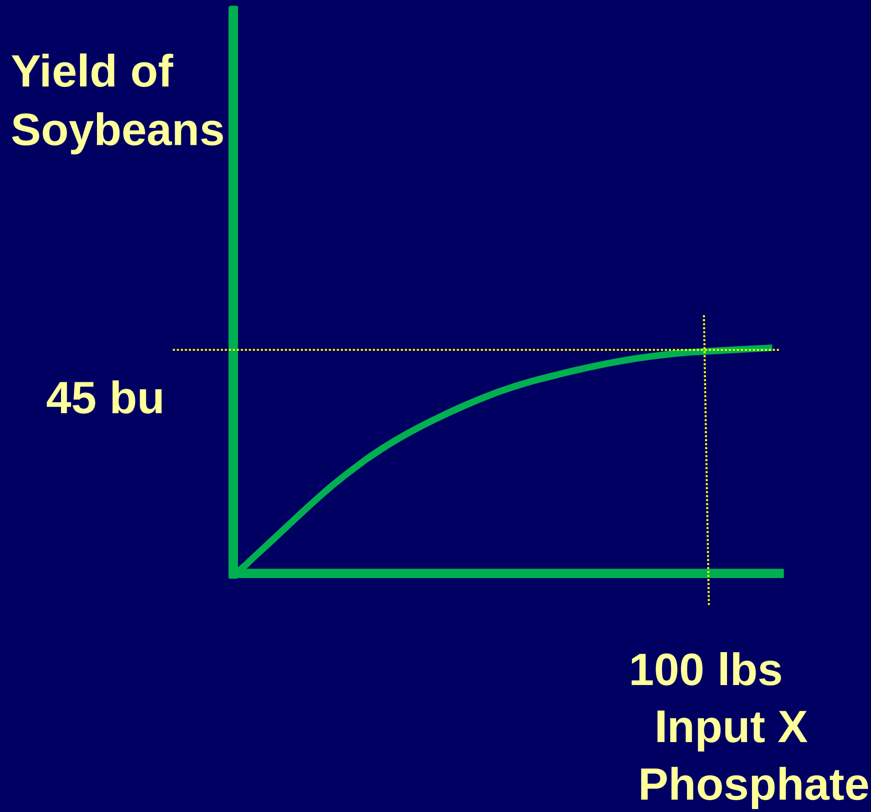
Two Products
One Variable Input

Production Function for Corn and Soybeans



Corn Yields Higher than Soybean Yields





Assume:

Farmer has 100 lbs Phosphate total

How should it be allocated between corn and soybean production?

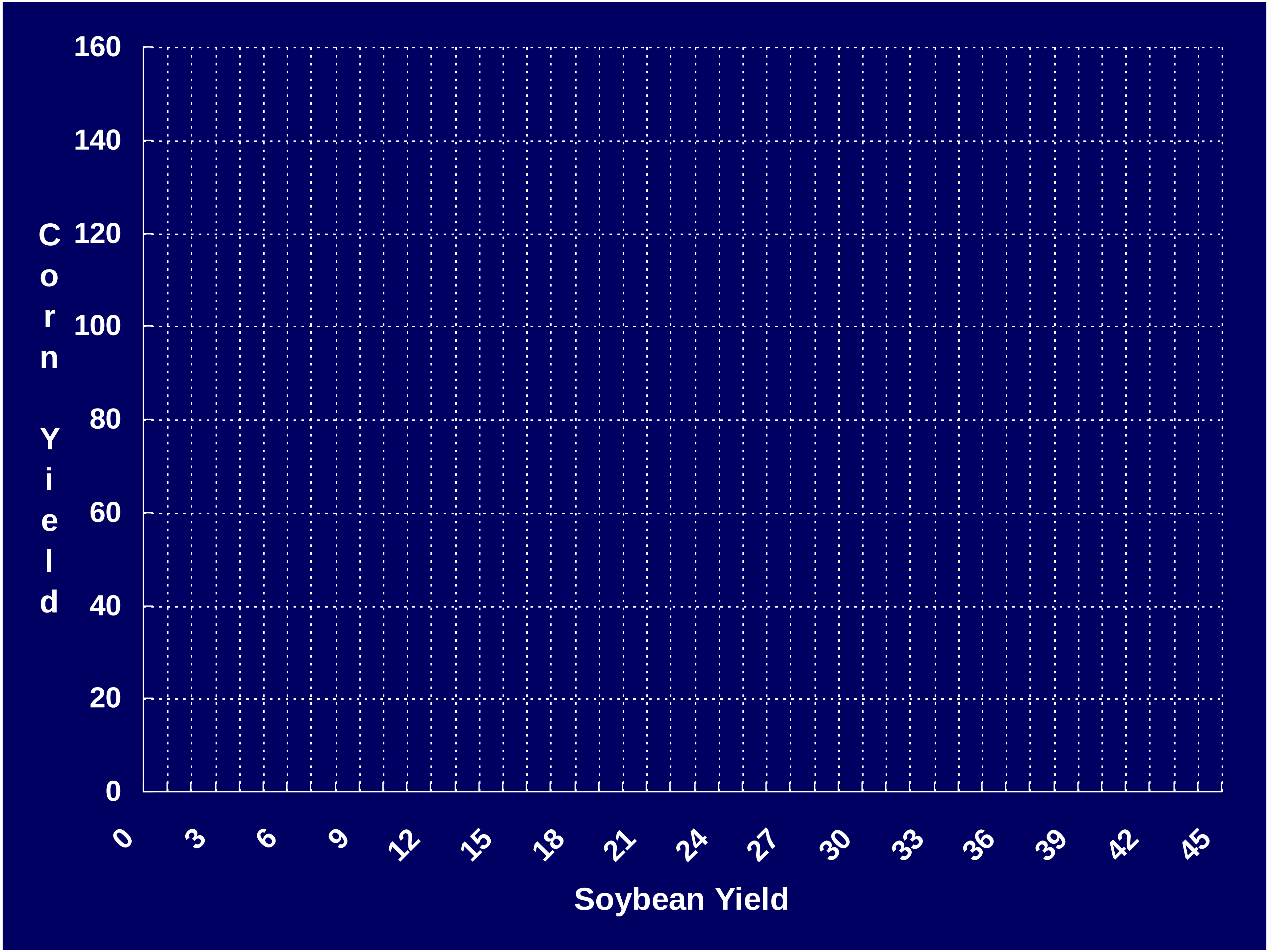
Depends on prices of corn & soybeans

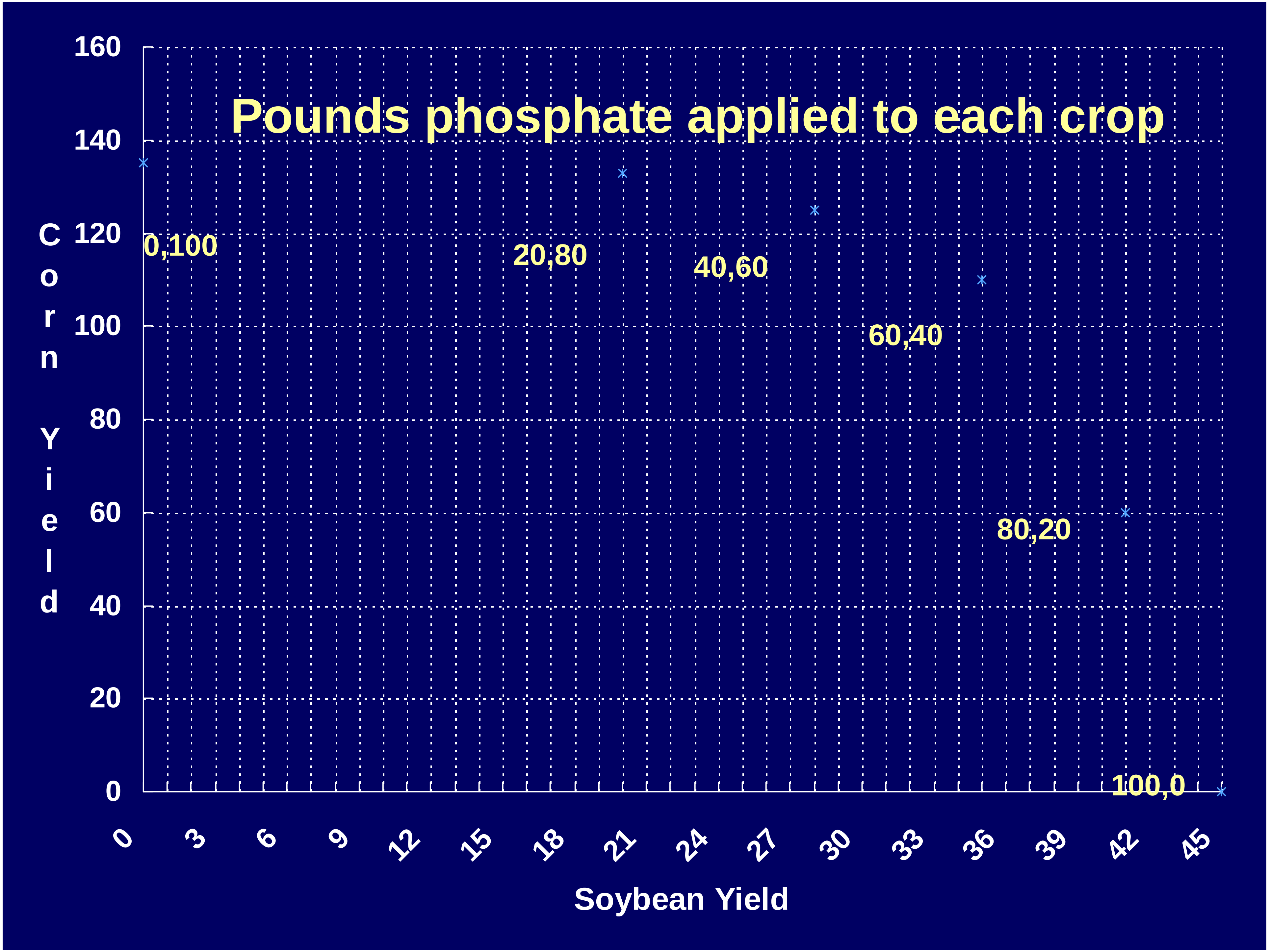
Data from Production Functions

Total Phosphate Used	Phosphate on Corn	Phosphate on Soybeans	Corn Yield bu/Acre	Soybean Yield bu/Acre

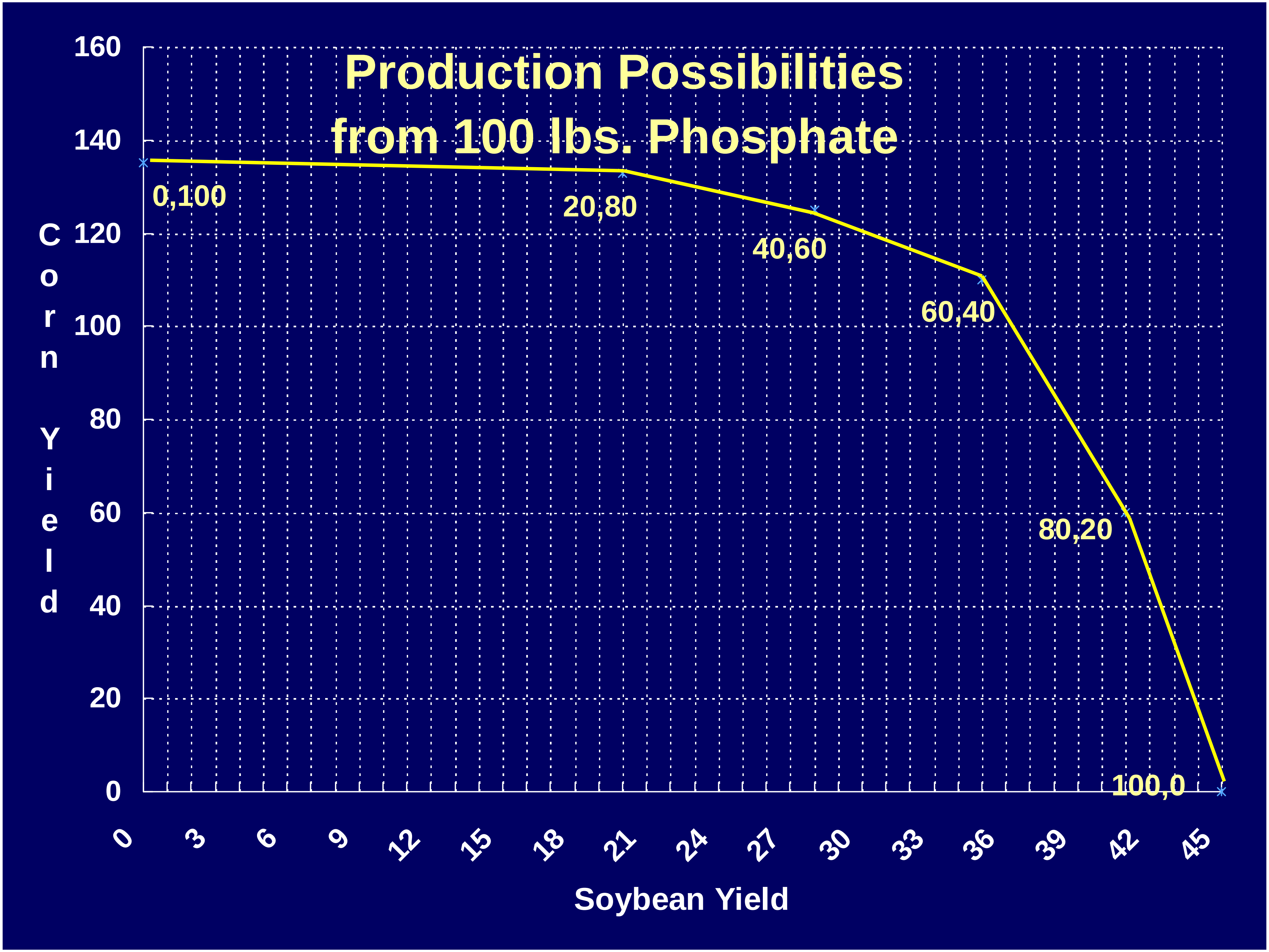
Data from Production Functions

Total Phosphate Used	Phosphate on Corn	Phosphate on Soybeans	Corn Yield bu/Acre	Soybean Yield bu/Acre
100	100	0	135	0
100	80	20	133	20
100	60	40	125	28
100	40	60	110	35
100	20	80	60	41
100	0	100	0	45


Corn Yield
160
140
120
100
80
60
40
20
0
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42
45
Soybean Yield



Pounds phosphate applied to each crop
0,100
20,80
40,60
60,40
80,20
100,0
Corn Yield
Soybean Yield
0
20
40
60
80
100
120
140
160
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42
45


Production Possibilities
from 100 lbs. Phosphate
0,100
20,80
40,60
60,40
80,20
100,0
Corn Yield
160
140
120
100
80
60
40
20
0
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42
45
Soybean Yield

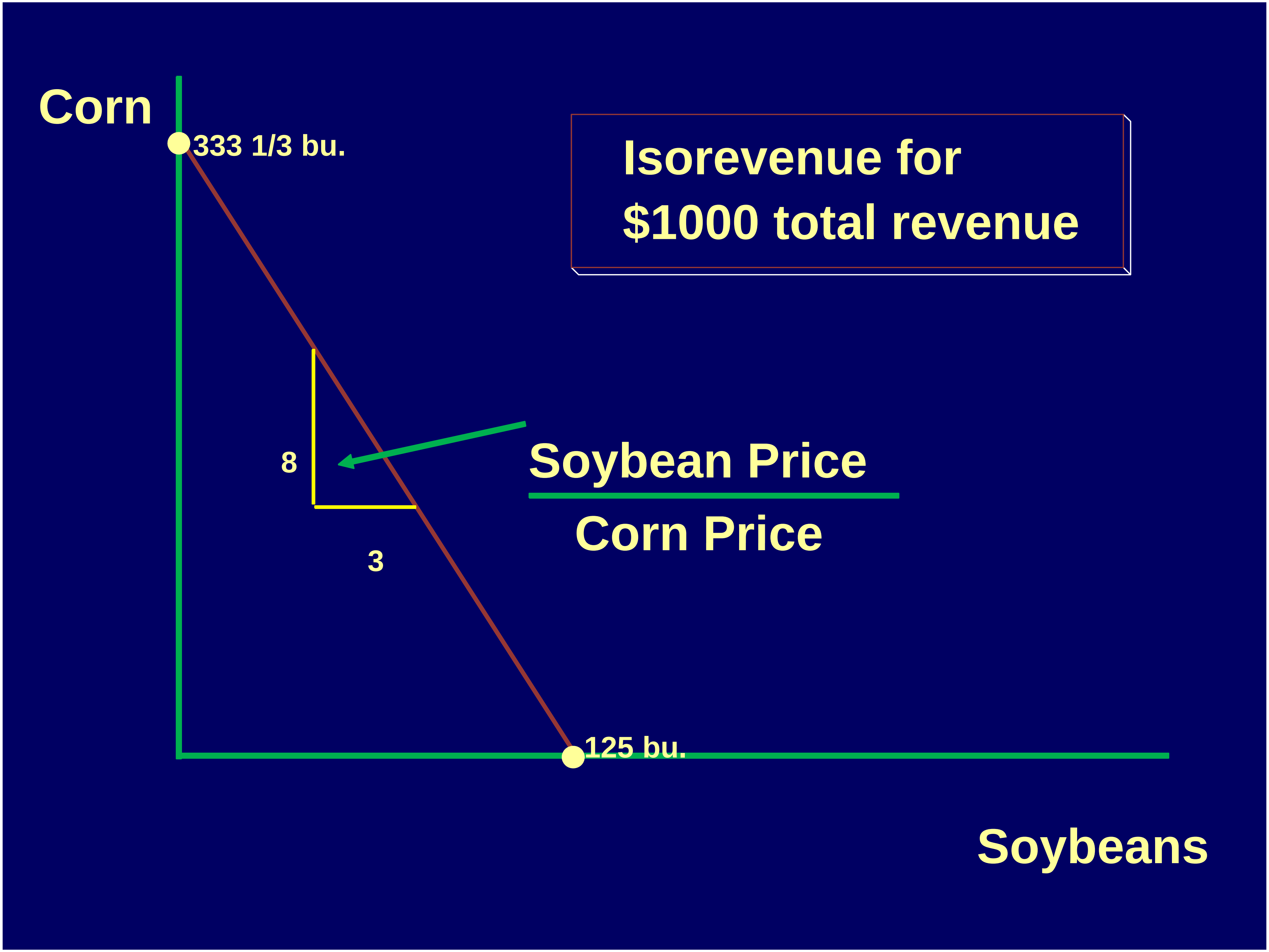
Assume:

Price of Corn $3.00/bu

Price of Soybeans $8.00/bu

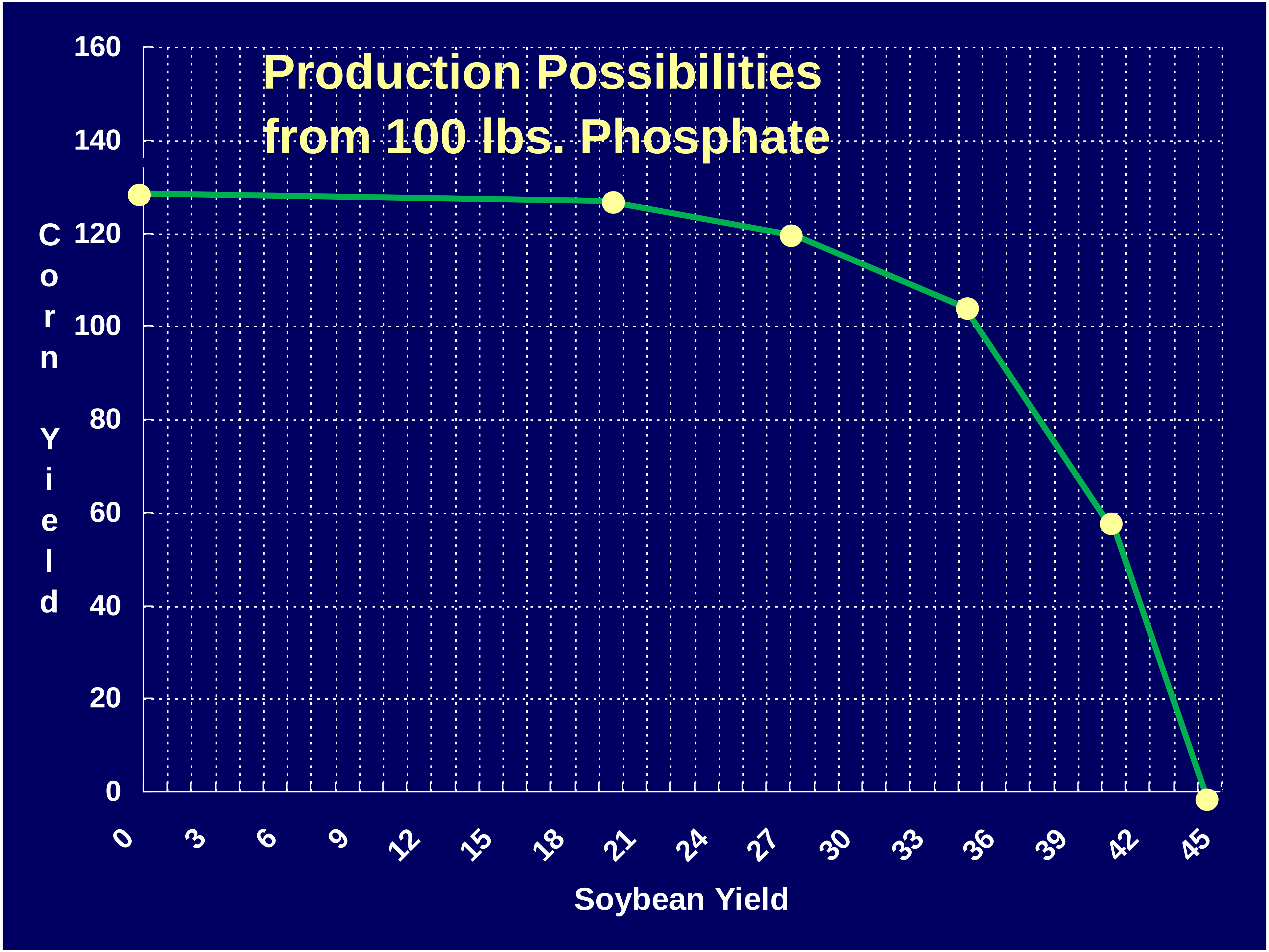
Isorevenue Line
All combinations of Corn and Soybeans that Produce the Same Total Revenue

for example, $1000
could be produced from 125 bushels soybeans
or 333 1/3 bushels corn
Other possibilities????

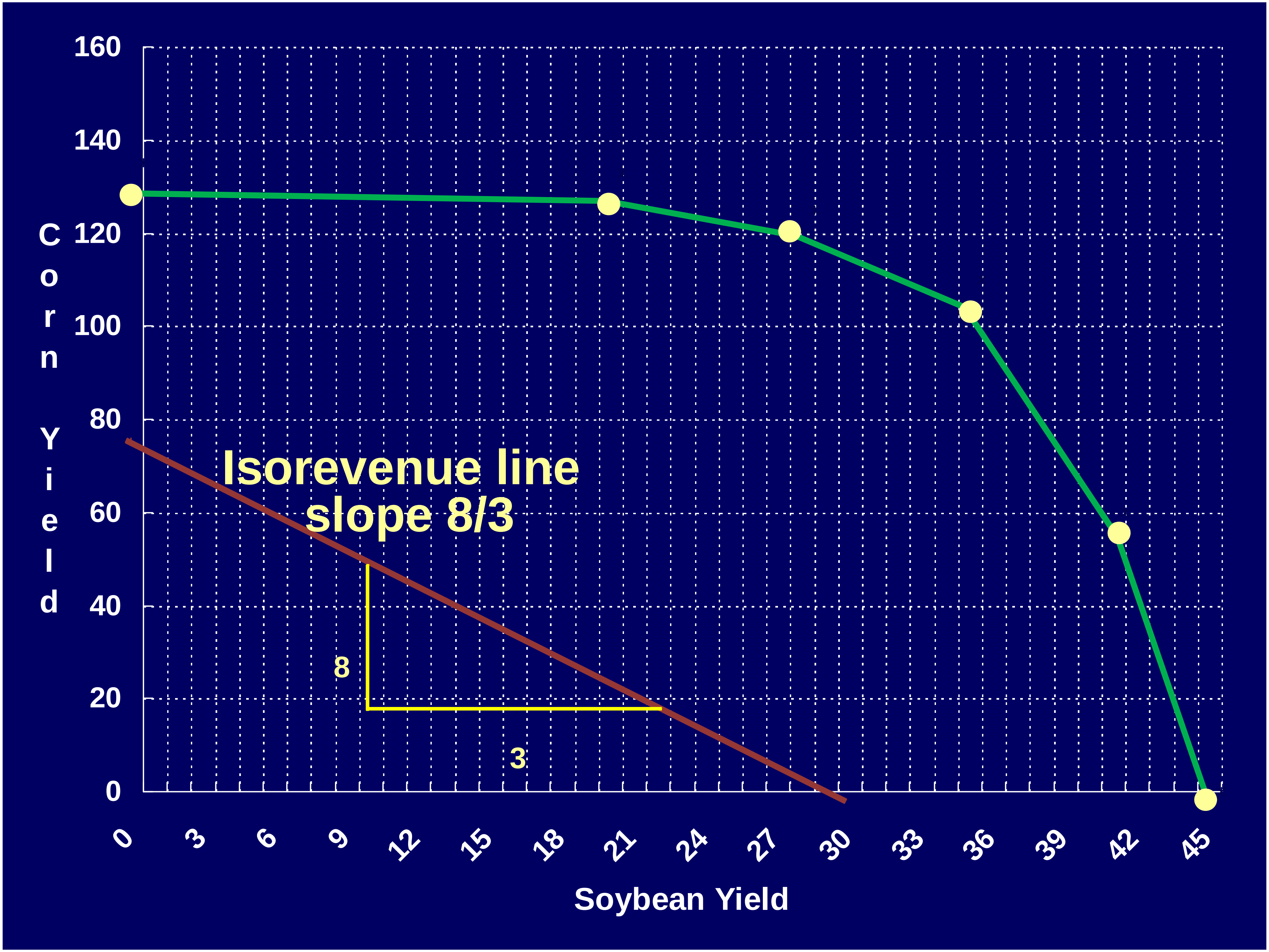

Corn
333 1/3 bu.
Isorevenue for
$1000 total revenue
8
Soybean Price
Corn Price
3
125 bu.
Soybeans

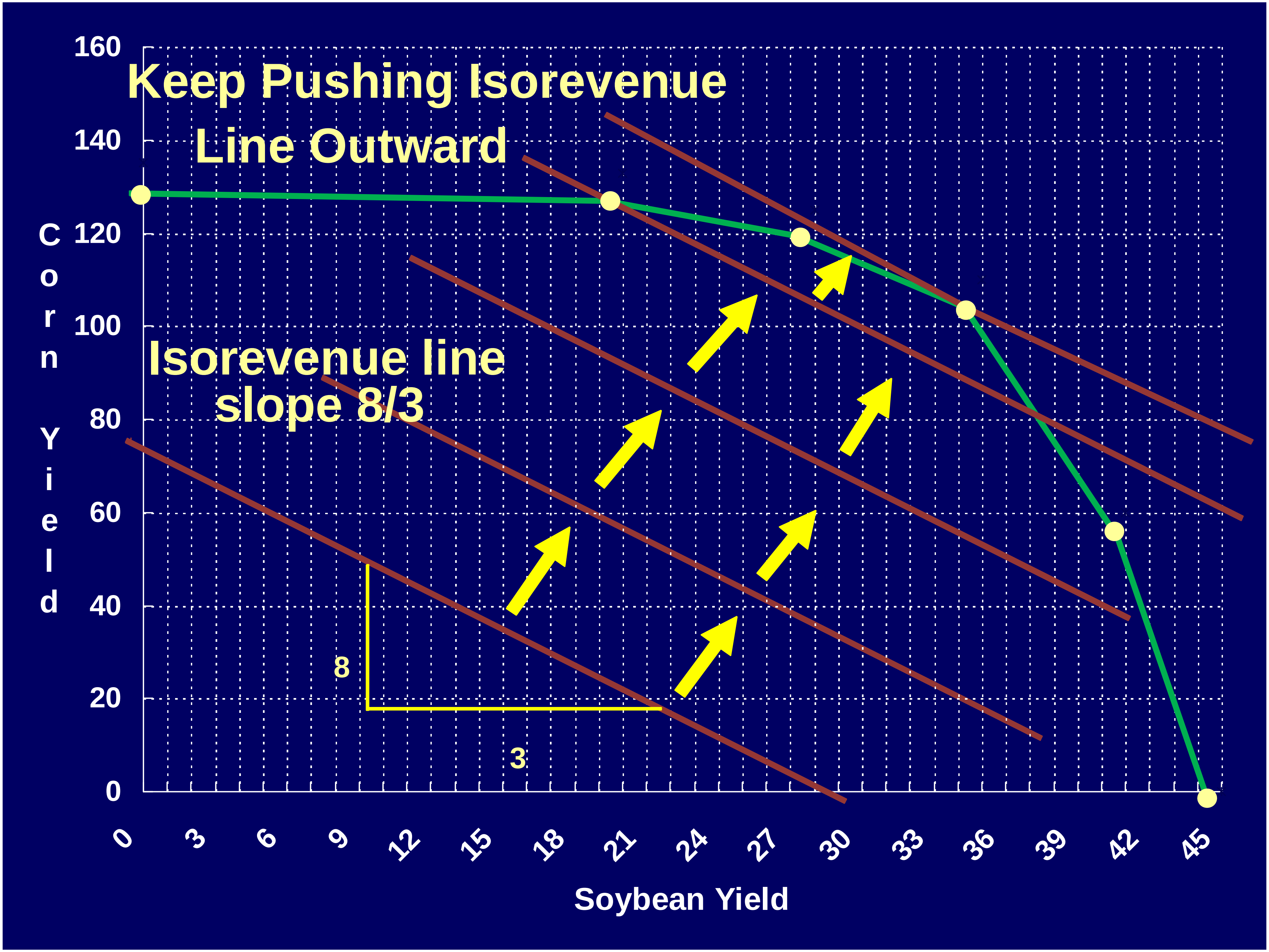
Now Bring Back

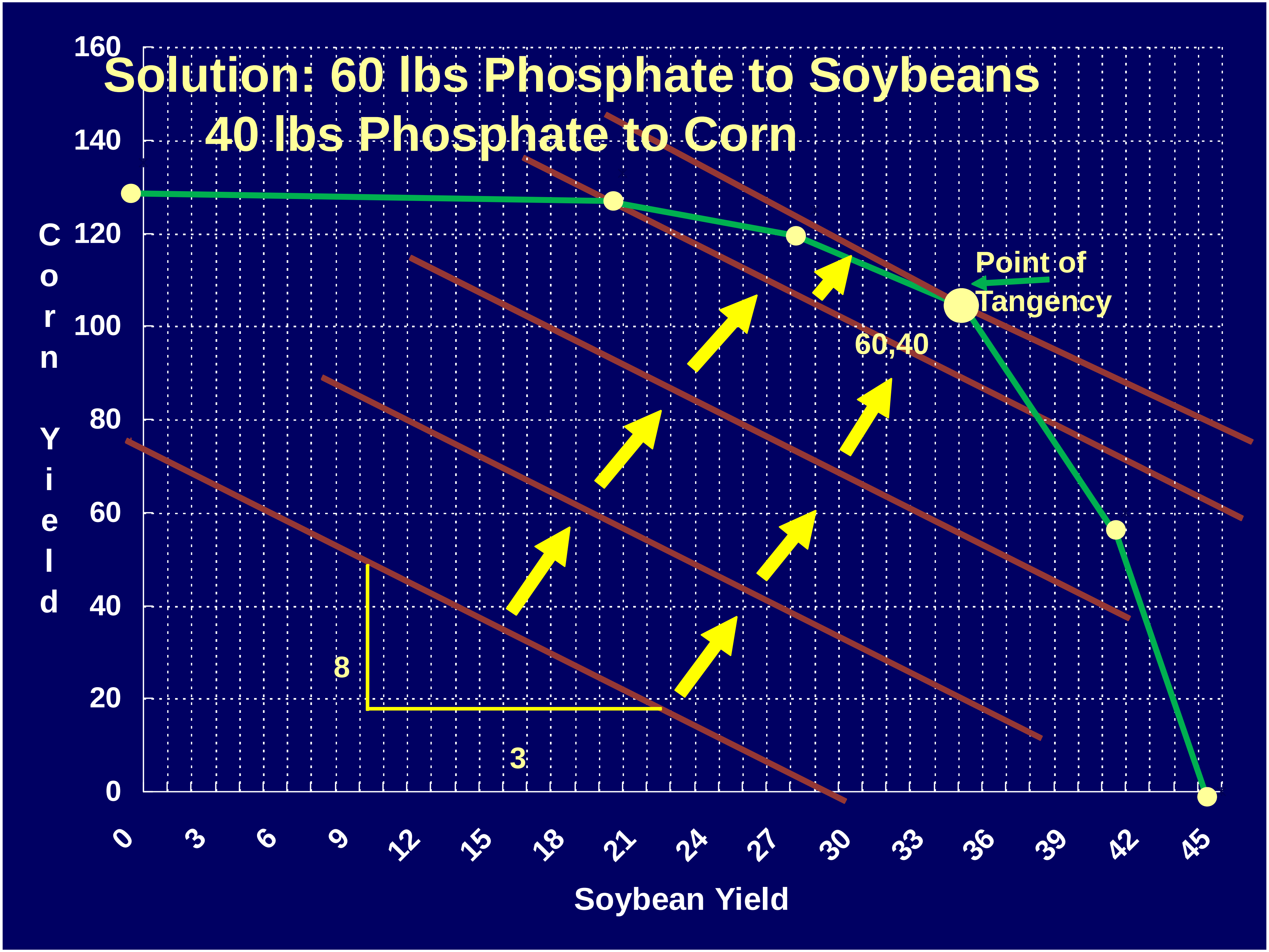
Production Possibilities Curve



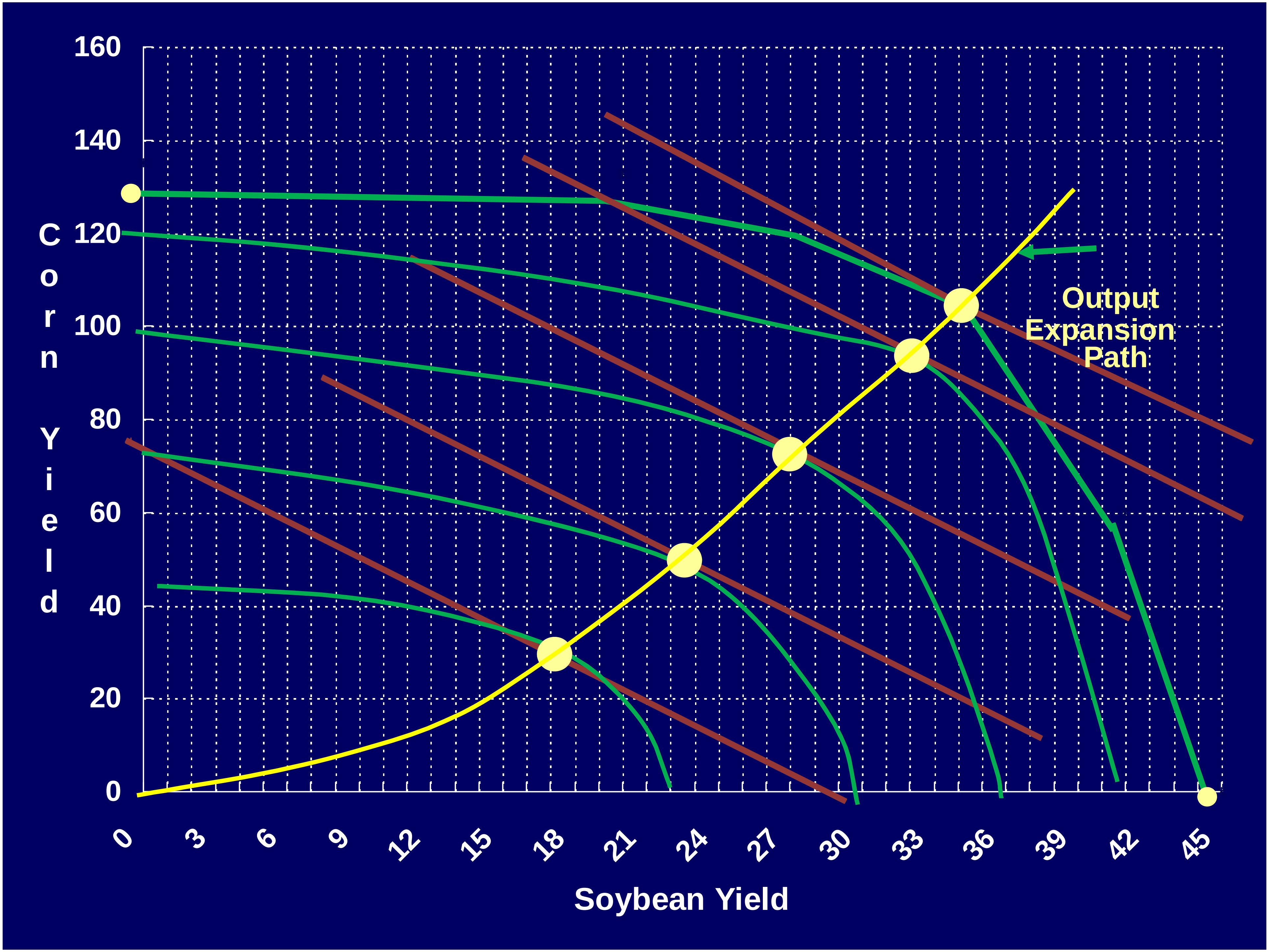
Production Possibilities
from 100 lbs. Phosphate
Corn Yield
0
20
40
60
80
100
120
140
160
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42
45
Soybean Yield


Corn Yield
160
140
120
100
80
60
40
20
0
Isorevenue line
slope 8/3
8
3
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42
45
Soybean Yield


Keep Pushing Isorevenue Line Outward
Isorevenue line slope 8/3
8
3
160
140
120
100
80
60
40
20
0
Corn Yield
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42
45
Soybean Yield



Solution: 60 lbs Phosphate to Soybeans
40 lbs Phosphate to Corn
Point of Tangency
60,40
8
3
Corn Yield
Soybean Yield
0
20
40
60
80
100
120
140
160
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42
45



160
140
120
100
80
60
40
20
0
Corn Yield
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42
45
Soybean Yield
Output Expansion Path

Output Expansion Path:

Connects points of tangency between the Product Transformation Curve and the isorevenue lines

This is a path along which the firm would expand as production of the two outputs is increased.

The slope of Product Transformation Curve equals the negative of the Rate of Product Transformation.

The slope of the Isorevenue Line equals the negative ratio of the output prices.

At the point of tangency between the Product Transformation Curve and the Isorevenue Line, the slope of the Product Transformation Curve and the slope of the Isorevenue Line are equal.

The Output Expansion Path connects all of these points.

The Rate of Product Transformation (RPT) is the negative of the slope of the Product Transformation Curve.

Hence, the Rate of Product Transformation is

$$\frac{\Delta \text{Corn}}{\Delta \text{Soybeans}}$$

At the point of tangency between the Product Transformation Curve and the Isorevenue Line

$$\frac{\Delta \text{Corn}}{\Delta \text{Soybeans}} = \frac{\text{Price of Soybeans}}{\text{Price of Corn}}$$

For a specific input, or resource level, this is the optimum amount of corn and soybeans to be produced.

Chapter 9: Alternative models of Competition

Perfect and Imperfect Competition

Models of Competition

Perfect (Pure) Competition

Horizontal demand curve

P = MR = AR

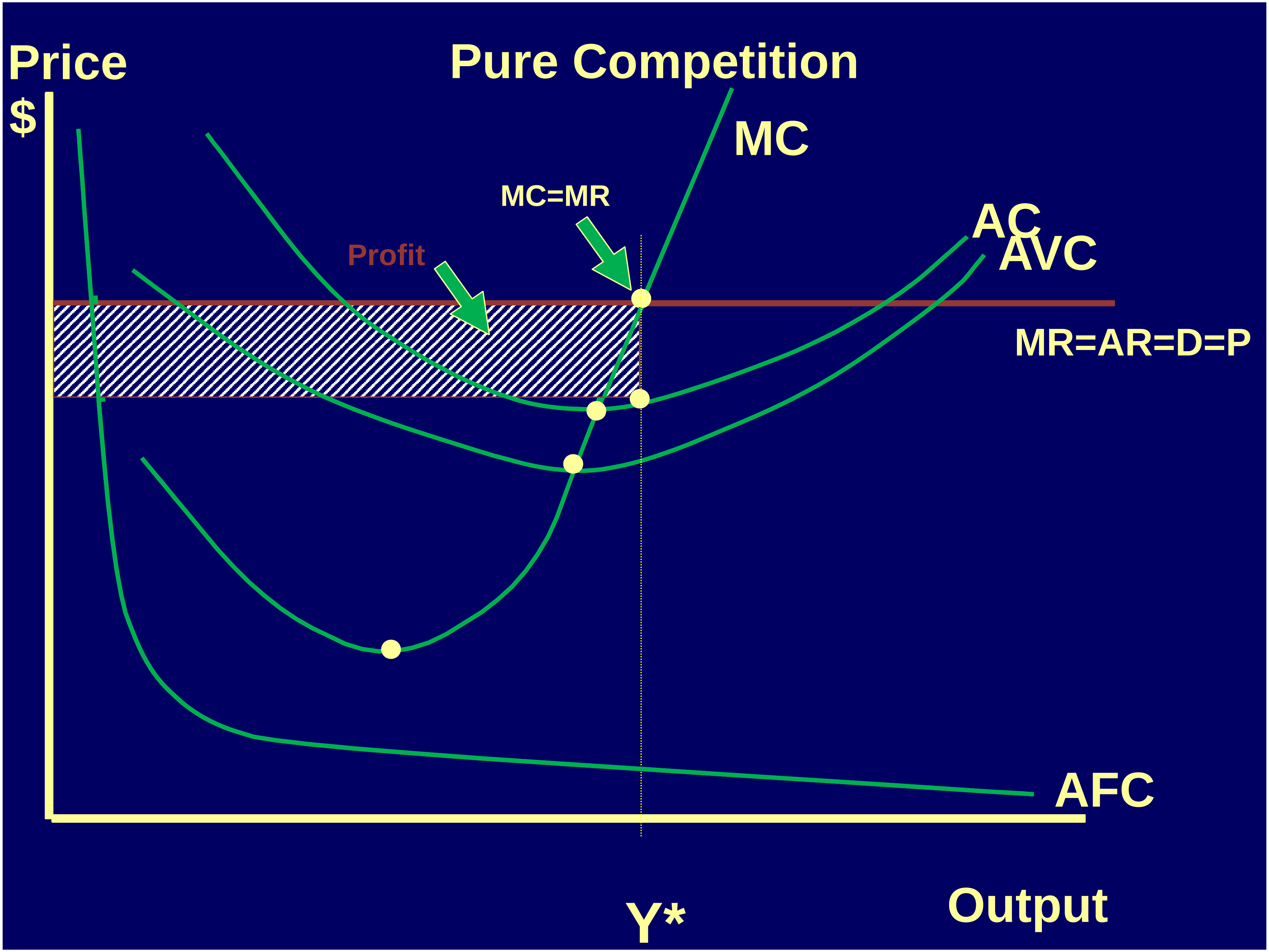
No individual firm large enough to influence price

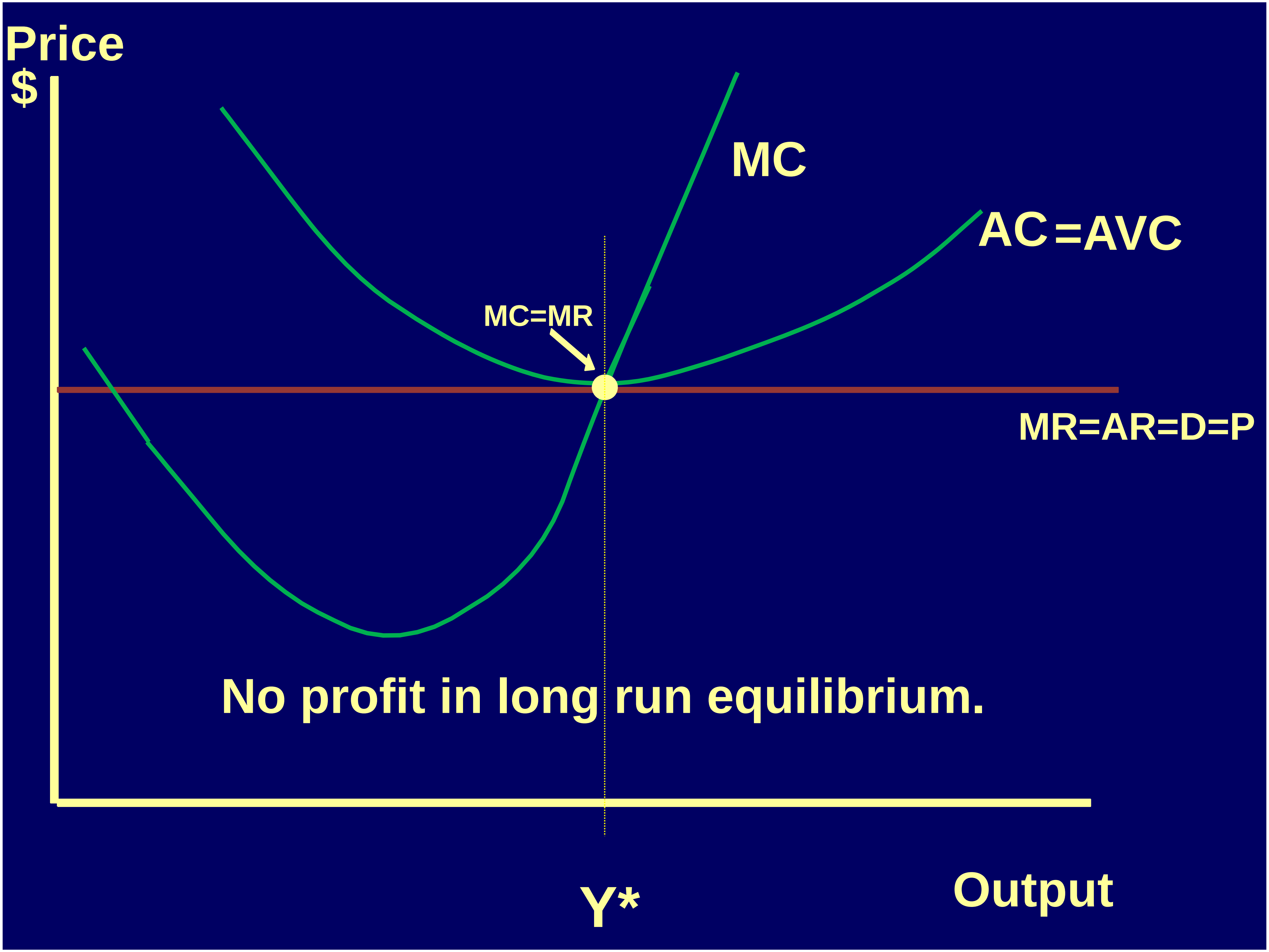
Demand "perfectly elastic" (infinite elasticity)

Profit maximum where MC=MR

Homogeneous product

(your corn and mine!)


Price
$
Pure Competition
MC
MC=MR
Profit
AC
AVC
MR=AR=D=P
AFC
Y*
Output

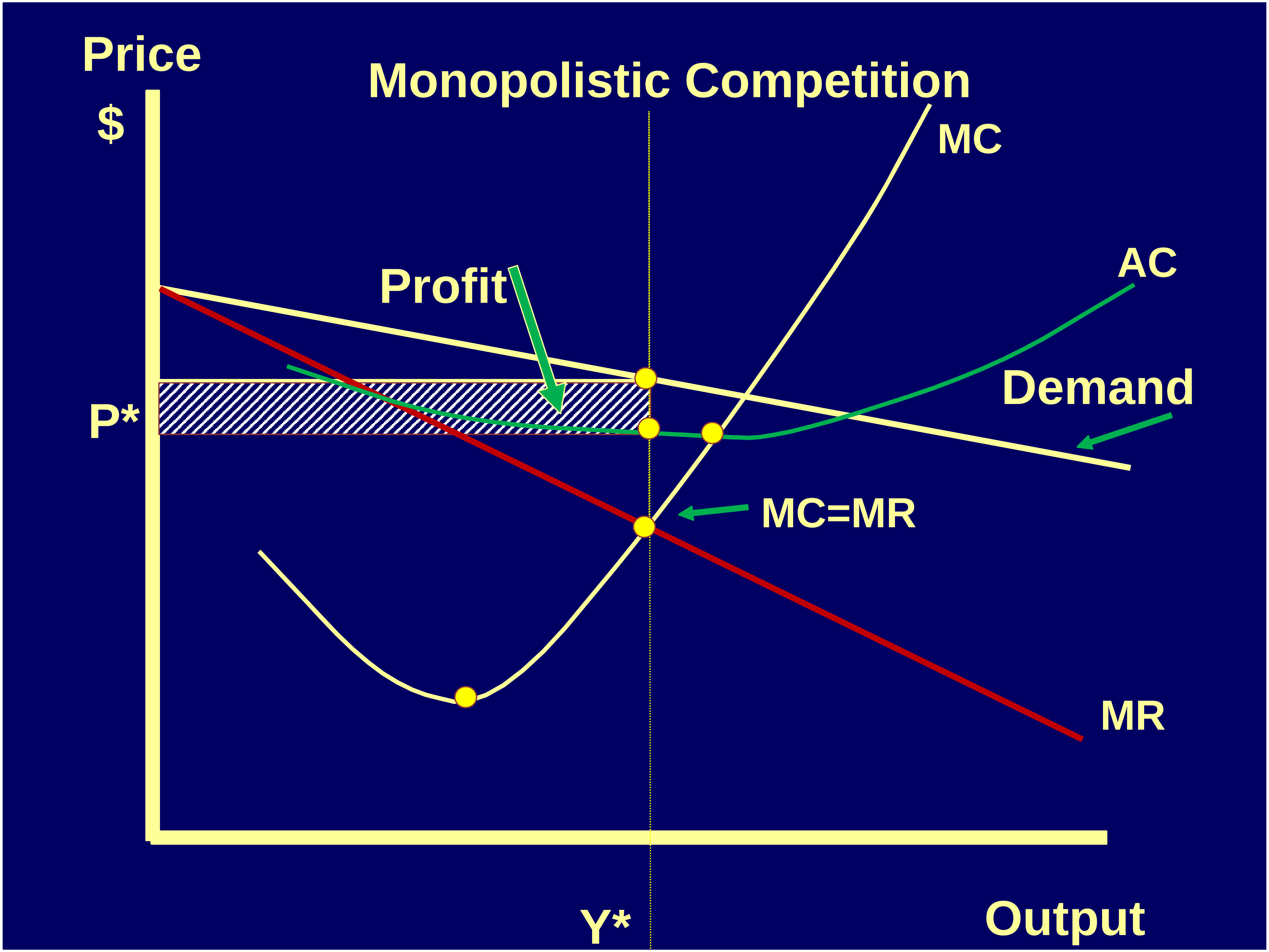


Price
$
MC
AC=AVC
MC=MR
MR=AR=D=P
No profit in long run equilibrium.
Y*
Output

Models of Competition

Monopolistic Competition

D not equal to MR
Demand curve not horizontal
(slight downward slope)
Demand elastic but not perfectly so
Some product differentiation
Elasticities more negative than -1
Examples: -3, or -25
Canned peas!!!


Price
$
Monopolistic Competition
MC
AC
Profit
Demand
P*
MC=MR
MR
Y*
Output

In monopolistic competition,
pure (economic) profit
is possible, but not assured
in long run equilibrium.

Models of Competition

Oligopoly

"Few" sellers

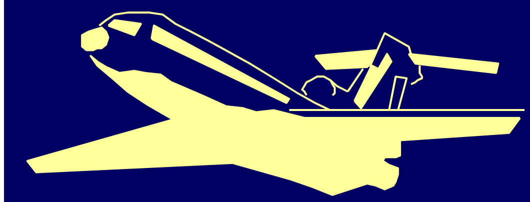
Pricing and output decisions
by firm linked to
pricing and output decisions
of other firms
in the industry

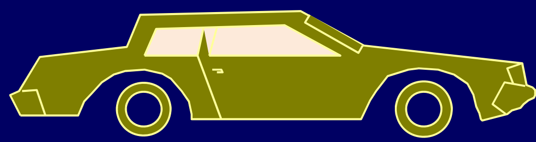
"Kinked" demand curve

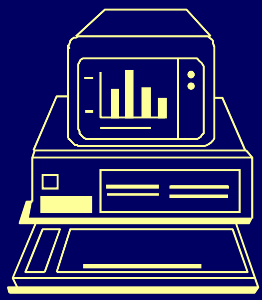
Competition ignores price increases
but follows price decreases

Prices tend to be sticky

For an Oligopoly, there are
possible pure profits
in the Long Run

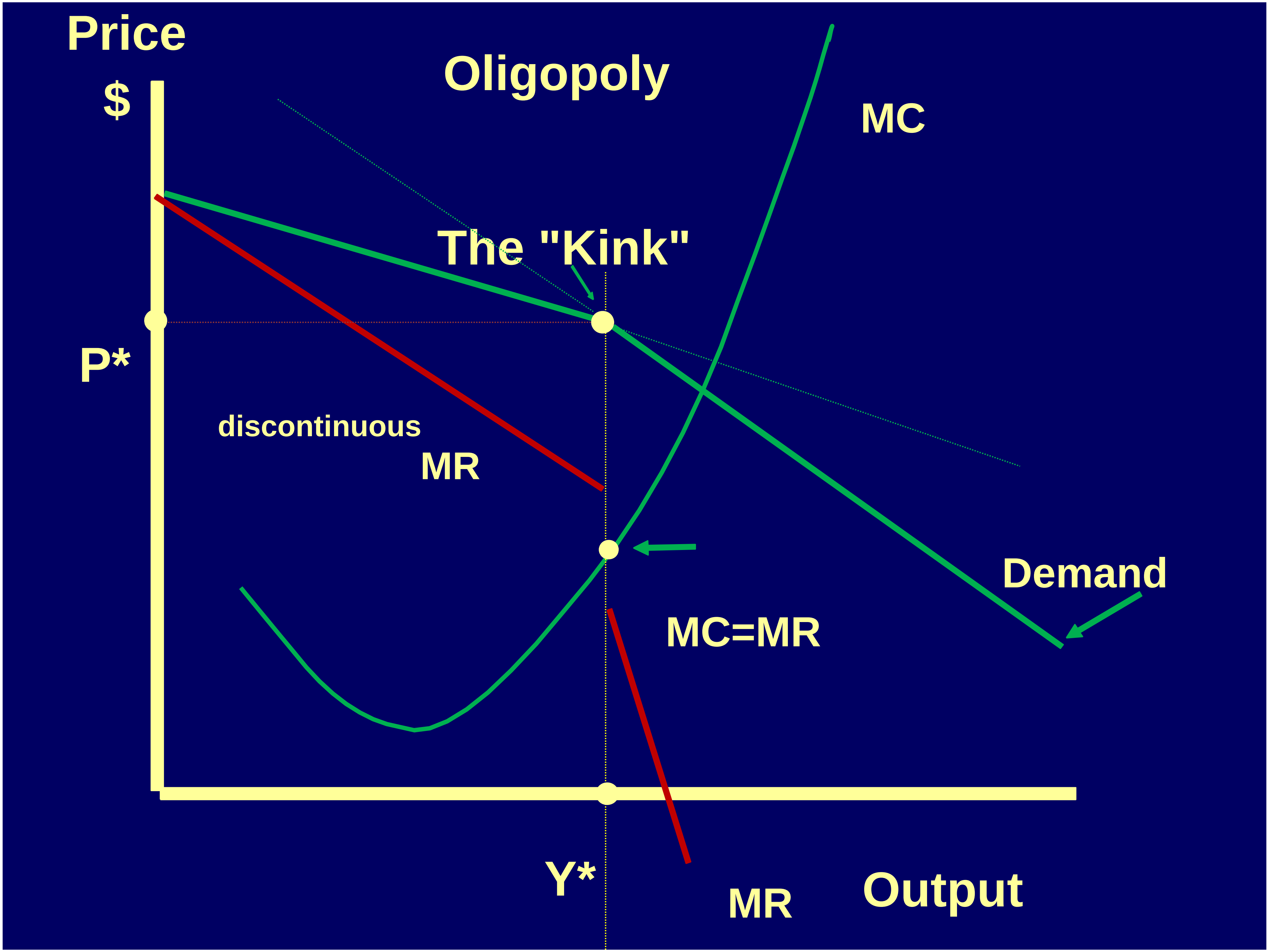






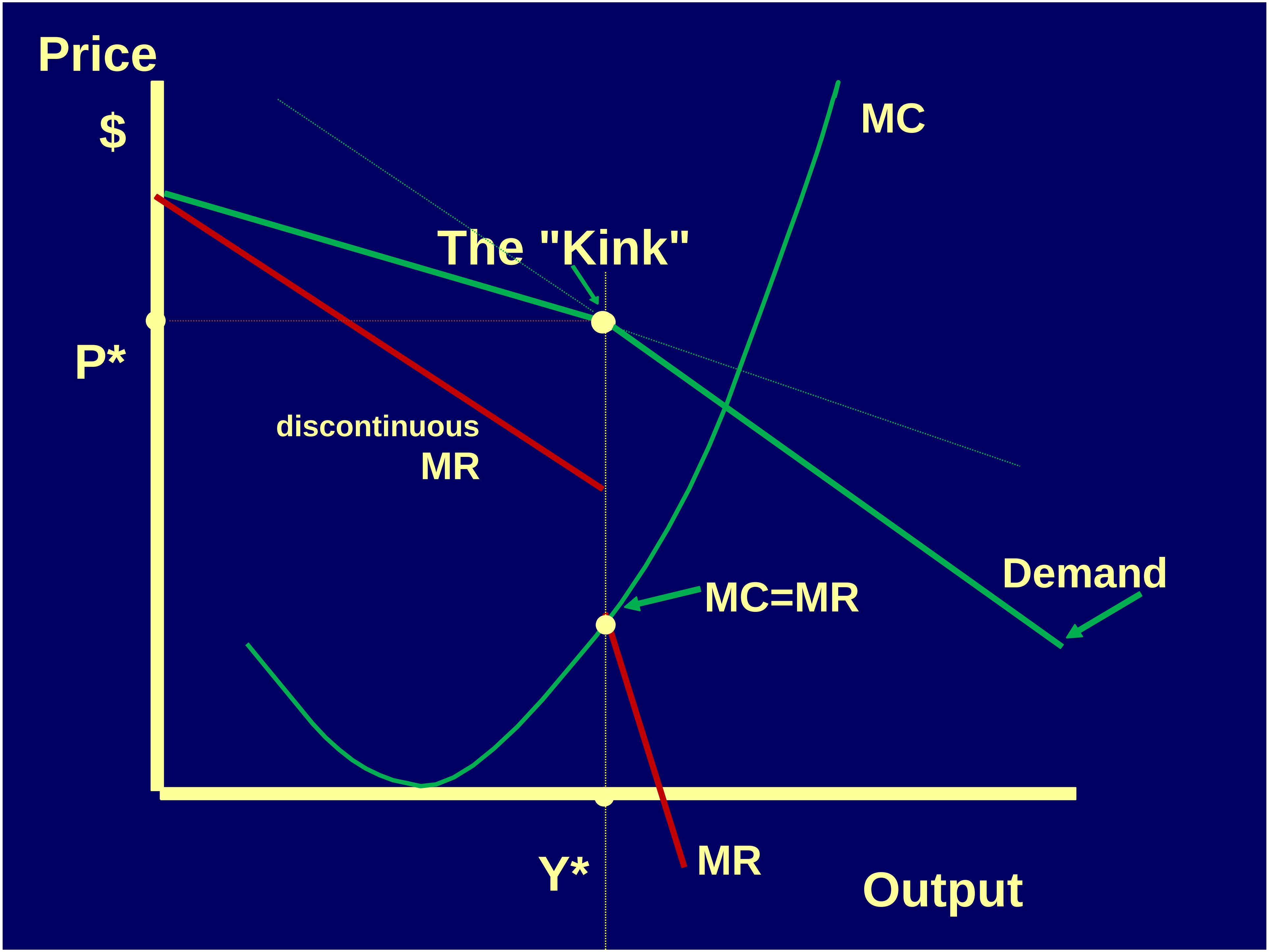
Airlines, Automobiles and Computers (perhaps)

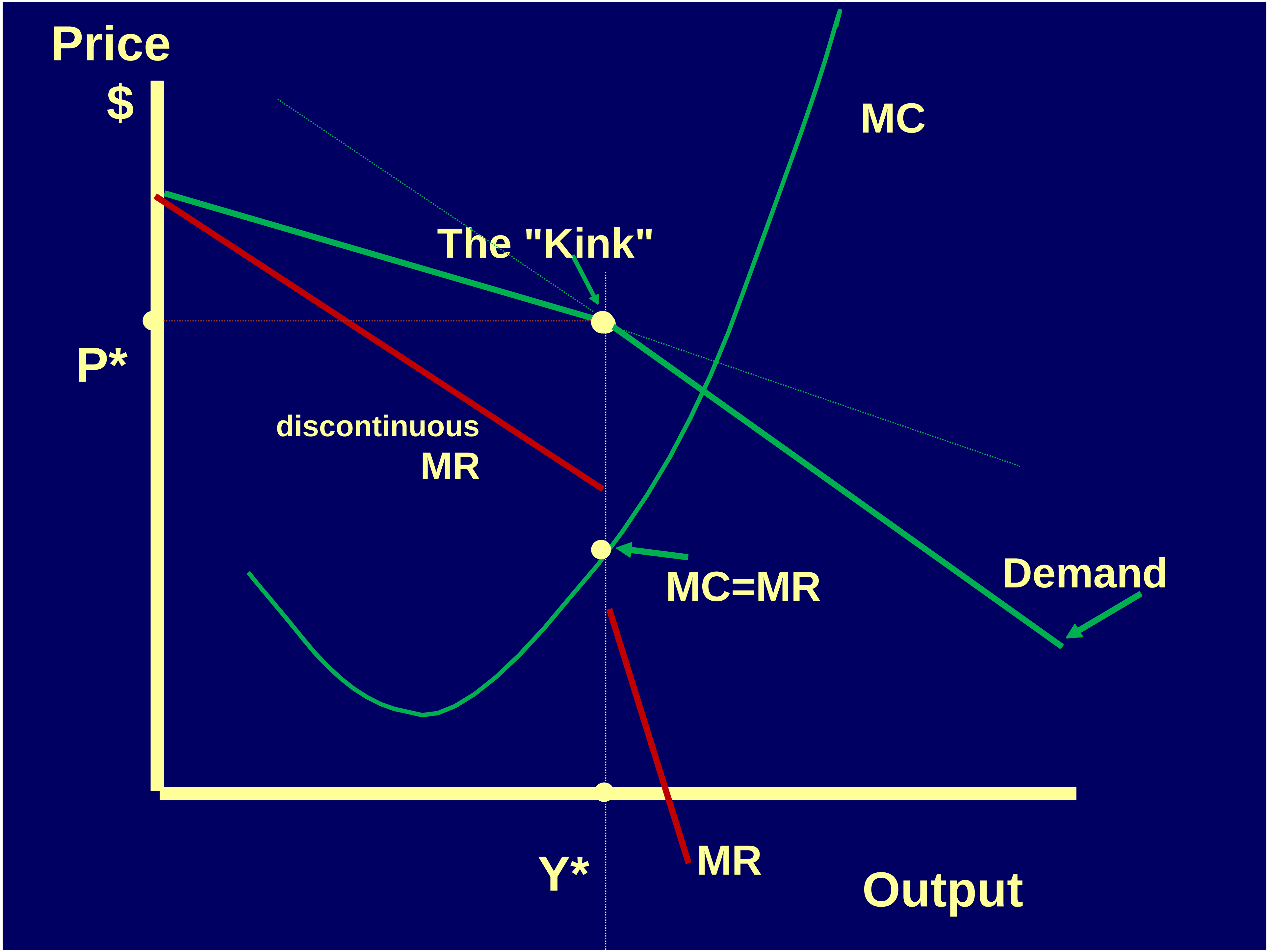
Product differentiation is a key characteristic



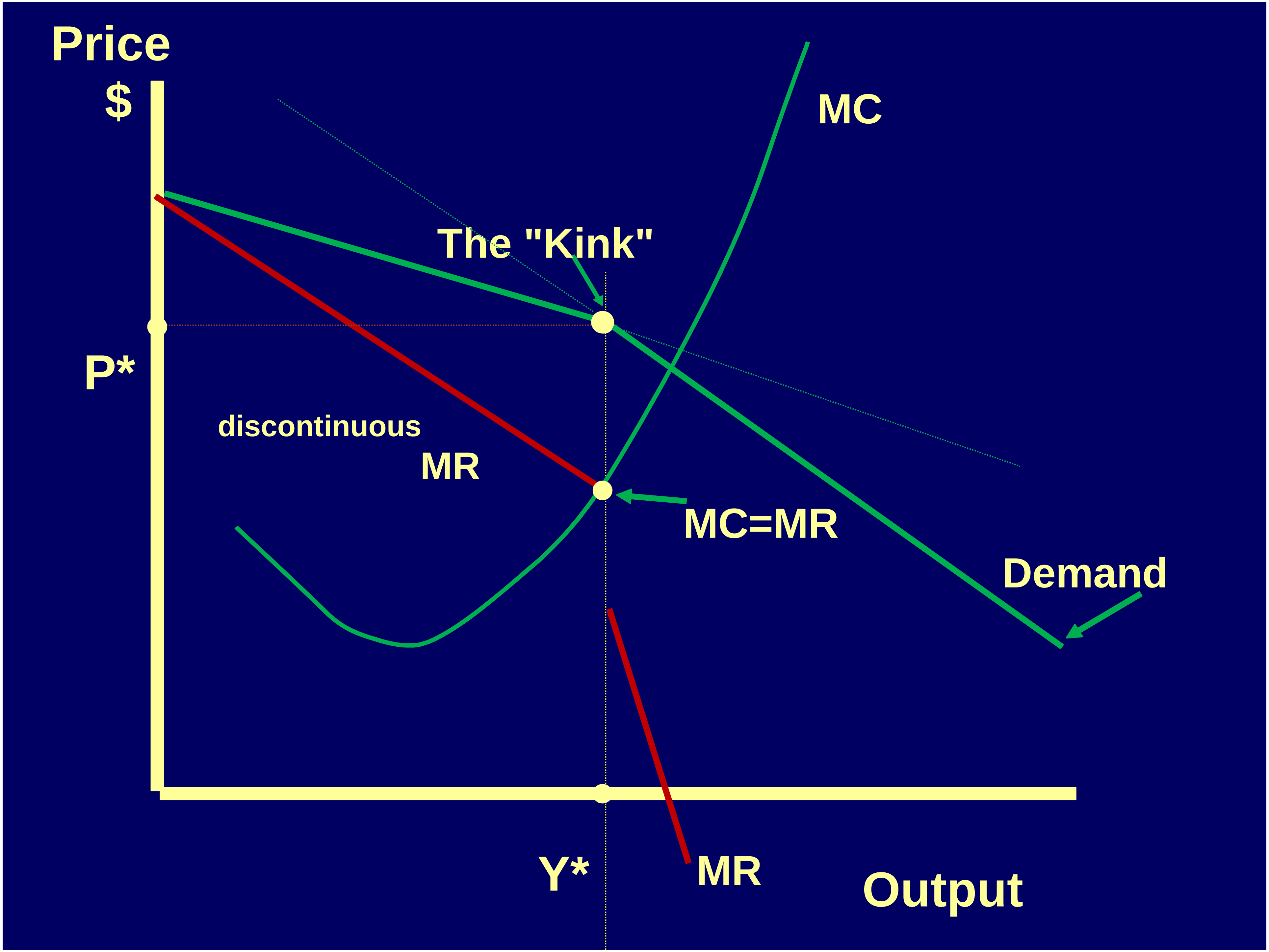
Price
$
Oligopoly
MC
The "Kink"
P*
discontinuous
MR
Demand
MC=MR
Y*
MR
Output

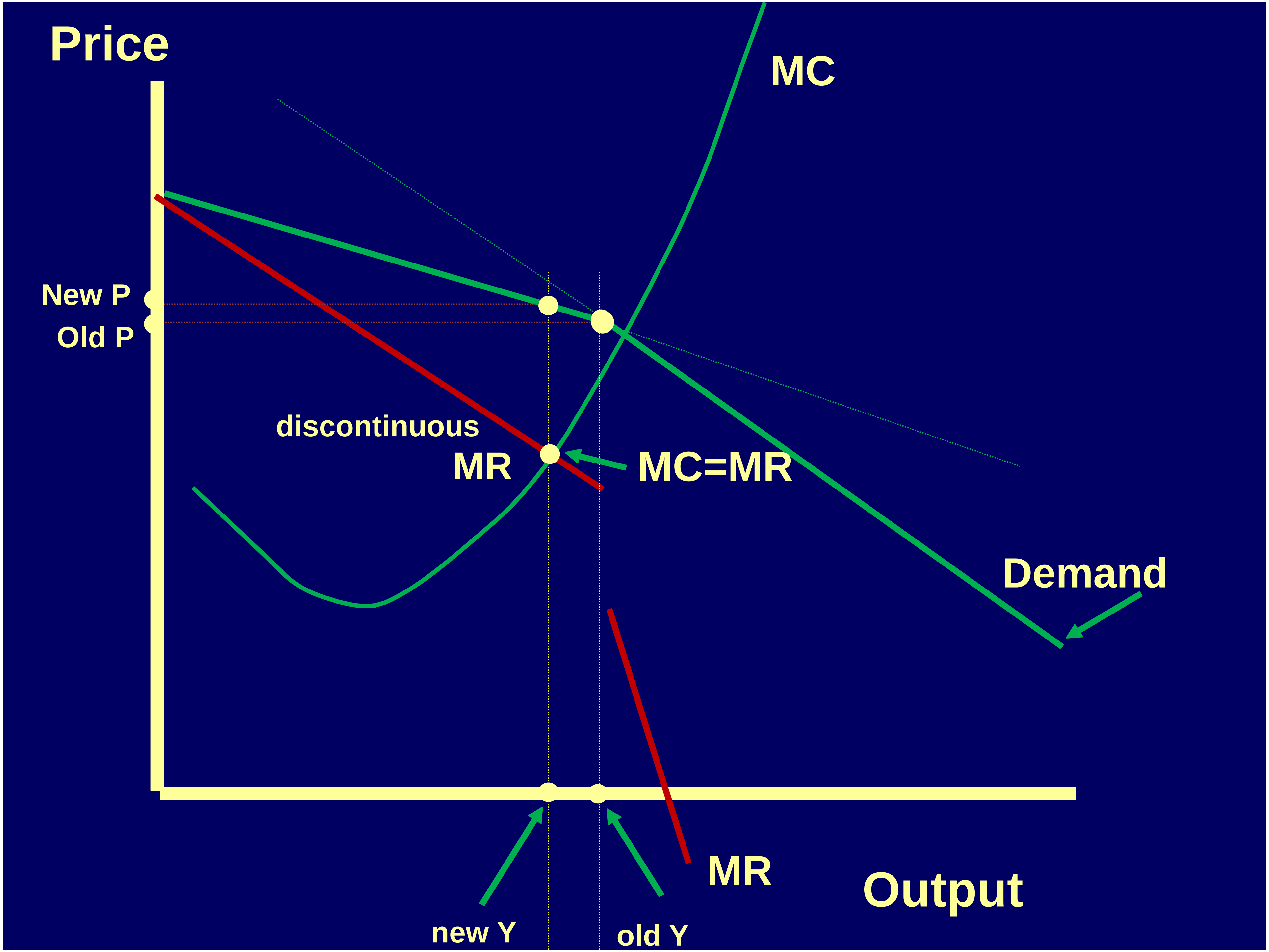
Impact of Changing Marginal Costs on Oligopoly Pricing


Price
$
MC
The "Kink"
P*
discontinuous
MR
Demand
MC=MR
Y*
MR
Output



Price
$
MC
The "Kink"
P*
discontinuous
MR
MC=MR
Demand
Y*
MR
Output


Price
$
MC
The "Kink"
P*
discontinuous
MR
MC=MR
Demand
Y*
MR
Output


Price
MC
New P
Old P
discontinuous
MR
MC=MR
Demand
MR
Output
new Y
old Y

Models of Competition

Monopoly

1 Firm

Firm is the industry

There can be long run profits

Not always profitable

(Monopoly in hula hoops!)

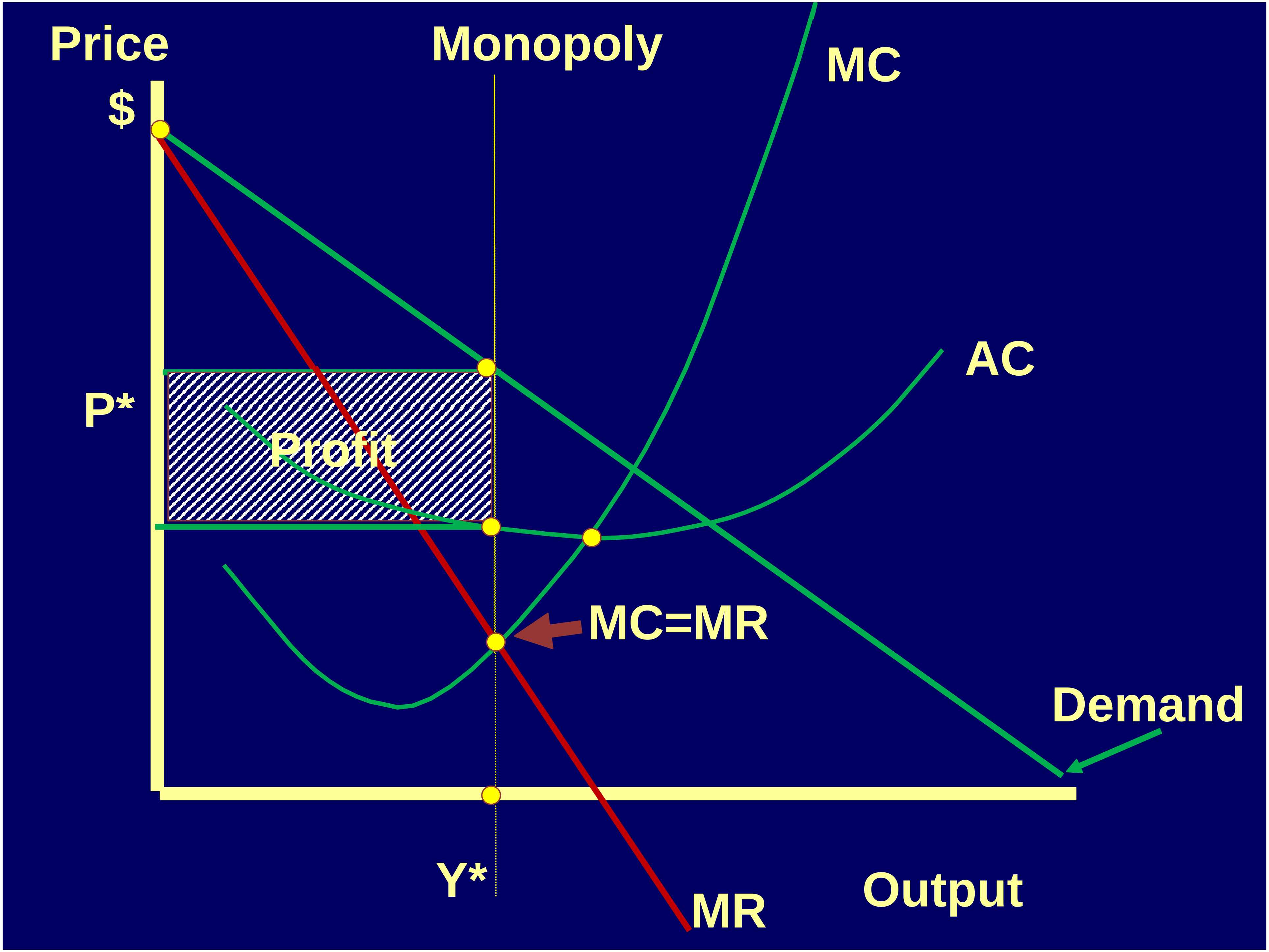
Patents, licenses

D not equal to MR

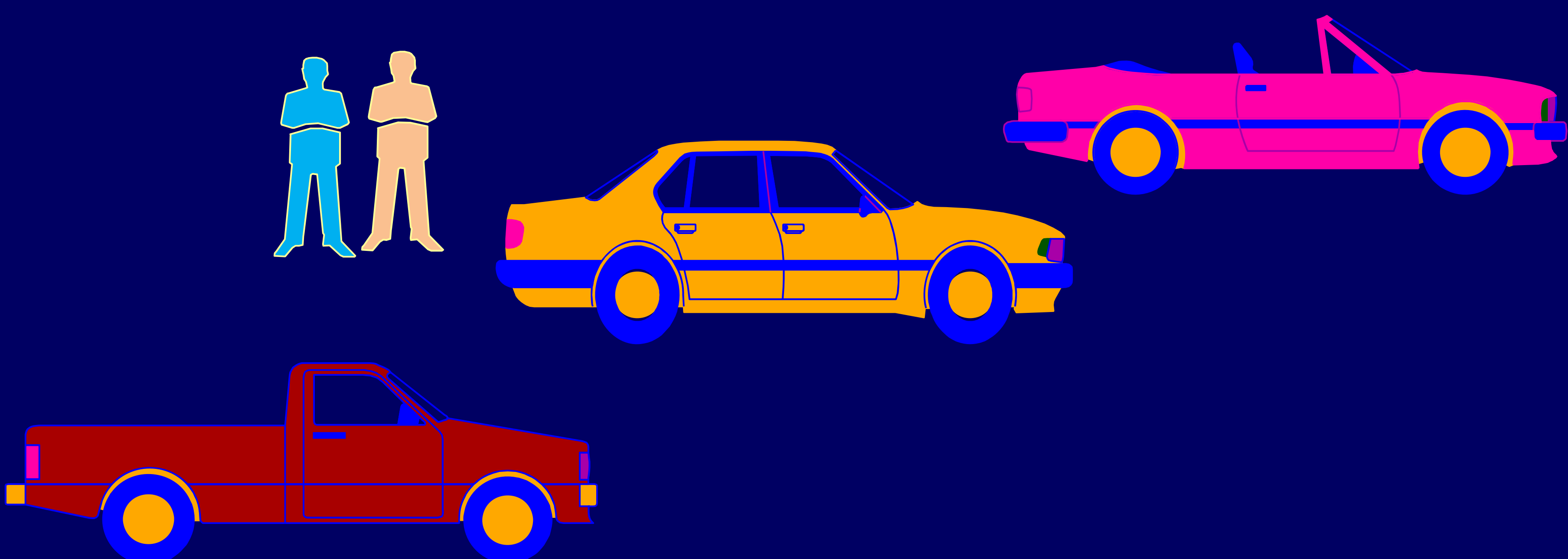
Elasticity depends on
how badly consumers need (want)
the good

Are there good substitutes ?

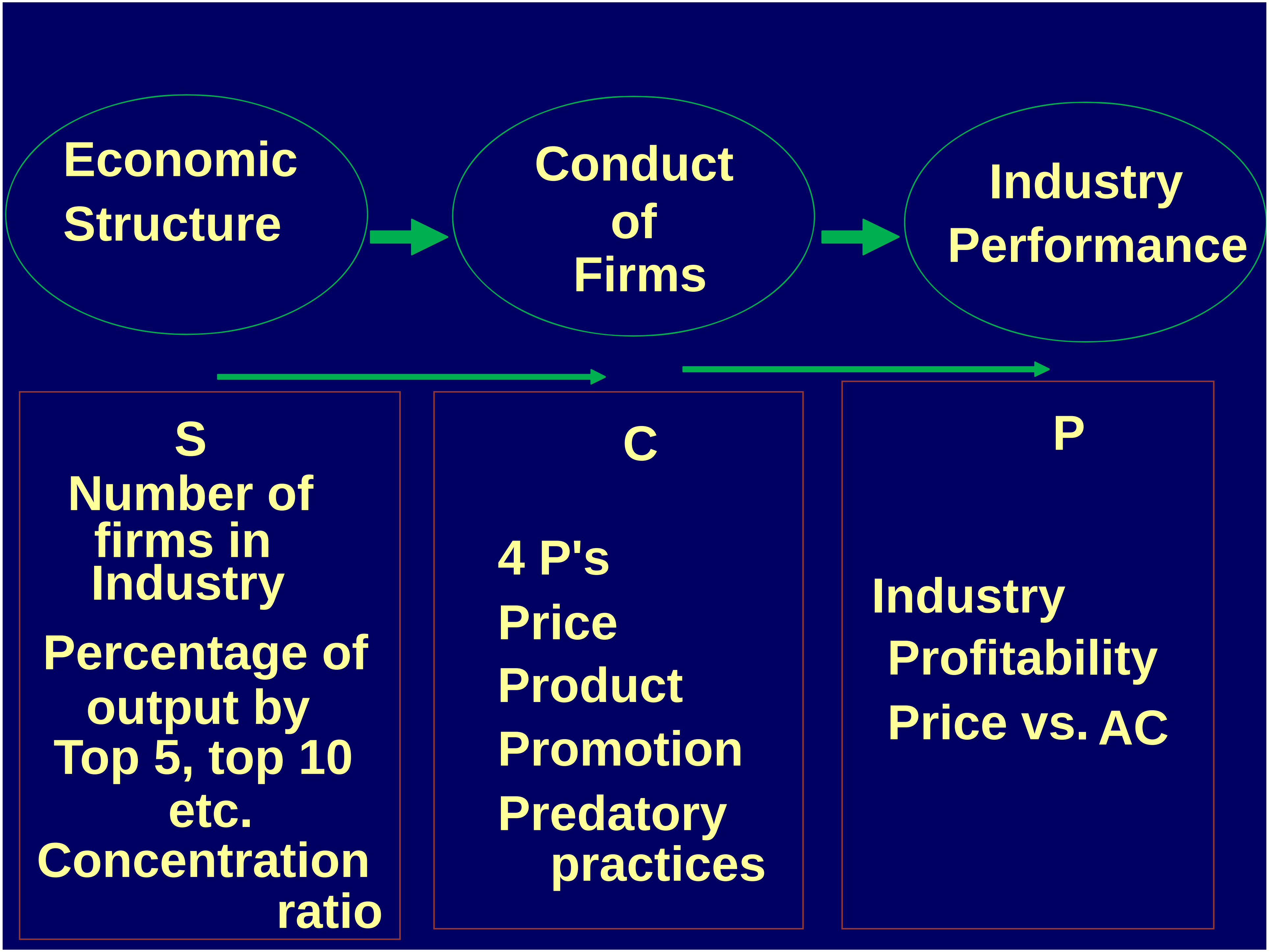
Polaroid???


Price
Monopoly
MC
$
AC
P*
Profit
MC=MR
Demand
Y*
Output
MR

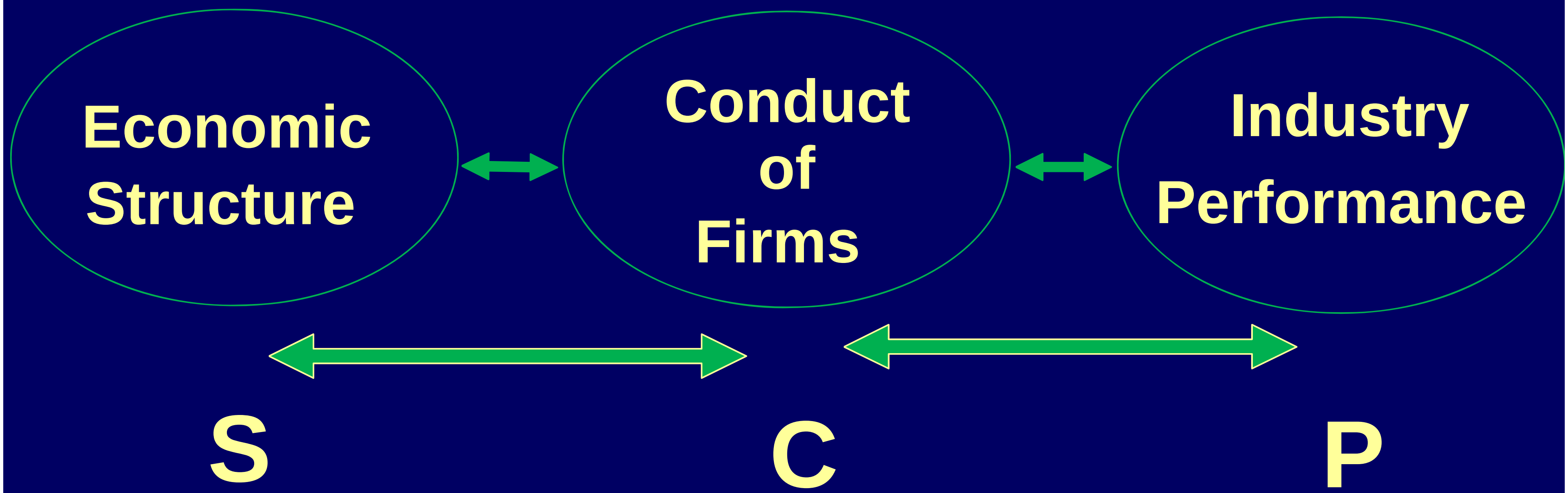
Contemporary views of Imperfect Competition



Bain Model
(due to Joe Bain)


Economic Structure
Conduct of Firms
Industry Performance
S
Number of firms in Industry
Percentage of output by Top 5, top 10 etc.
Concentration ratio
C
4 P's
Price
Product
Promotion
Predatory practices
P
Industry Profitability
Price vs. AC

Do arrows run both directions???



Firm Growth options:

1. Horizontal mergers
2. Conglomerates
3. Vertical integration
4. Internal growth through reinvestment of profits

Limits to Growth:

1. Competition in industry
2. Access to capital markets
3. Demand for goods produced
4. Antitrust laws
5. Overall profitability
6. Patents, licenses
   held by others

Agricultural Bargaining

Farmers are (usually) price-takers

Cooperatives formed:

inputs--Southern States, Cenex

outputs--dairy coops

attempt to cooperate to

get lower input prices

higher output prices

works (sometimes!)

dairy and oranges

but not wheat and beef

Chapter 10: Agricultural Marketing

Marketing of Agricultural Commodities

Marketing Creates

Form Utility

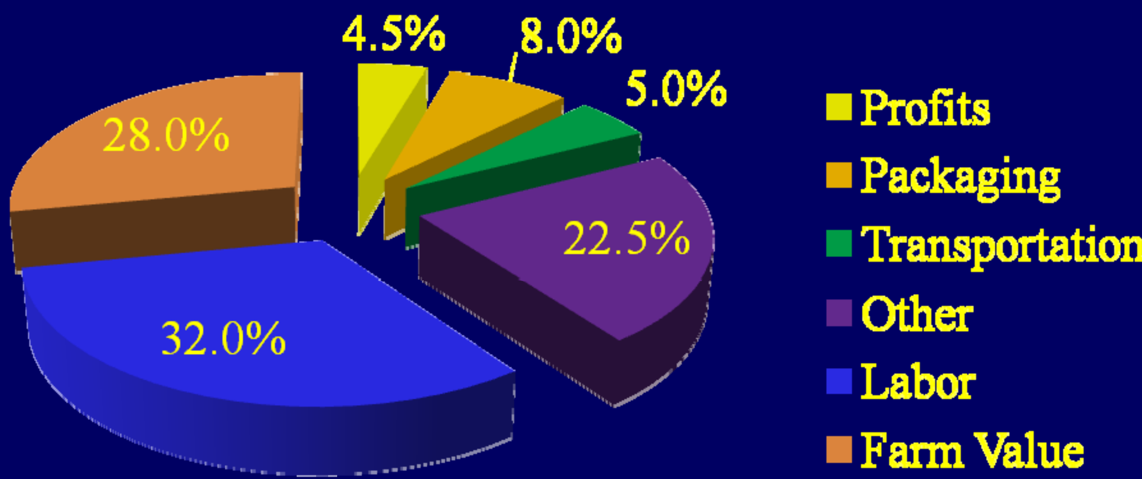
Time Utility

Place Utility

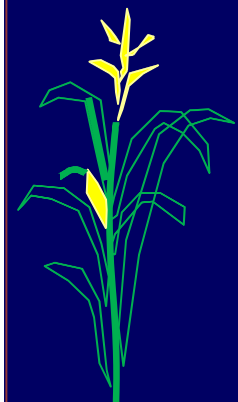
The farm value represents only slightly more than a fourth of the price of food at the grocery store.

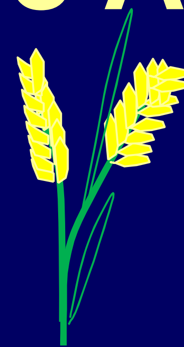
The remainder consists of labor in processing and distribution, transportation, advertising, and other wholesaling and retailing costs.

Estimated Components of Retail Food Prices (%)



Law of Comparative Advantage





	Corn	Wheat
IN	130 bu/Acre	50 bu/Acre
ND	70 bu/Acre	40 bu/Acre

Indiana has Absolute Advantage
in both corn and wheat production

North Dakota has a Comparative Advantage
in wheat production

Indiana produces corn; North Dakota wheat
then trade!

Need for Marketing

Approaches to the Study of Marketing

1. Functional approach

What functions is the market to perform???

a. Bring buyers & sellers together

b. Processing, storage, transportation

c. Grading

d. Information, risk-bearing

Exchange functions:

where goods are traded

packaging, labeling,

advertizing, promotion

locating supplies of the good

assembly

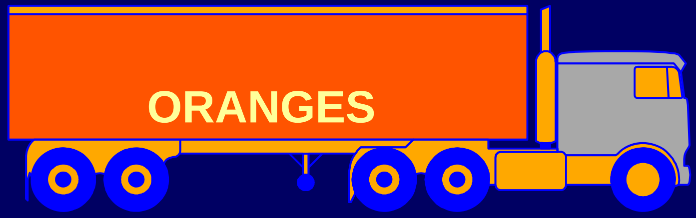
Physical Functions:

Form utility

Time utility

Place utility

Storage and transportation
(oranges grown in California
eaten in Kentucky)



Facilitating functions:

Increasing operational efficiency

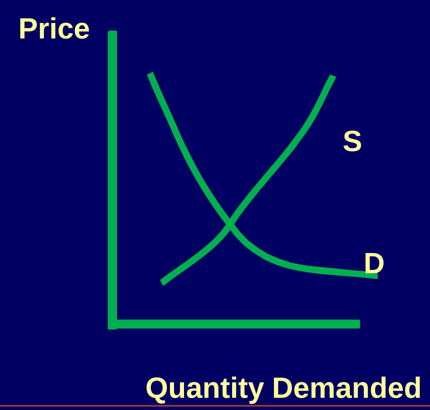
Increasing pricing efficiency

P=MC????

Financing

Risk-bearing

Market information
collection, dissemination, analysis



Approaches to the Study of Marketing

2. Institutional approach

Activities of organizations & people

- **Merchant-middlemen**
  - **take title to goods**
  - **buy from wholesalers**
- **Example: shopping mall merchants**

What functions does a shopping mall perform?

A shopping mall is a MARKETING INSTITUTION

Comprised of MERCHANT MIDDLEMEN

Agent Middlemen

Do not take title to goods

Livestock auction

Compare a livestock auction with
a shopping mall

Commissionmen & brokers
often work on a percentage basis

Speculative Middlemen

Assume risk

Seek gain

Hold title to goods or contracts

Gains from assuming risk

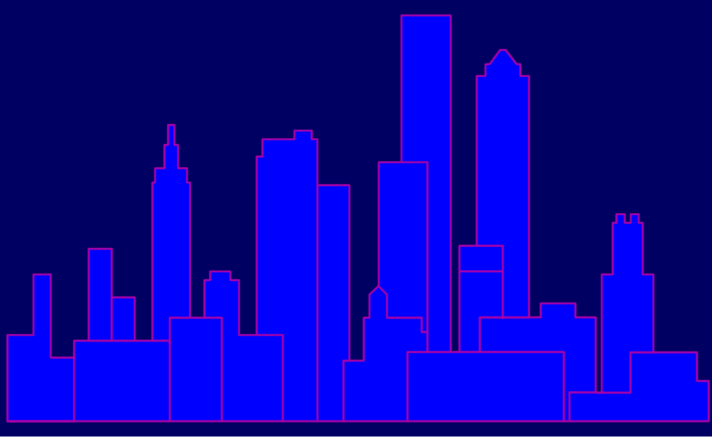
Facilitative organizations

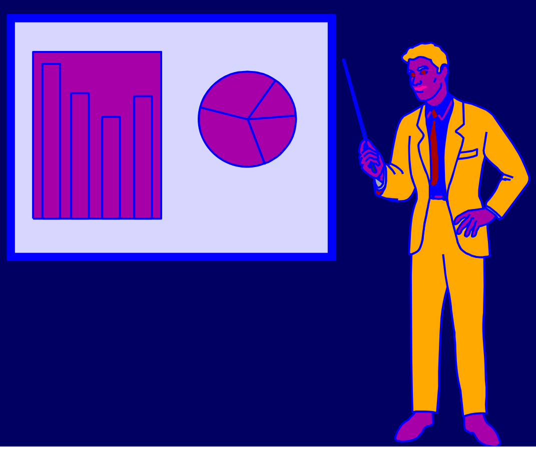
Chicago Board of Trade

Minneapolis Grain Exchange

Commodity Futures Trading Commission

Rules of the Game!





Approaches to the Study of Marketing

3. Structural approach

Bain Model

Structure ⟷ Conduct ⟷ Performance

Marketing Margins

Difference between retail
and wholesale price

Gross returns to retailer

Not net returns!

Not a measure of farmer's well being

Retail groceries 2% profit on
gross sales

Markups surely higher than 2%

Farmer's share of the food dollar is

an interesting statistic (under 16%), but
not a measure of the well-being
of farmers

An indication of how much processing is involved
Fresh beef vs TV dinner
Would farmers be better off if
consumers did not eat so many TV dinners?
(Alternately, does anyone still know what a TV dinner is??? Maybe substitute fast food!)

Futures Markets

- Buy or sell contract
  - for future delivery of a good
- Corn, soybeans, beef
- Farmer: interested in locking in a price
- Processor has similar interest
- Farmer sells contract to deliver in future
- Processor buys contract
- Contract sets price, grade, delivery location
  - #2 corn at Mpls

A trader need not produce or want grain in order to buy or sell contracts

Speculators

Assume risk due to price fluctuations

Bet that price will move upward if they buy a contract

downward if they sell a contract

Sell purchased contract later for higher price

Buy back sold contract later for lower price

Profit if speculator guesses the correct movement

Losses otherwise

That's the risk involved

Contracts purchased and sold on margin

Contract for 5000 bu. wheat

Speculator puts up only

a small percentage of value

of the 5000 bushels of wheat

Big gains

Big losses

Losses can exceed money put up

Limits to how far prices move each day

(the market closes when the limit is reached)

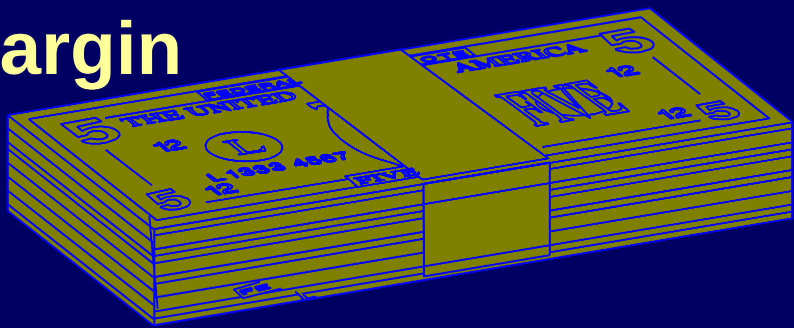
Market moves rapidly

in "wrong" direction

Speculator can't get out

Liable for all losses due to price movement,

not just the margin

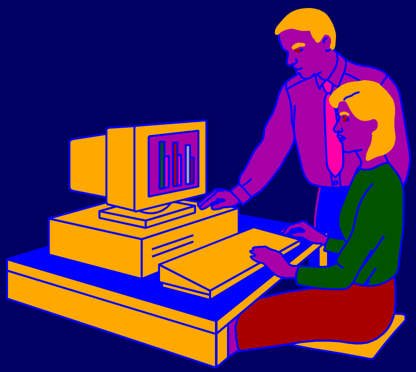


Not for amateurs

Hedging

Objectives:

- Reduce price uncertainty
- Ensure a profit, if possible



Need to know:

- Production potential (how much do you intend to produce?)
- Costs of production
- Acceptable profit level

Hedging Dangers:

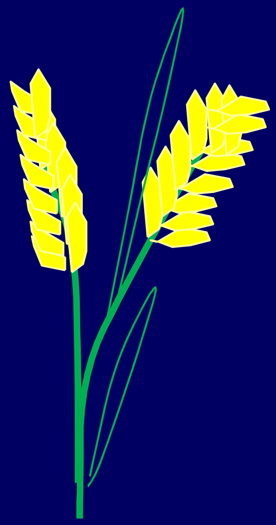
Crop failure

Death of livestock

Price increases

(margin calls)

Financing



Farmers therefore usually hedge only a portion of estimated production

Hedging Procedure:

Sell a contract for future delivery

If price stable or declines

Cost is margin plus brokerage fees

Buy back contract when crop is harvested

Purchased contract cheaper than contract sold earlier

Futures contract price for commodity is ensured

Sell crop produced on cash market

"Losses" offset by gains on futures contract

In effect, the producer obtains

the contract price less the brokerage costs of the transaction

If price increases,

margin calls from brokers during

the production season

Purchase contract when crop is harvested

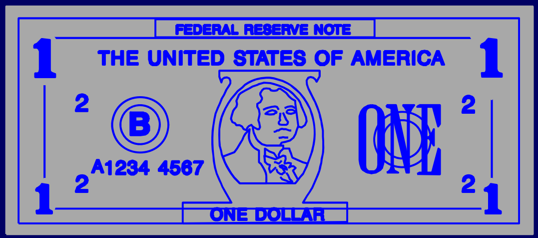
Loss on the hedge

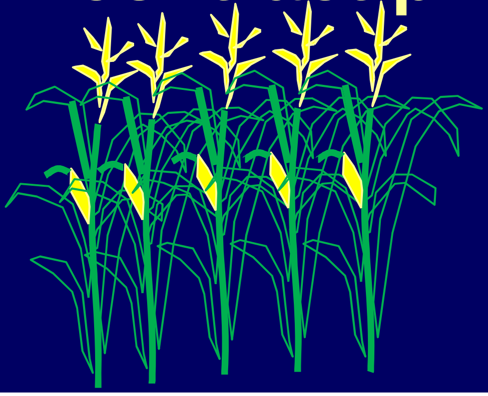
but crop is sold on cash market

Gains on cash market

offset losses on futures transaction

Farmer locked in contract price





Hedging Example:

As of April 1 Soybeans for Dec. delivery are $6.00/bu.

Profitable for farmer

Sells contract for 5000 bu.

Contract for $30,000 December delivery

Now Assume that on

Dec. 1, Soybeans are selling for $9.00/bu.

The Farmer repurchases the contract for $45,000, and

loses $15,000 on futures transaction

The farmer then sells 5000 bu. beans for $9.00/bu.

and makes $45,000 on cash market

Net gain--$45,000-$15,000=$30,000,

the same as if Soybeans were $6.00/bu.

Again suppose that as of

April 1 Soybeans for Dec. delivery are $6.00/bu

This price is again profitable for the farmer, who sells a Dec. contract for 5000 bu.

Contract for $30,000 December delivery

Now assume that on

Dec. 1, Soybeans are selling for only $5.00/bu.

The farmer repurchases the contract for $25,000

Gain of $5,000 on futures contract transactions

The farmer then sells 5000 bu. on cash market and gets $5.00/ bu. or $25,000 for the soybeans

Gain = $25,000 from cash sales + $5,000 from futures transactions

Total gain of $30,000--as if beans were $6.00/bu.

Brokerage commissions on all of this

May need a friendly banker

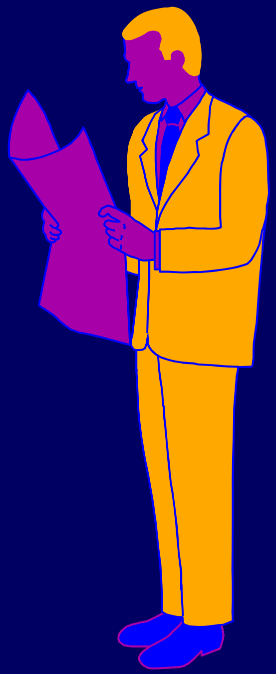
Not for all farmers

Simple contracts that specify
price at data of delivery
may do as well or better

Puts & Calls

RIGHTS TO PURCHASE
or PLACE ON THE MARKET

a contract for
future delivery
of a good



Put = right to place on the
market a contract for
future delivery
of a good

Call = right to purchase
from the market a contract
for future delivery
of a good

Specified price and date

These "rights" cost something

Rights may be but need not be exercised

Cost of the "right" varies
depending on expectations regarding prices

If people expect prices to rise
there is little value to the right to place
on the market at the current price

If people expect prices to fall
the right to place on the market at the
current price is valuable

How valuable depends on how far prices
are expected to fall
and the variability of prices

How sound are expectations???

Buy put=buy right to sell contract

Buy call=buy right to purchase contract

Sell put = sell right to sell contract

Sell call=sell right to purchase contract

Contracts are ordinary futures contracts

Puts & Calls also used in stock market

rights to buy & sell stock at a specified price at some future point in time

Highly dependent on expectations!

Chapter 11: Credit in Agriculture

Agricultural Credit

Farmers as a whole are in an

excellent net worth situation

Owner's equity would be the envy of any small businessperson

Owner's equity is typically nearly 90% of liabilities

Aggregate data masks problems of individual farmers

Shopping mall merchant vs. farmer

merchant usually has much greater debt load

Even real estate debt is low, in aggregate

Agriculture not going broke--
at least not in the aggregate

Sources of funds that finance farming activities have changed dramatically in the past 25 years

1970s and earlier:

Four main sources of funds:

1. Federal Land Bank and Production Credit Associations
2. Commercial banks in located in rural areas
3. Farmers Home Administration (a federal agency)
4. Insurance companies (in certain regions)

Farm Credit Institutions in the 1970s and today

Industry recognizes the unique characteristics of farming

Built to serve short and long-run credit needs

Federal Land Bank

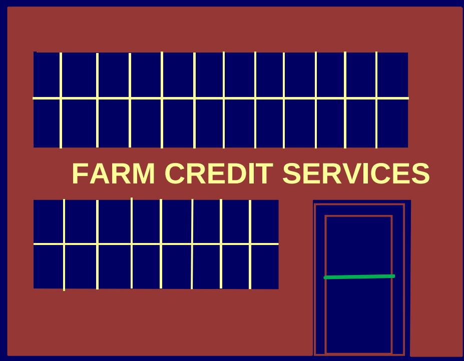
Historically, lends money for farmland purchases

Occasionally made loans for other purposes but lending always made based on equity in farmland

Chartered by the federal government the Federal Farm Loan Act of 1916

Owned by member-borrowers

NOT a federal agency



Federal Land Bank merged in 1987 with Production Credit Associations to form Farm Credit Services

Production Credit Associations

Established under laws enacted 1923-33

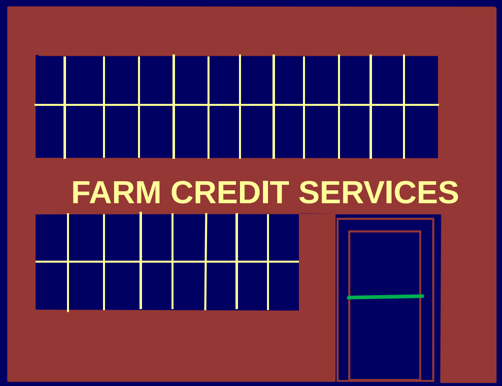
Short & intermediate credit to farmers

Commercial banks not meeting critical needs

Did not like risks involved

Sell bonds to raise money

Owned by member-borrowers (farmers)



Also merged with the Federal Land Bank

In 1987 to form Farm Credit Services

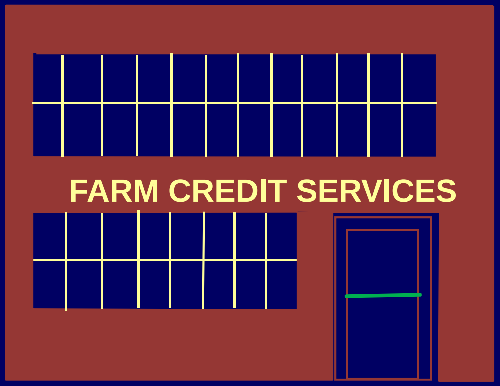
Farm Credit Services

Still operating under laws enacted 1923-33

Short & intermediate credit to farmers

Commercial banks not meeting critical needs

Did not like risks involved



Sell bonds to raise money

Owned by member-borrowers (farmers)

Chartered by the federal government

The farm financial crisis in the early 1980s dramatically reshaped agricultural credit. It became apparent that intermediate-term (for farm inputs and machinery) and long-term (farmland purchases) lending were intertwined and there was no longer a need for the two to be separate.

For example, farmers borrowed money for machinery purchases using land as collateral.

The outcome of this was Farm Credit Services which exists currently. Farm Credit Services is owned by member borrowers, but chartered by the federal government.

Commercial banks

Vary a lot in interest in ag lending

Portfolio balance: farm vs nonfarm

Rural banks--heavily invested in farming

Lots of variation in banker's willingness
to lend money to farmers

Equity in farmland issues

Some farmers love commercial bankers
Other farmers-the last place to look for a loan!

Commercial banks love loans where the collateral is excellent and the probability of loan default is low.

This was true for much of farming in the 1970s, when land values were appreciating rapidly, and crop and livestock prices were strong.

By 1980s, farmland values and crop prices were plummeting.

The result was large numbers of loan defaults.

The load defaults scared the socks off of rural bank lenders.

Bankers are very unhappy when the value of collateral is plummeting

Today, commercial banks, particularly small banks in rural areas, remain as a source of credit for some farmers, but loans get a lot more scrutiny with respect to the probability of default

Farmer's Home Administration FmHA (NOT FHA)

Former Federal agency

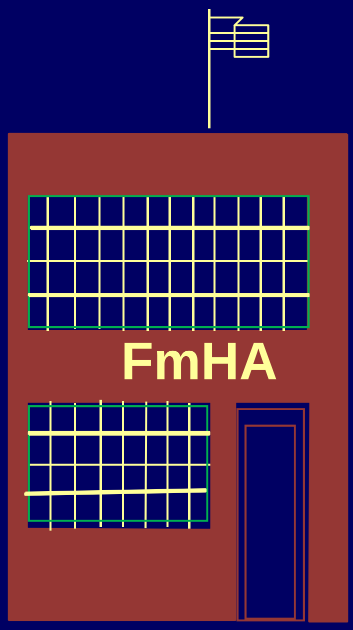
Lender of last resort for those who could not get loans elsewhere

Management assistance came along

FmHA ran the farm with farmer as hired worker!

Sent farmers into strange enterprises that built cash flow but need high management

Became part of the Farm Service Agency
Terminated in 2006



Life Insurance Companies

Prefer manageable risk

No drought, disease

No random events you can't put in
a mortality table

Select certain areas to lend
Iowa, historically

Were they in for a surprise when
land values fell!

Increasingly scared off!

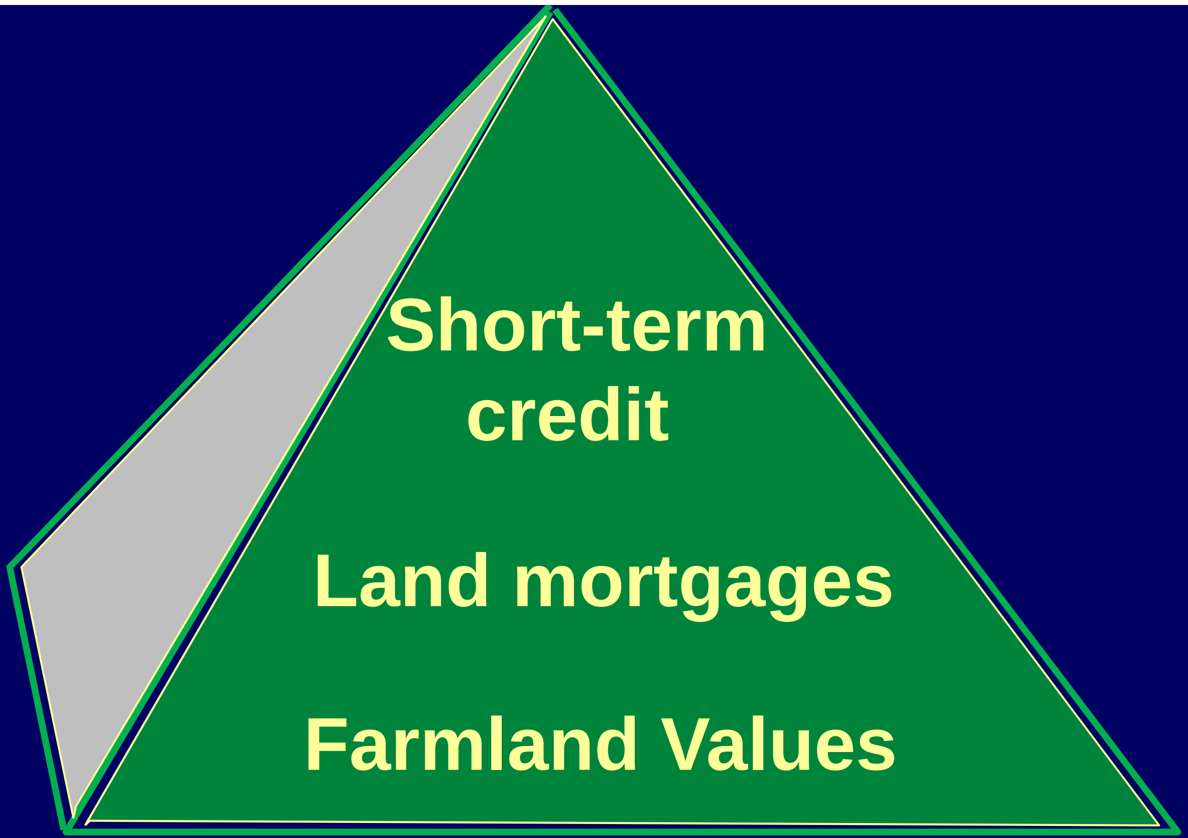
Better (less risky, higher return)
nonfarm investments

Life Insurance Companies

Were a source of credit in major commercial farming areas
such as in the Corn Belt

The decline in farmland values in the 80s chased them out of the business

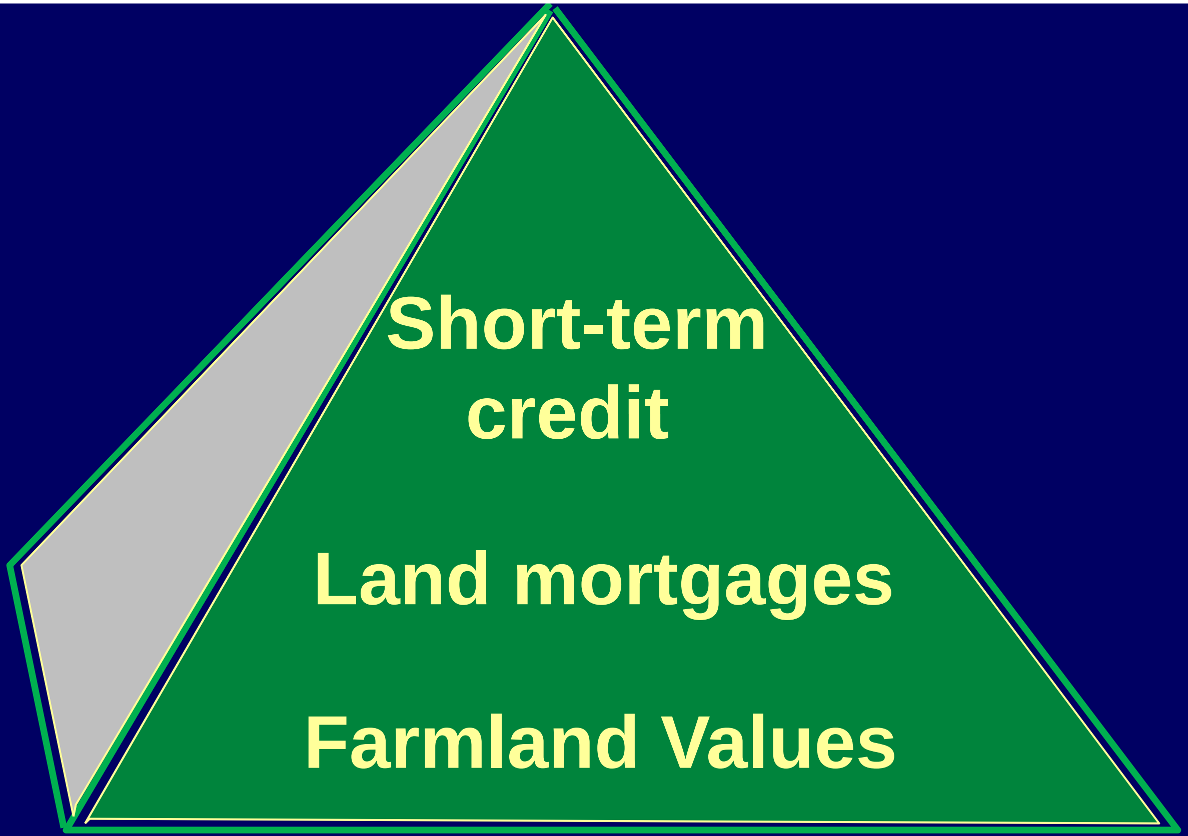
No longer a major credit source



Traditional Credit Pyramid

Credit based on farmland values

Money for farm inputs and Machinery depended on stable and rising land values



The credit pyramid collapsed when farmland values collapsed in the 1980s

The foundation crumbled

Problems:

1. Importance of farmland
   (sensitivity to changes in farmland values)
2. Sometimes little cash on hand
   (need for continued short-term borrowing
   to cover expenses)

Cannot plant a crop with equity in land--
need a source of credit
(perhaps several sources)

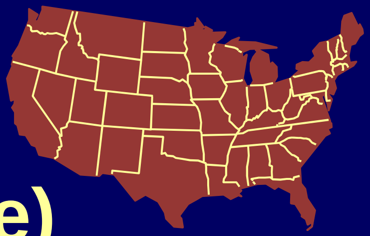
Wealth does not necessarily
mean good cash flow

Events of the 1980s

Federal Land Bank merged with PCAs

Linkages between short and long run
Both using same collateral (farmland)

12 farm credit districts



Loan portfolio all in one industry
(agriculture)

A commercial banker would gasp at risks involved

Need for government assistance

Without govt. backing bonds sold to raise money
would have higher & higher interest rates
to account for risk of portfolio

Farm Credit-- Past, Present, Future

Throughout recent times, risk in ag lending if not low, at least could be managed

Lower interest rates to farmers than urban dwellers

Importance of increasing farmland values

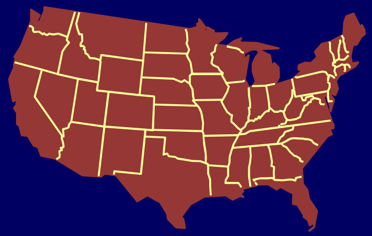
Lender little concerned with repayment capacity so long as land values continued to increase

If farmer could not repay, land could be resold and lender paid off

Farm Credit in the 21st Century

A modern commercial farm is a multimillion dollar enterprise, if you add the cost of land, machinery, buildings, equipment and inputs

Where does the money to finance such large enterprise come from?



21st century farm finance is very different from farm finance in much of the 20th century where farmers relied heavily on banks and other lending agencies for funds

Farmers are no longer as fixated on borrowing money to purchase farmland

Instead, they look to rent farmland from retired farmers and their spouses who own farmland

Retired farmers are happy to cash rent land as they get a better return than keeping the money in a bank plus the land appreciation which is not taxed unless they sell

This works well for many commercial farmers, as they can expand the operation without loan money and use the cash they have to buy inputs

Note that much of the capital is being supplied by the retired farmer, not the person doing the farming!

Machinery purchases no longer require a bank or credit agency loan. Instead, farmers can *LEASE* farm machinery for an annual “rent” in much the way a person leases a car without getting a regular car loan for purchase

Farm machinery dealers will even lease used equipment!

So two major expense items, the cost of the land and the cost of the machinery, are being financed by the retired farmer and the equipment dealer. So far, the farmer has not needed a bank loan or a loan from Farm Credit Services

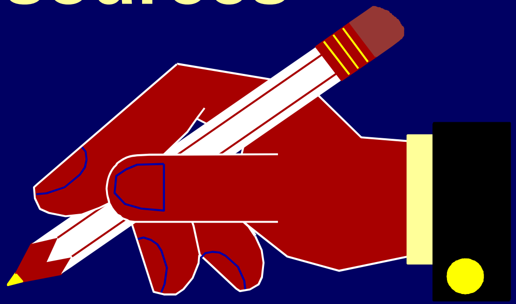
Short-term loans for input purchases MIGHT be financed by the input supplier.

Alternately, the farmer MIGHT even have cash on hand from accumulated profits from previous year to self-finance these.

Each farmer will be in a different situation

Implications:

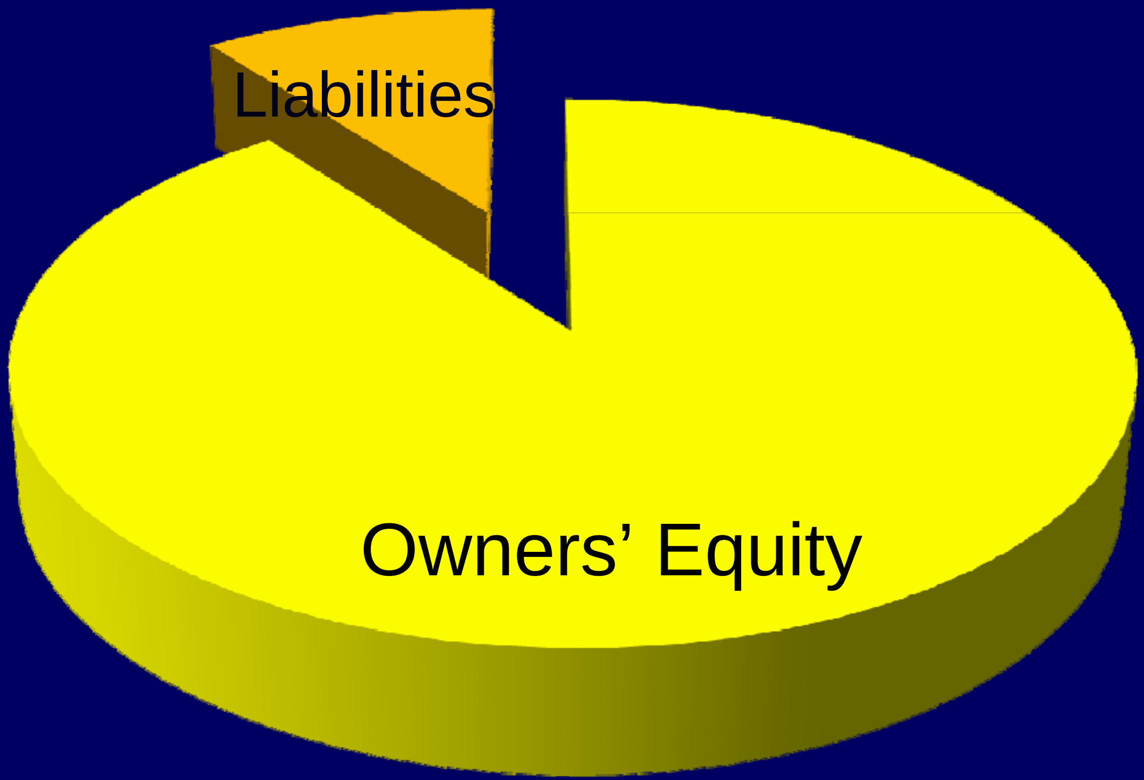
Commercial farmers may have little need for funds from traditional credit sources such as commercial banks and Farm Credit Services



Not all commercial farmers are relying on these non-traditional sources of financial capital, but increasing numbers are.

Note that young farmers can get started in farming using these methods without incurring a huge amount of debt!

U.S. Farm Assets and Liabilities, 2012



Owners' Equity is 90 % of Total Assets invested in Agriculture

Source: USDA NASS

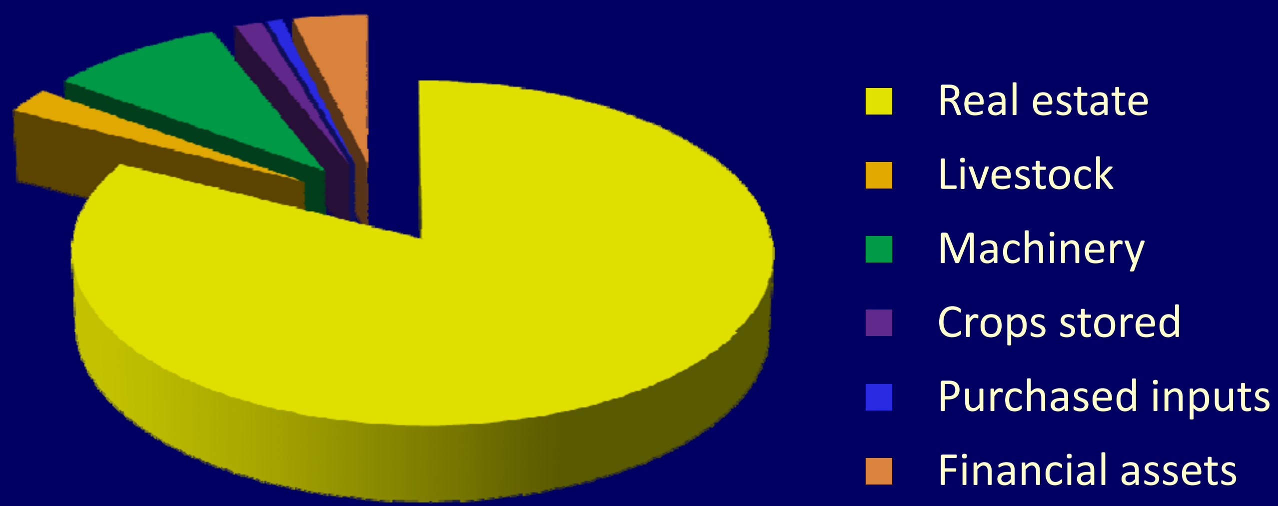
Total Farm Assets, 2012, and their Components

Over 3 TRILLION dollars invested in U.S. Farming
82% of that is farm Real estate

	billion $
Total Farm assets	3,010.3
Real estate	2,483.9
Livestock	73.2
Machinery	272.9
Crops stored	42.0
Purchased inputs	23.7
Financial assets	114.6

Source: USDA NASS

Components of U.S. Farm Assets, 2012



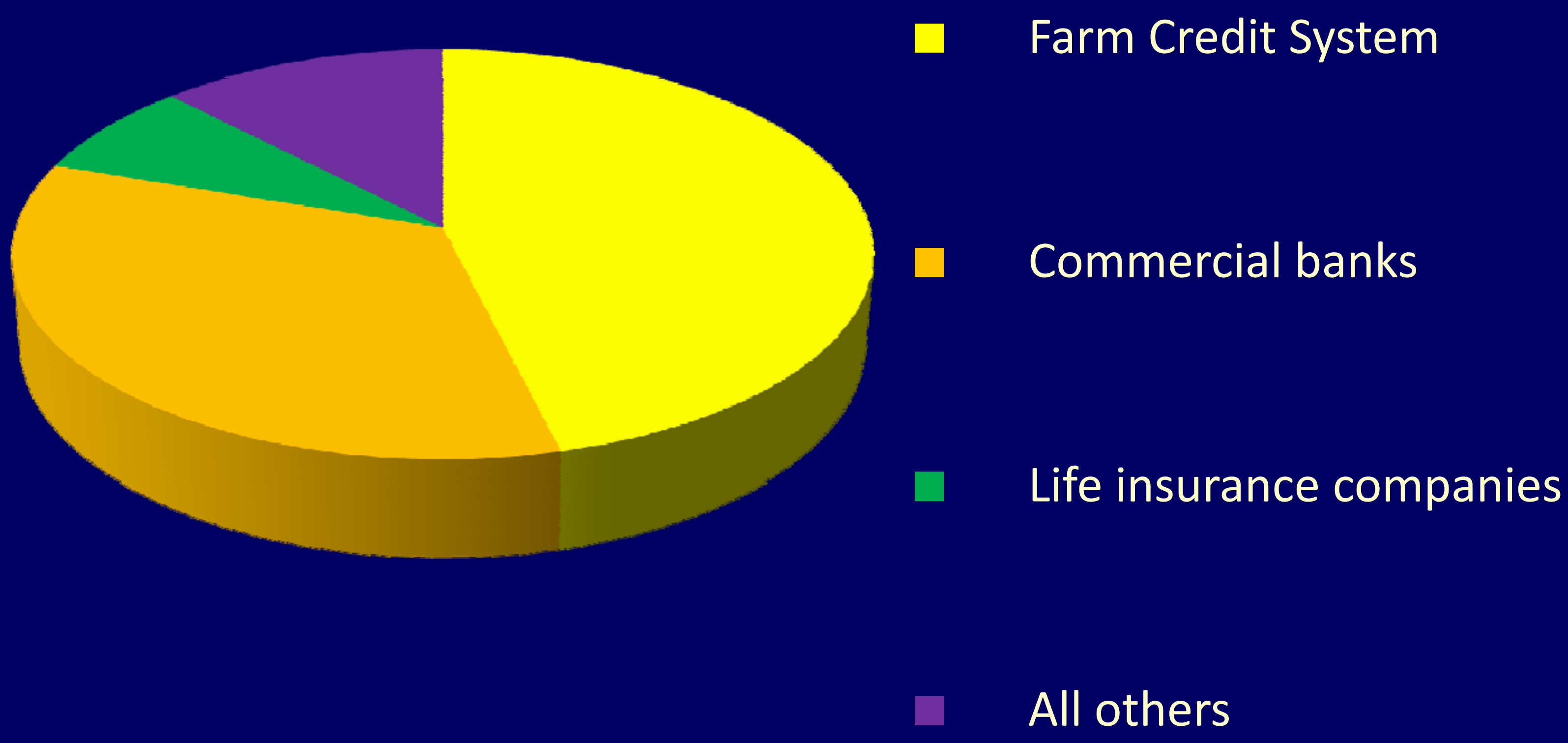
Source: USDA NASS

Sources of Farm Debt, 2012

	billion $
Total farm debt	300.3
Real estate	173.0
Farm Credit System	79.8
Farm Service Agency	3.8
Farmer Mac	3.8
Commercial banks	59.0
Life insurance companies	13.0
Individuals and others	12.9
Storage facility loans	0.7
Nonreal estate	127.3
Farm Credit System	42.5
Farm Service Agency	3.5
Commercial banks	59.9
Individuals and others	21.4

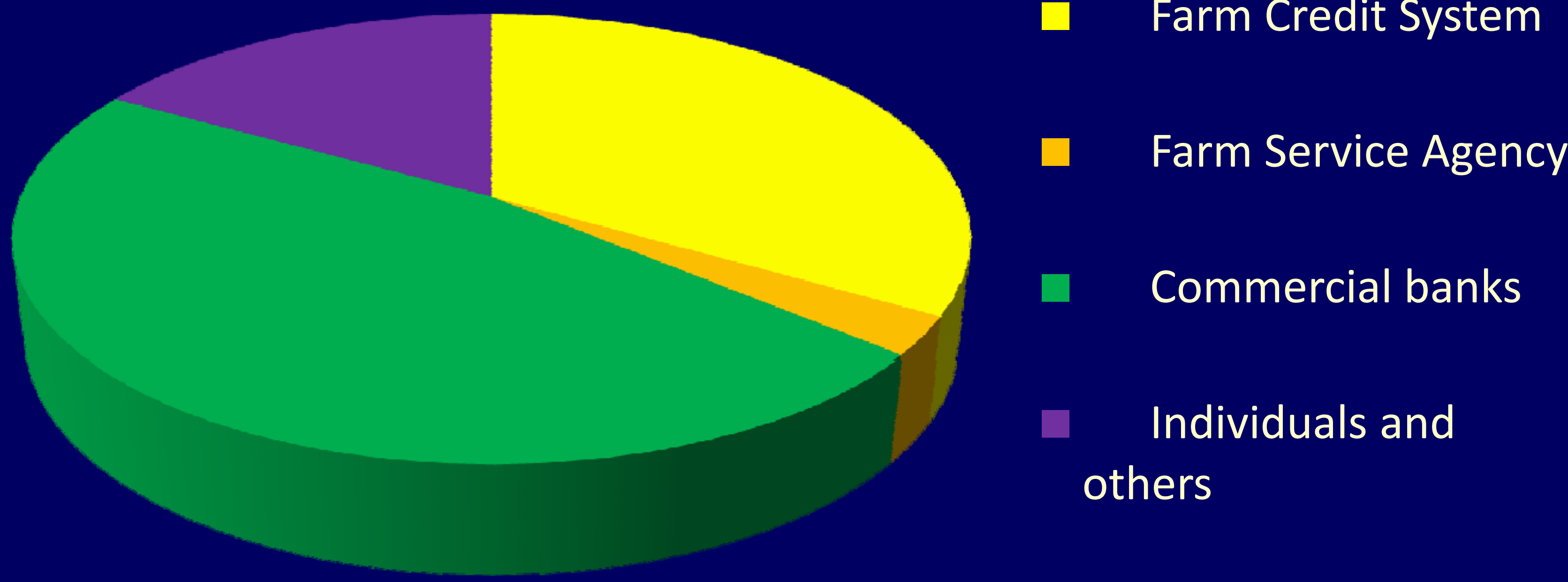
Source: USDA NASS

Components of of Farm Real Estate Debt, 2012



Source: USDA NASS

Components of of Farm Non-Real Estate Debt, 2012



Source: USDA NASS

The Average Farm (2012)

Real Estate	$1,129,024
Livestock	$33,274
Machinery	$124,060
Crops Stored	$19,079
Farm Inputs	$10,751
Financial Assets	$52,113
Total Assets	$1, 368, 302
Debt of all sorts	$136,500
Net Worth	$1,231,802

Source: Compiled from USDA data assuming 2.2 million farms

Over 80 percent of farm assets are in real estate

(live poor, die wealthy)

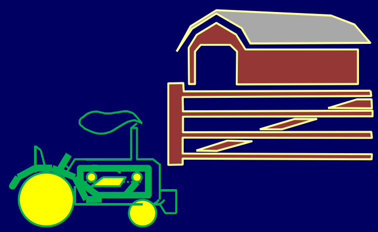
Farmers have relatively little money in checking accounts, savings accounts or other financial assets

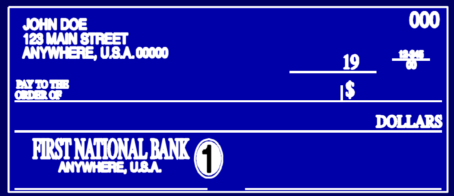
Wealth tied up in instead in real estate

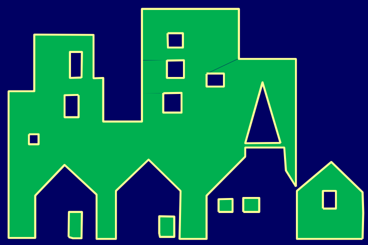
Machinery unimportant when compared with real estate

Urban dweller:

wealth in houses, stocks, bonds, & bank deposits







Agricultural

and

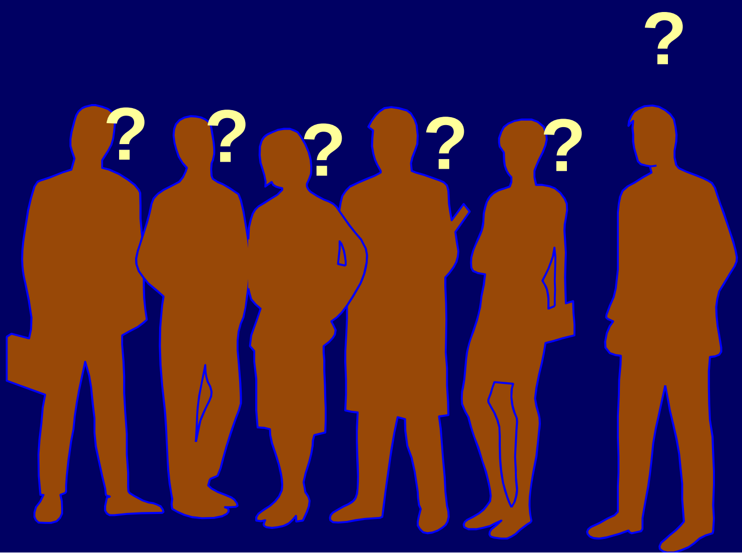
Public Policy

Agricultural and Public Policy

Public policy requires
group decisionmaking

Facts versus Values

Things people think are facts
may actually be closely held values



Agricultural Creed (Don Paarlberg)

1. Farmers are good citizens

   a high % of the population should be on farms

2. Farming is a business and a way of life

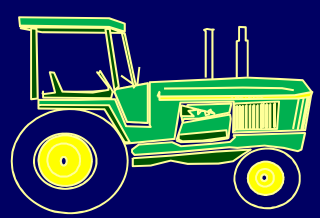
3. Farms should be family owned & operated

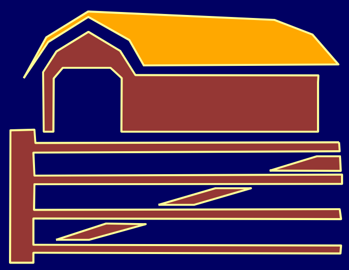
4. The land should be owned by the person who tills it

5. It is good to make two blades of grass grow where one grew before

6. Anyone who wants to farm should be free to do so

7. A farmer should be his own boss

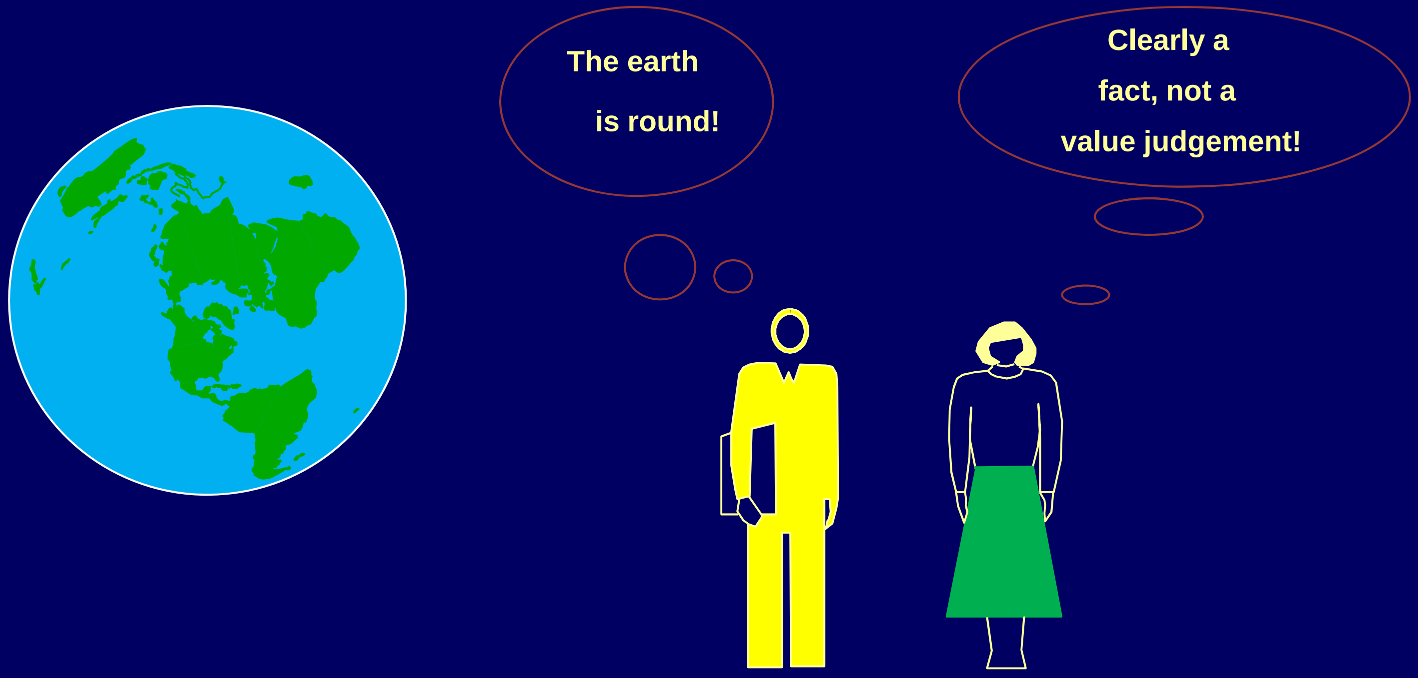




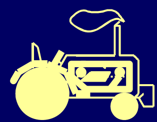
These are values, not facts

Nothing wrong with them, but...

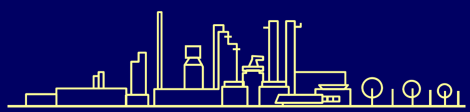
not necessarily supportable based on scientific evidence



Much of the US industrial productivity (wealth) is due to the fact that we need only a small proportion of our people to produce food
We could put a large share of our population back on the farm, but then who would run the factories?

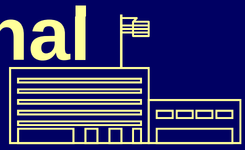


Would there be sufficient income for former urban dwellers, or would they need to reduce their standard of living?



(Spreads net farm income ever thinner)

How much would it cost to provide additional needed public services in rural areas?



Farming might be considered a way of life for some people

In particular, for those who are independently wealthy or have part-time off-farm employment

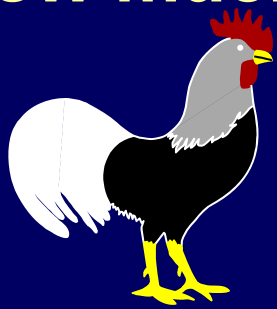
Others must run as a business in order to feed and clothe the family

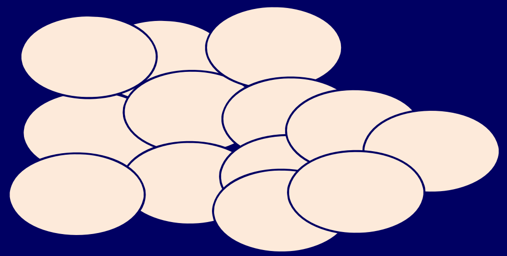
One cannot survive for long subsisting only on pleasant surroundings!

Policy Questions to think about:

Is the family-sized farm the low-cost producer?

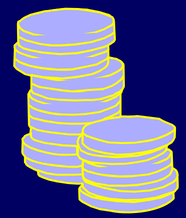
How much more would the urban dweller pay for chicken produced on a family farm?





Eggs laid by free-ranging hens-- are they worth more???

Will consumers be willing to preserve the family farm if it means significantly higher food prices???



How many laborers

can be hired before a farm ceases to be a family enterprise?

This is a value-laden issue!

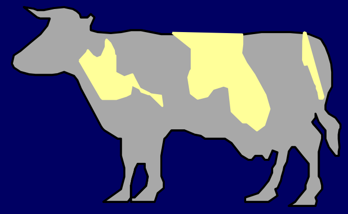
What about custom harvesting?

Most farmers hire as they please

without worring about

philosophical questions such as these!

What difference does it make???



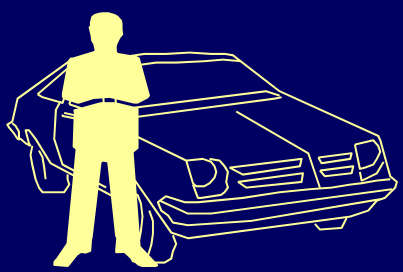
Should a farmer know all cows by name?

Renting land may be the only way some young farmers can get started

What is wrong with that?

What is inherently "good" about farm ownership?

While farmers might rank higher than used car salesmen on the social ladder, there is nothing inherently better about being a farmer than being engaged in any of dozens of other occupations.

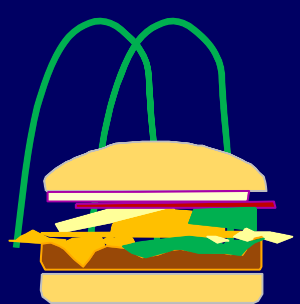


Given the capital required to start, there is no way that everyone can be free to enter agriculture.

Historically, this may have been in part true during the period of time when the federal government gave away land to beginning farmers.

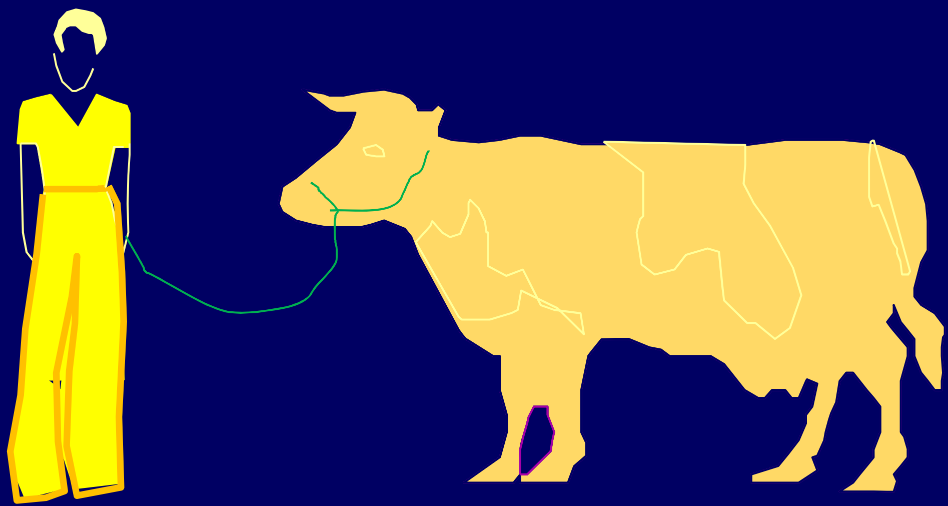
Investment in hamburger franchise versus investment in a farm.

Neither have easy entry.



Being ones own boss does not mean that one is free to do as he or she pleases (ask any dairy producer!!!!)

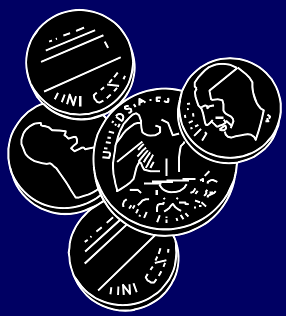
Safe haven of *salaried employment* versus *income variability*



Parity pricing of farm commodities:

Farmers are price-takers

Government should set price high enough so farmers get a "reasonable" income



Parity level:

Adjust prices such that purchasing power is equivalent to what it would have been 1909-1914* (adjusted for effects of inflation)

*1909-1914 was a period of good farm prices

Problems with parity pricing:

1. All benefits of new technology

   go to farmers in the form of higher prices. Is this fair to consumers?

   Much of the new technology was produced by researchers using public support (tax dollars)

2. Parity price capitalized into land values

   Renter may not benefit

3. Overproduction & surpluses at parity price

Bargaining Power

Attempts to make farmers price setters, not price takers

Ability to restrict supply from market is essential

Varying degrees of success

Grower coops such as oranges--good success

Milk--federal govt. backs producers with milk marketing orders

Good discipline among growers essential

Does not appear to work for major commodities such as wheat, beef corn or soybeans

Bargaining Power

Input side

Farmer owned coops

- Southern States
- CHS (Cenex)

Lower prices than business run for profit

Profits returned to farmers as dividends

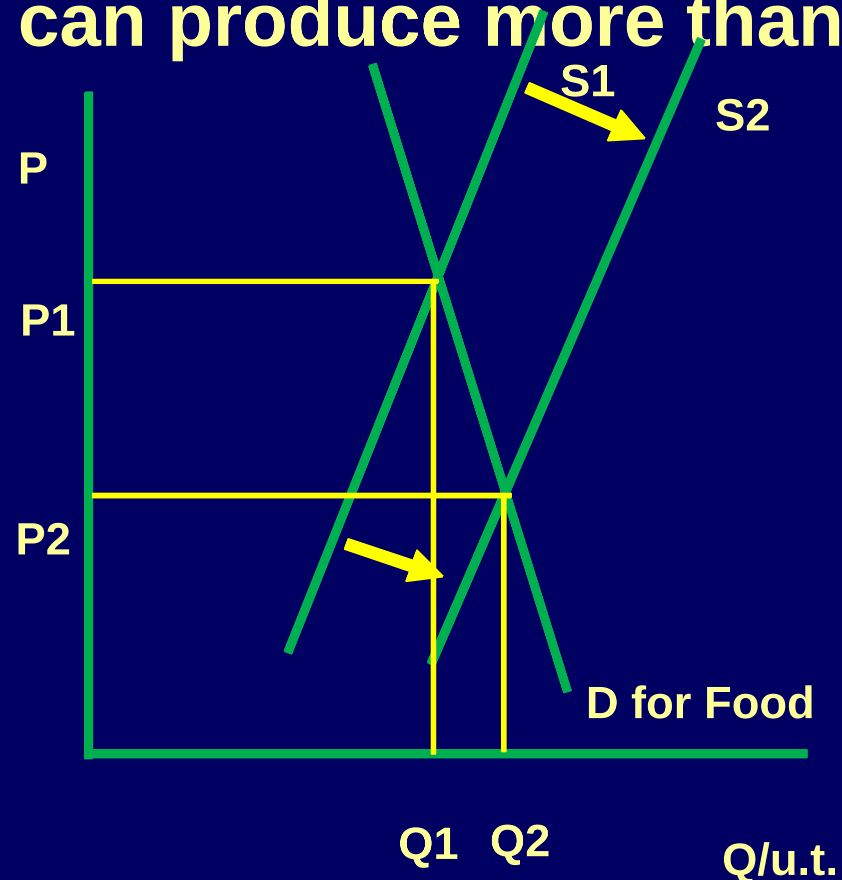
No guarantee of efficiency & low prices

Coops can be poorly run

Basic Problems in Farm Policy:

1. Overcapacity

can produce more than is needed



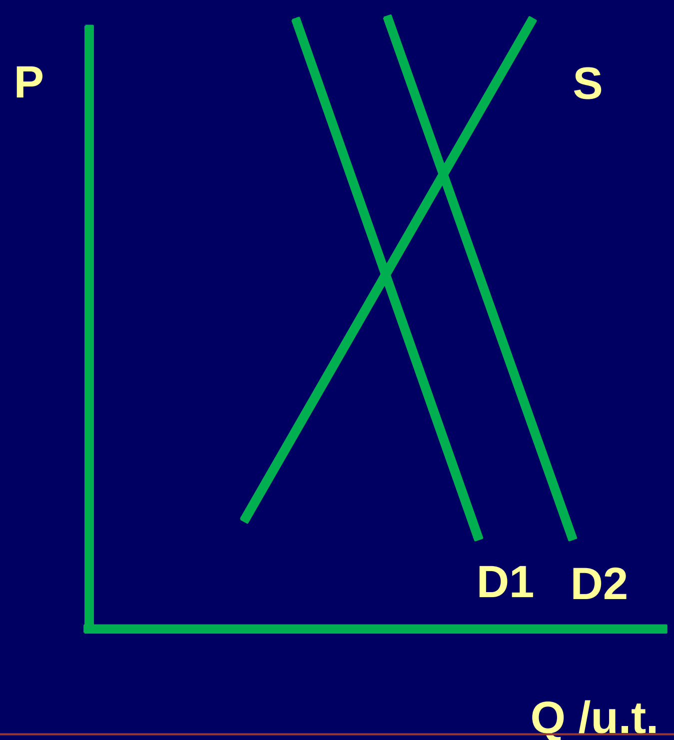
Small shift in S
causes big decrease in P

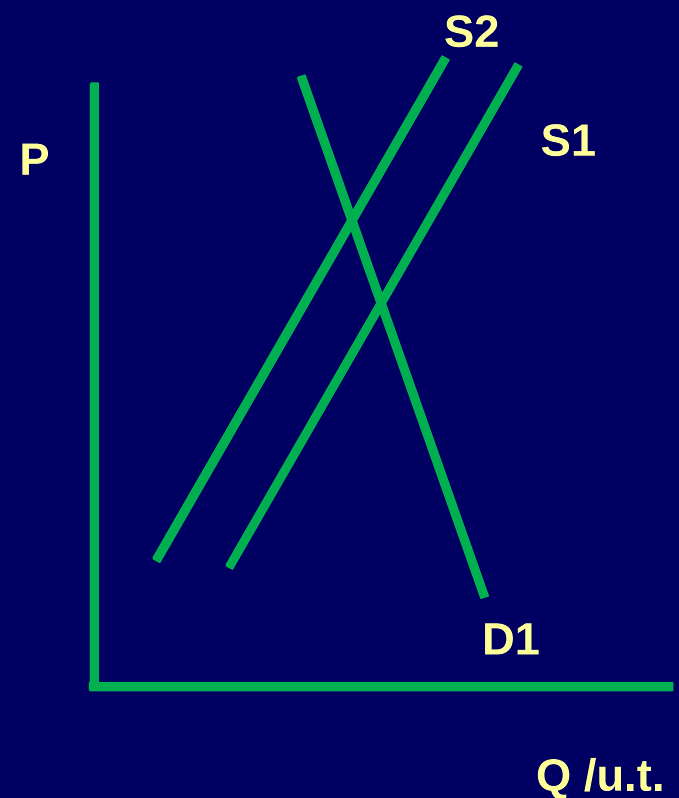
Inelastic D & S

2. Price Instability

Domestic demand fairly stable

Small shifts in export demand
or crop failures
cause big changes in price





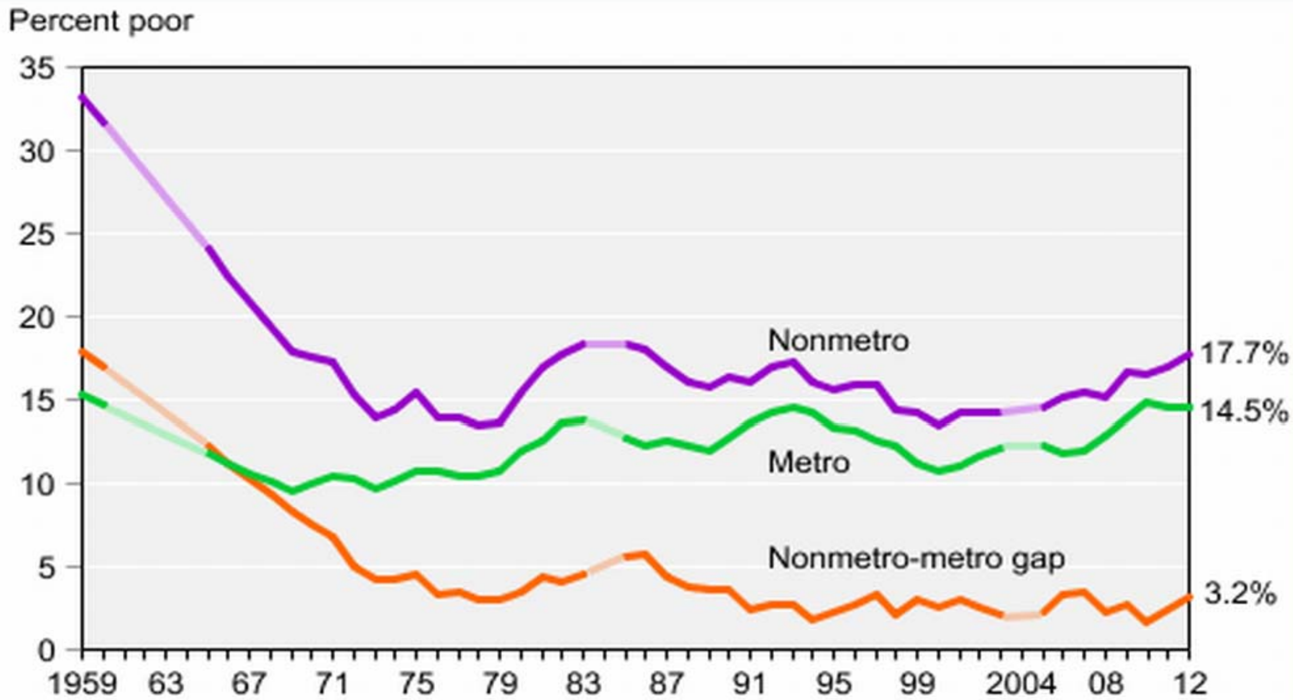
3. Rural Poor

2012 : 8.5 million poor lived in nonmetropolitan areas

Poverty rates in nonmetropolitan areas are currently only slightly higher than in metropolitan areas

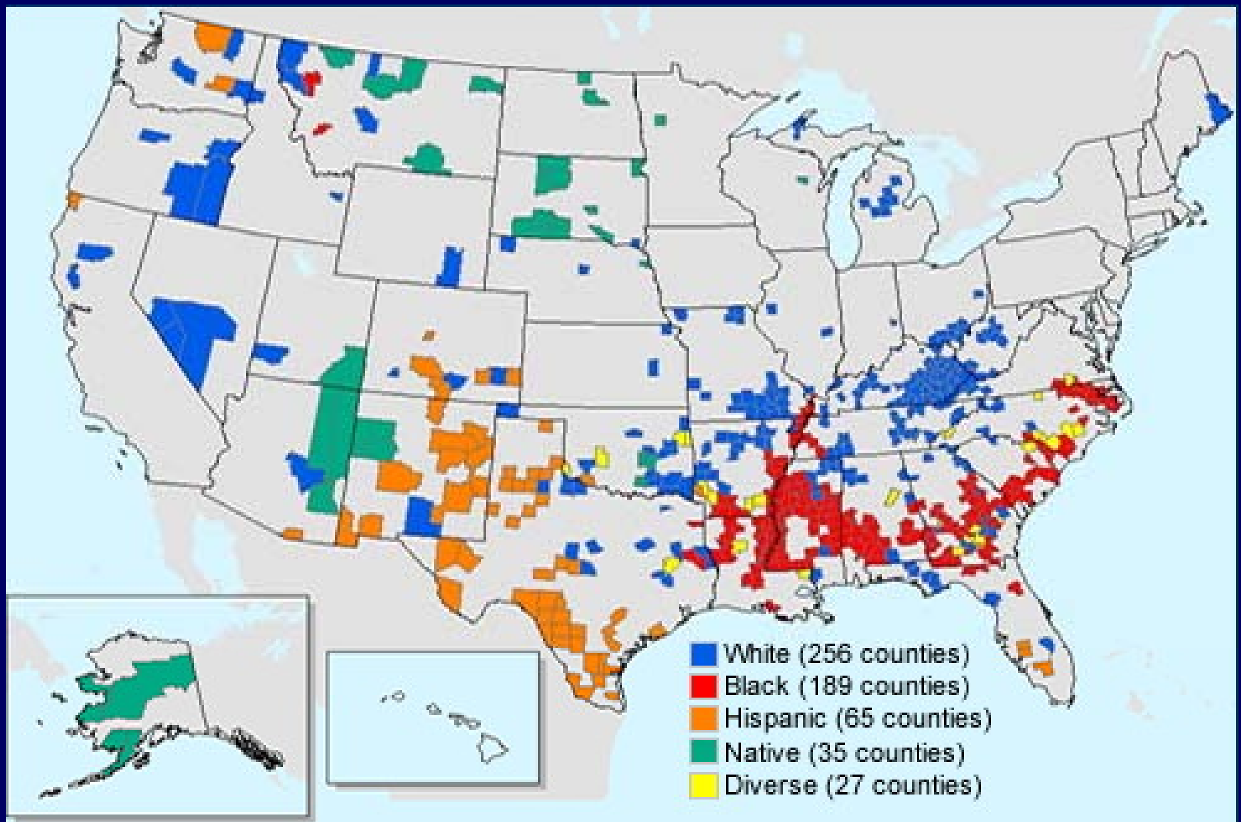
Non-metro	17 percent
Metro	14.5 percent

Poverty Rates by Metro/Non-Metro Residence, 1959-2012



Note: Metro status of some counties changed in 1984, 1994, and 2004. Metro and nonmetro rates are imputed for 1960-66, 1984, and 2004.
Source: USDA, Economic Research Service using data from U.S. Census Bureau and U.S. Department of Labor, Bureau of Labor Statistics, Current Population Survey (March Supplements and 2013 Annual Social and Economic Supplements).

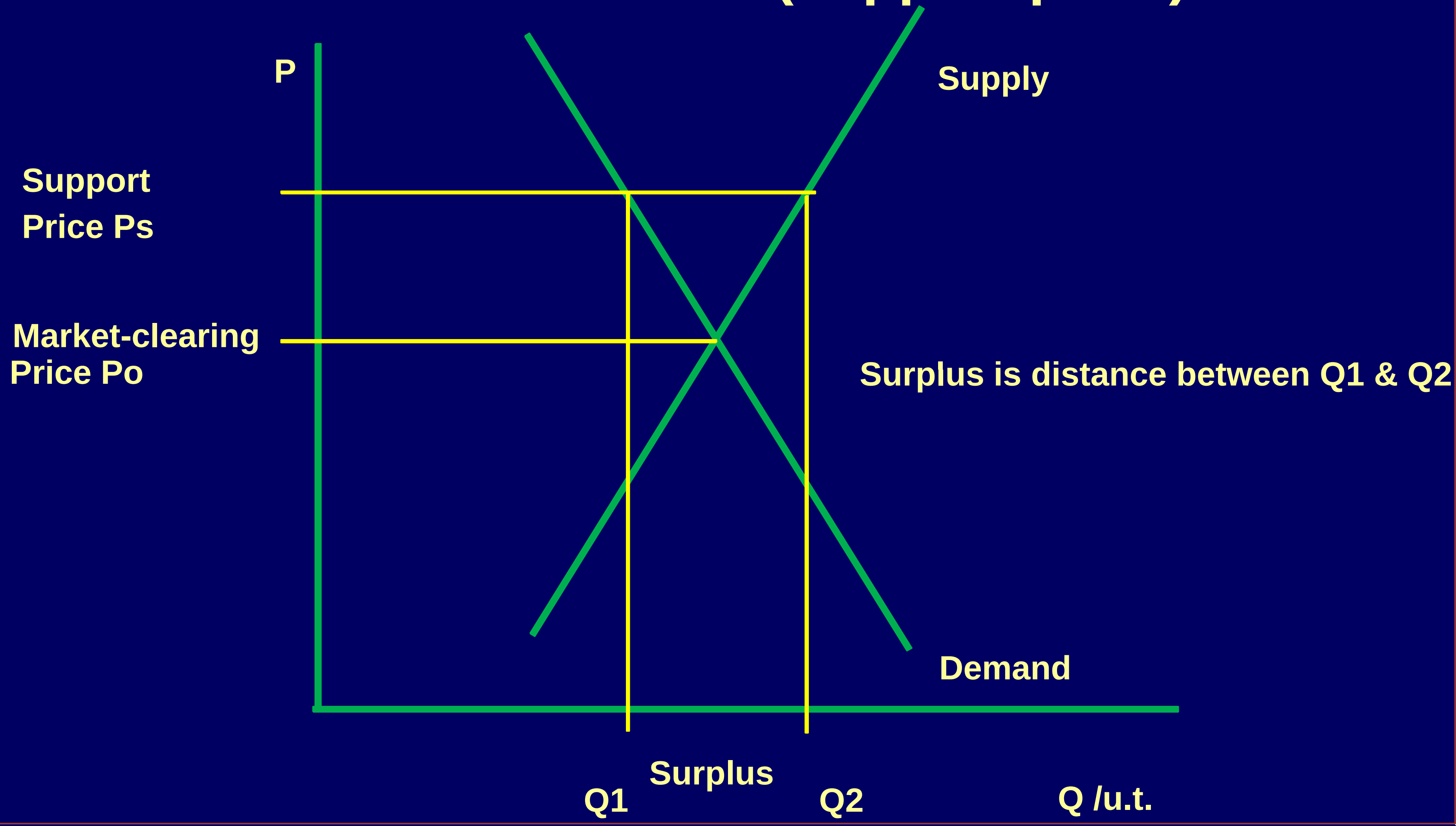
Nonmetro Counties with High Poverty by Race/Ethnicity, 2007-2011



Source: USDA, Economic Research Service using data from the American Community Survey 5-year estimates, 2007-11.

Government Involvement in Agriculture

Raise price of ag commodity (support price)



Federal government faces choices if prices are to be supported

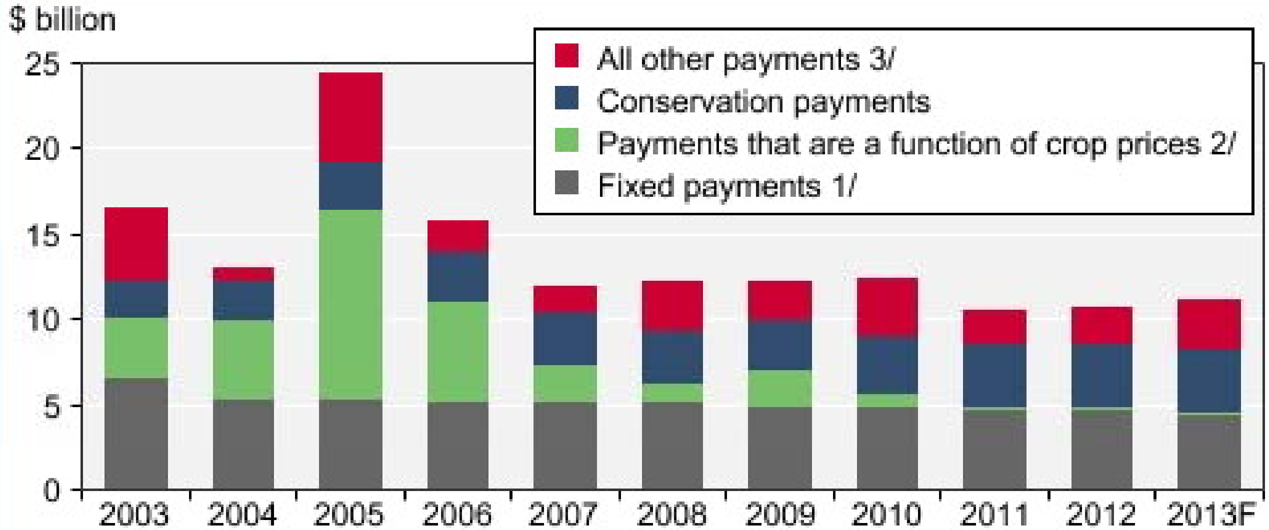
1. Buy up surplus
   Sell when prices are high
   "Ever normal granary"

2. Acreage allotments,
   poundage restrictions

   Farmers may be better off,
   revenuewise, with small Q and large P

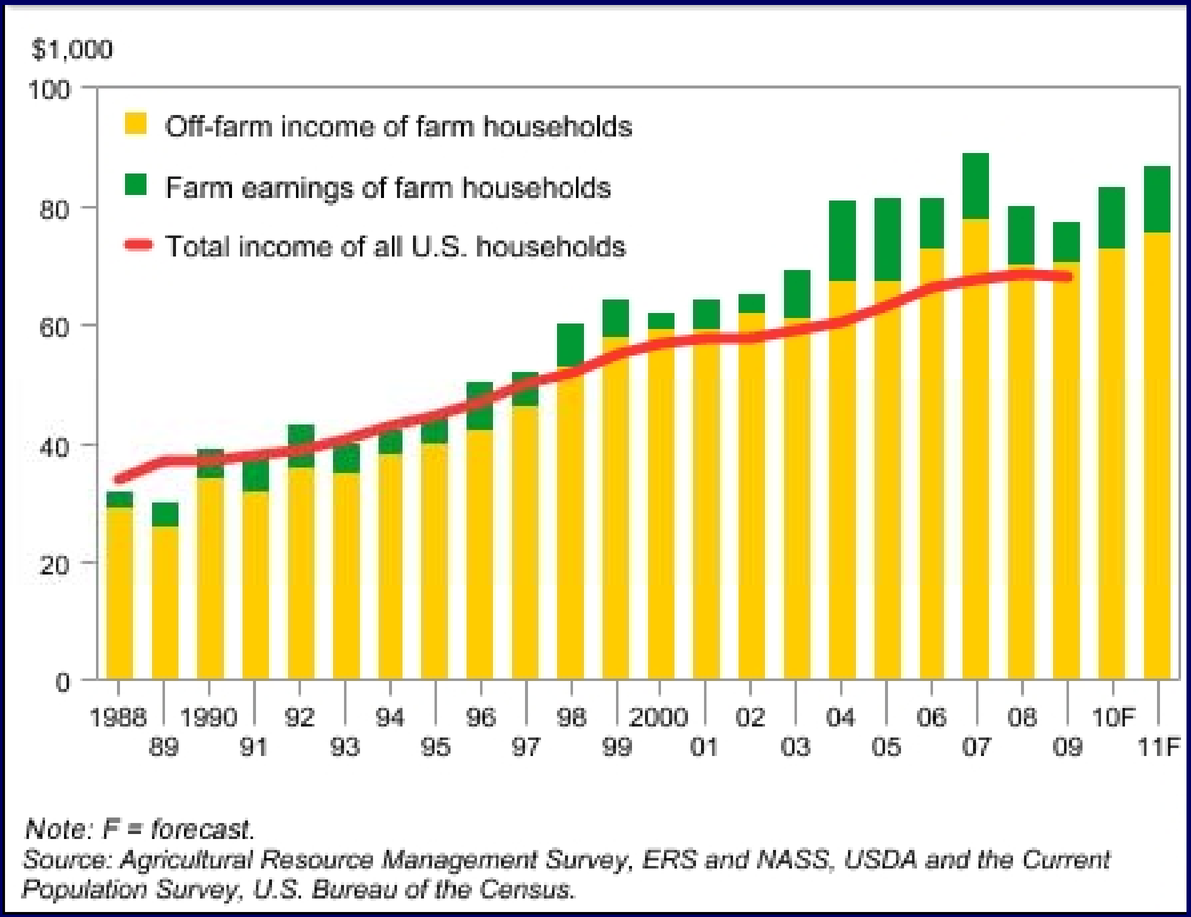
3. Land retirement
   Conservation Reserve Program (CRP)
   Supply Restriction

Government Payments to Farmers, 2003-2013



F = Forecast.
1/ Production flexibility contract payments and direct payments whereby payment rates are fixed by legislation.
2/ Counter-cyclical payments, average crop revenue election (ACRE) payments, loan deficiency payments, marketing loan gains, and certificate exchange gains in which commodity payment rates vary with market prices. The certificate exchange program ended after making payments for the 2009 crop year.
3/ All other payments include disaster relief payments, tobacco transition payments, and dairy program payments.
Source: USDA, Economic Research Service, Farm Income and Wealth Statistics.
Data as of August 27, 2013.

Average farm household income continues to exceed average U.S. household income



The average farm household has a higher total income than the average non-farm household, if income from off-farm employment is counted!

Programs for Assisting Farmers

Commodity Credit Corporation loans

(CCC loans)

Nonrecourse loans made to farmers based on some specified price (loan price or rate)

If price drops below, farmers need not (DO not) pay the difference

If price above the loan rate, famers get the additional amount

Also a source of short term credit as you get a loan on crop well before it is sold

Two-price plans

Farmers get one price for part of production, another price for the remainder

Milk--manufacturing (cheese, butter)
milk priced lower than milk entering fluid market

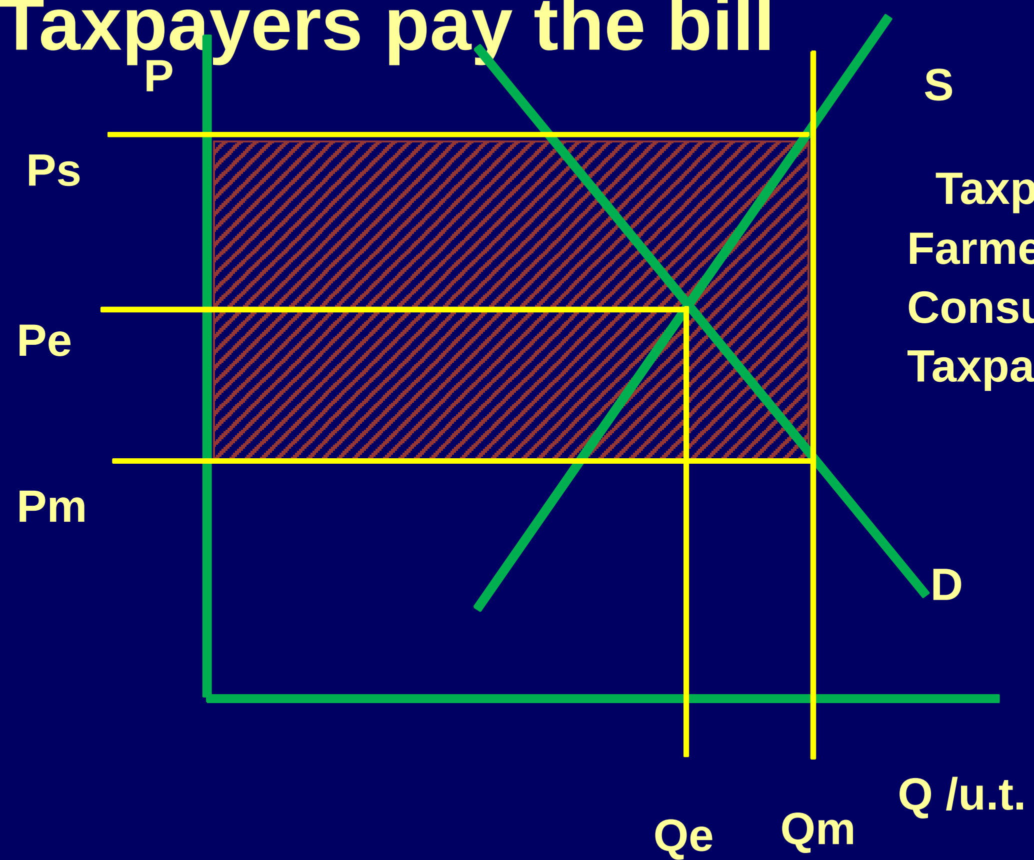
This may be the same milk

Higher price for wheat for domestic market than for foreign market

Foreign demand more price elastic

Direct Payments to Farmers

Consumers benefit from lower price but Taxpayers pay the bill



Taxpayers bill is shaded area

Farmers produce Qm at price Ps

Consumers get Qm at price Pm

Taxpayers pay (Ps-Pm) x Qm

Have farm programs increased farm income?

Yes & No!

They have clearly helped stabilize farm incomes

Much of their value has been
capitalized into higher land values

Farmers have perhaps become wealthier
but do not necessarily have higher net incomes

Have farm programs preserved a structure of American agriculture consisting largely of family farms?

A good question

We wish we knew the answer!

Arguments on both sides of the issue

Not clear that they have

Not clear that they have not

A Question for Discussion……

Farm families, an average, have the same or better incomes than their urban counterparts.
Further, they are normally wealthier than urban dwellers.

Given this, should the Federal government continue to subsidize farm incomes through price supports and other mechanisms using tax dollars?

?

Farm Organizations-- what do they advocate?

American Farm Bureau Federation

Free market
No acreage allotments
Farmer should produce as much as he wants
Farm bureau and the ag. extension service
Buy lots of insurance
For "big" commercial farmers
Not for programs that smell like welfare assistance
Often supports Republicans
Largest Farm Organization, 50 states +Puerto Rico

National Farmers' Union

Pro price and income supports
Acreage allotments
Supply restriction
For the "little" guy
Generally supports liberal Democrats
Links to CENEX or CHS
Supports rigid govt. programs
Not enthusiastic about land retirement
Pro family farm & rural life
Second largest , after the Farm Bureau

National Farmers Organization

Organize farmers to restrict supply and gain bargaining and pricing power

Farmers can limit production if they get together

Not excited about having the federal government limit production

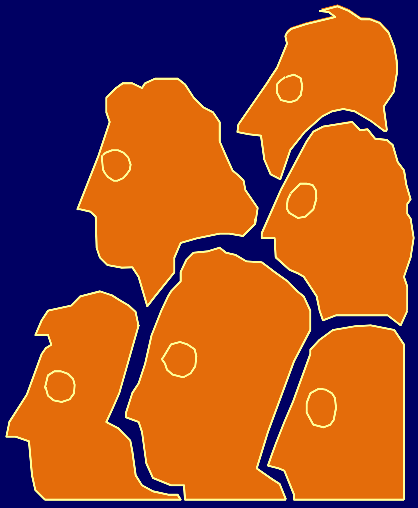
Battles between farmers who restrict supply versus those that sell

Not as active as they once were

National Grange

More of a rural social than a political organization
Broadly Supports improved lives for rural people
Not of great importance in federal farm policy
Political strategy left to other farm organizations

Farm Bureau
Farmers Union
NFO
Grange
AAM
Others



American Agricultural Movement

Efforts aimed at generating
public attention about the plight
of the farmer

More extremist than NFO

Militant efforts aimed at supply control

Uncomfortable with much of basic ag. economics

Supports parity pricing for farm commodities

Not as active as they were 20-40 years ago
when they organized strikes and tractor
caravans to Washington DC.

Tactics were certainly colorful!!!

Chapter 13: Economics of Resources

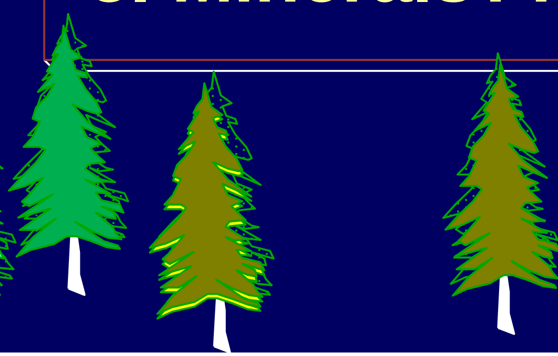
Natural Resource Economics

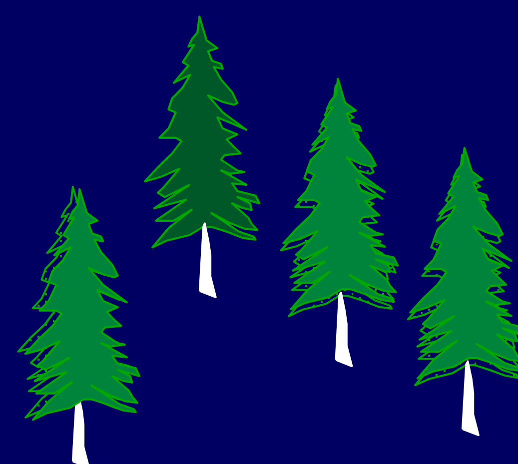
Natural resource--

A resource provided by nature

Natural resources important to agriculture

1. Land
2. Water
3. Air???
4. Wildlife???
5. Minerals???





Types of natural resources:

Fund or Stock

Use "uses up" the resource

Nonrenewable or renewable only over a very long period of time

Oil, coal, gas,

Topsoil??

Soil productivity??

Flow Resource

Not "used up"

Renewable

Cover crop as a source of nutrients

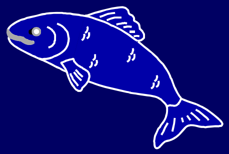
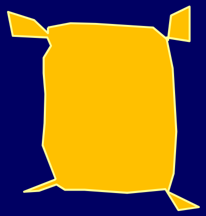
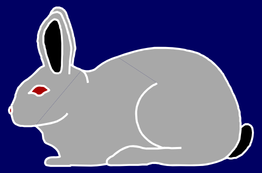
Water maybe

but....

irrigation water table???

Trees

Issues in agriculture involving natural resources

1. Soil Conservation


2. Water quality
3. Chemical fertilizer runoff
4. Pesticides & the Environment
5. Air pollution near livestock facilities
6. Agriculture near industrial areas
7. Acid rain
8. Wildlife & agricultural production
   - coyotes vs sheep
   - hunters

9. Others

Pricing of Stock (nonrenewable) resources

How should a stock resource be priced?

1. Cost of recovery

Over time, the easily recovered resource
will be removed first

increasing marginal cost of recovery

The first oil wells were but a few hundred feet deep

Stock resources ultimately become more expensive
to recover as easily recovered supplies
are exhausted

New recovery technology needed to obtain supplies

Examples:

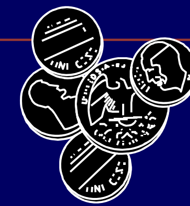
An ounce of gold from many tons of ore

Large-scale off-shore drilling platforms

New technology can, in some instances, dramatically lower recovery costs

In other instances, new technology can keep recovery costs from increasing

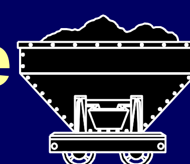
2. Cost of recovery plus money for investment in new technology for recovery

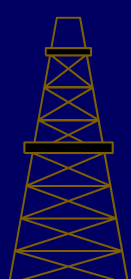


3. Use renewable resources instead

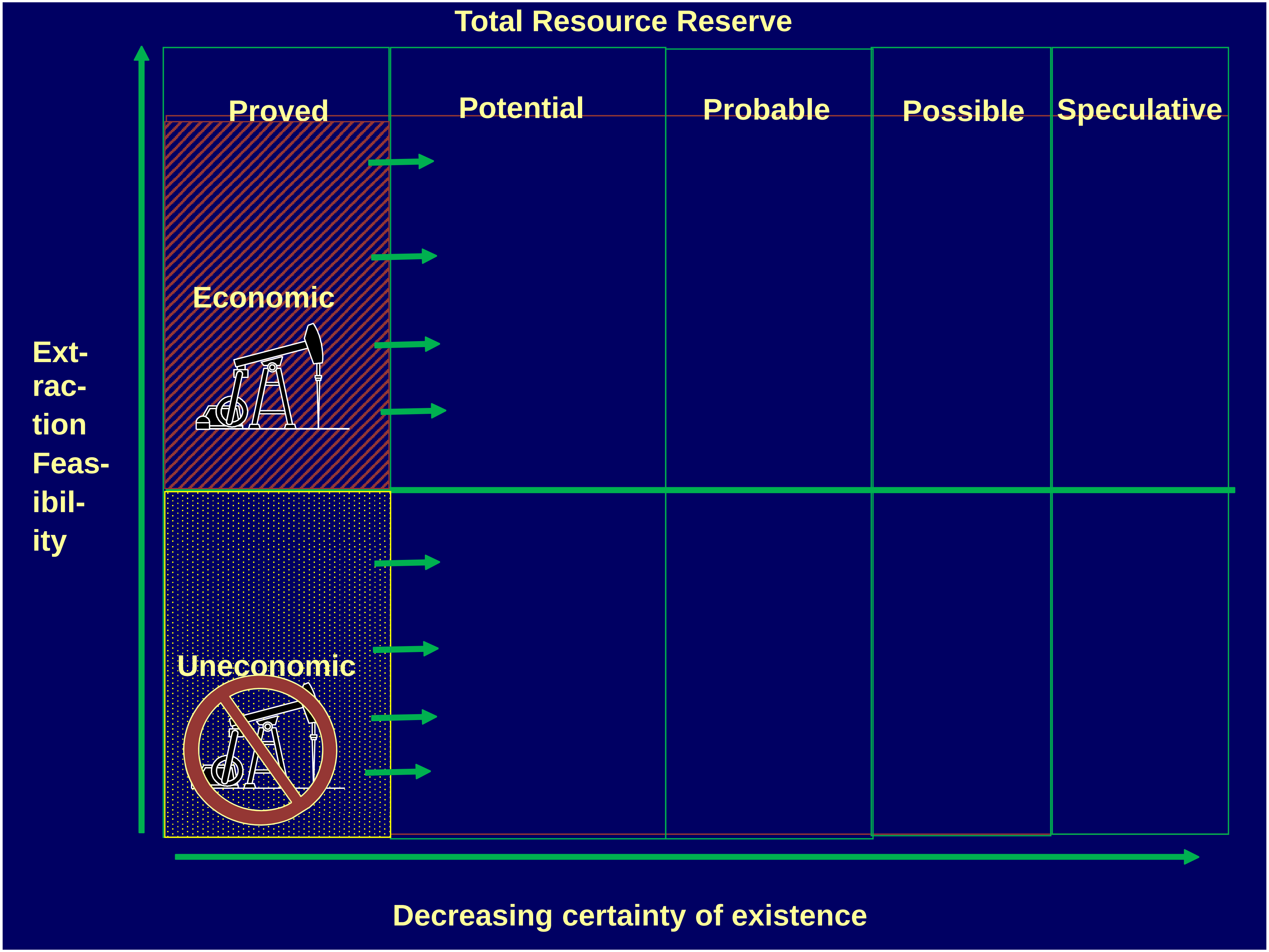
grain alcohol as a fuel

4. Substitute nonrenewable resources in good supply for nonrenewable resources in short supply





coal versus oil for fuel & electricity
oil vs. natural gas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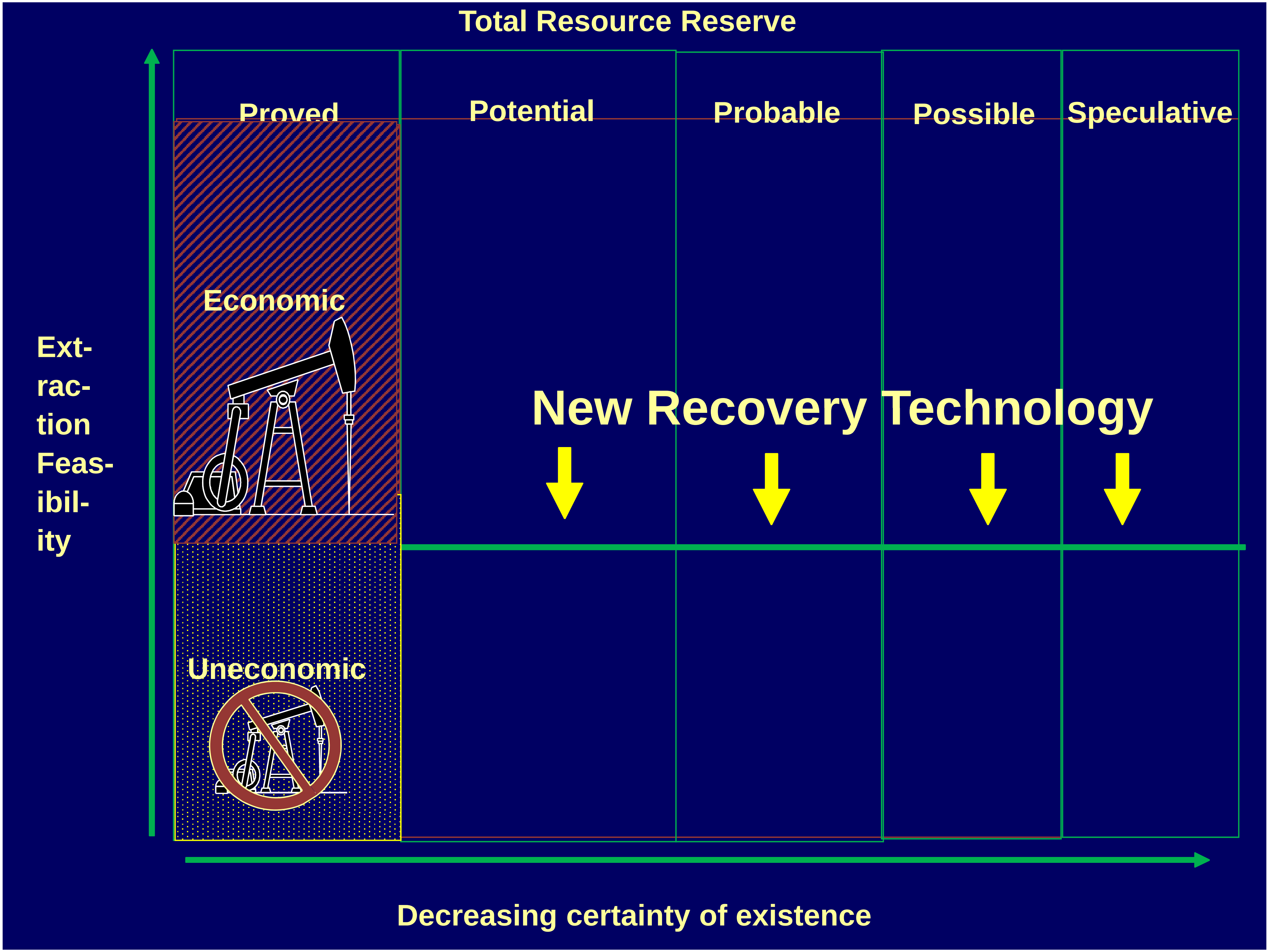
Decreasing certainty of existence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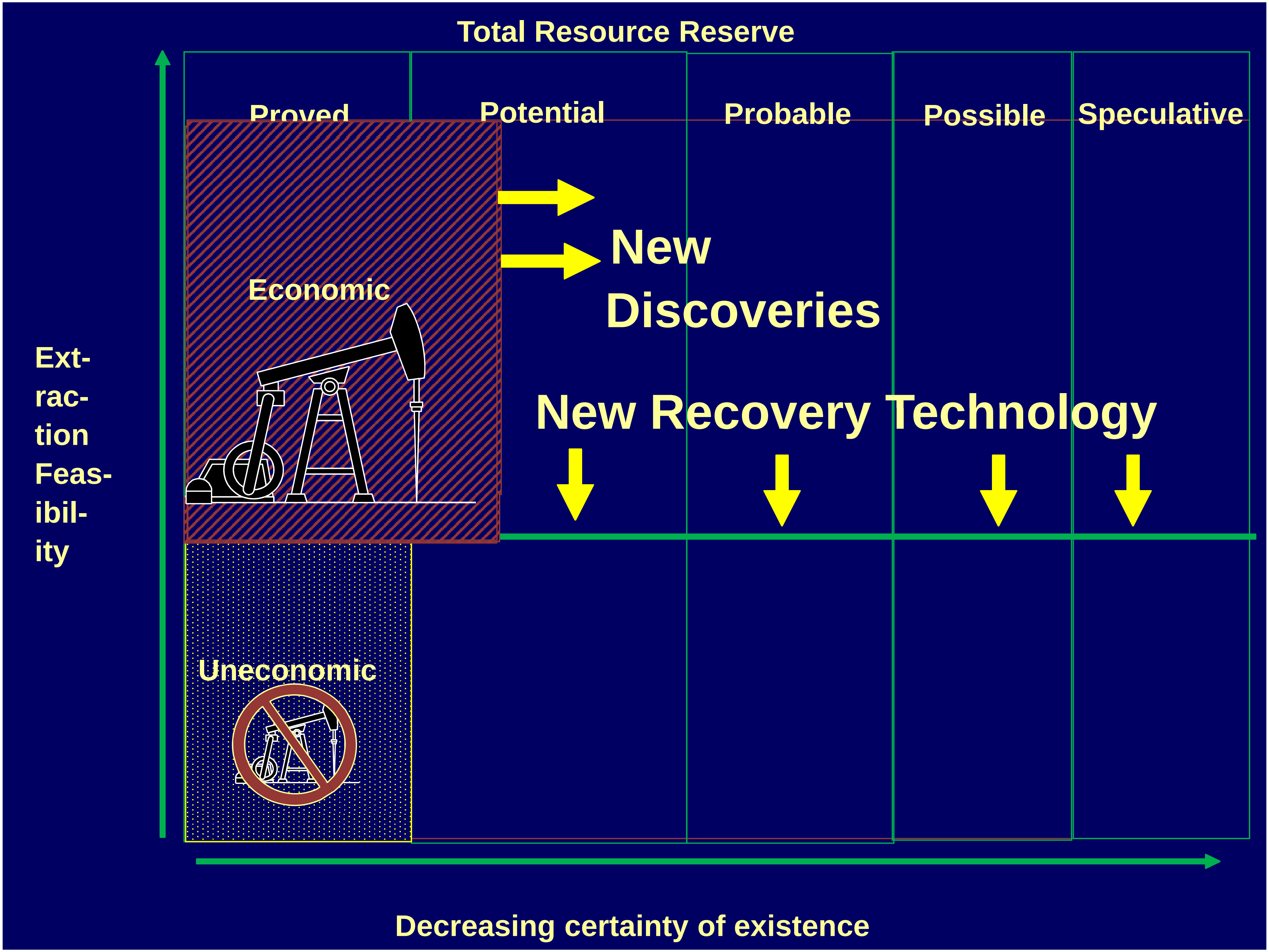
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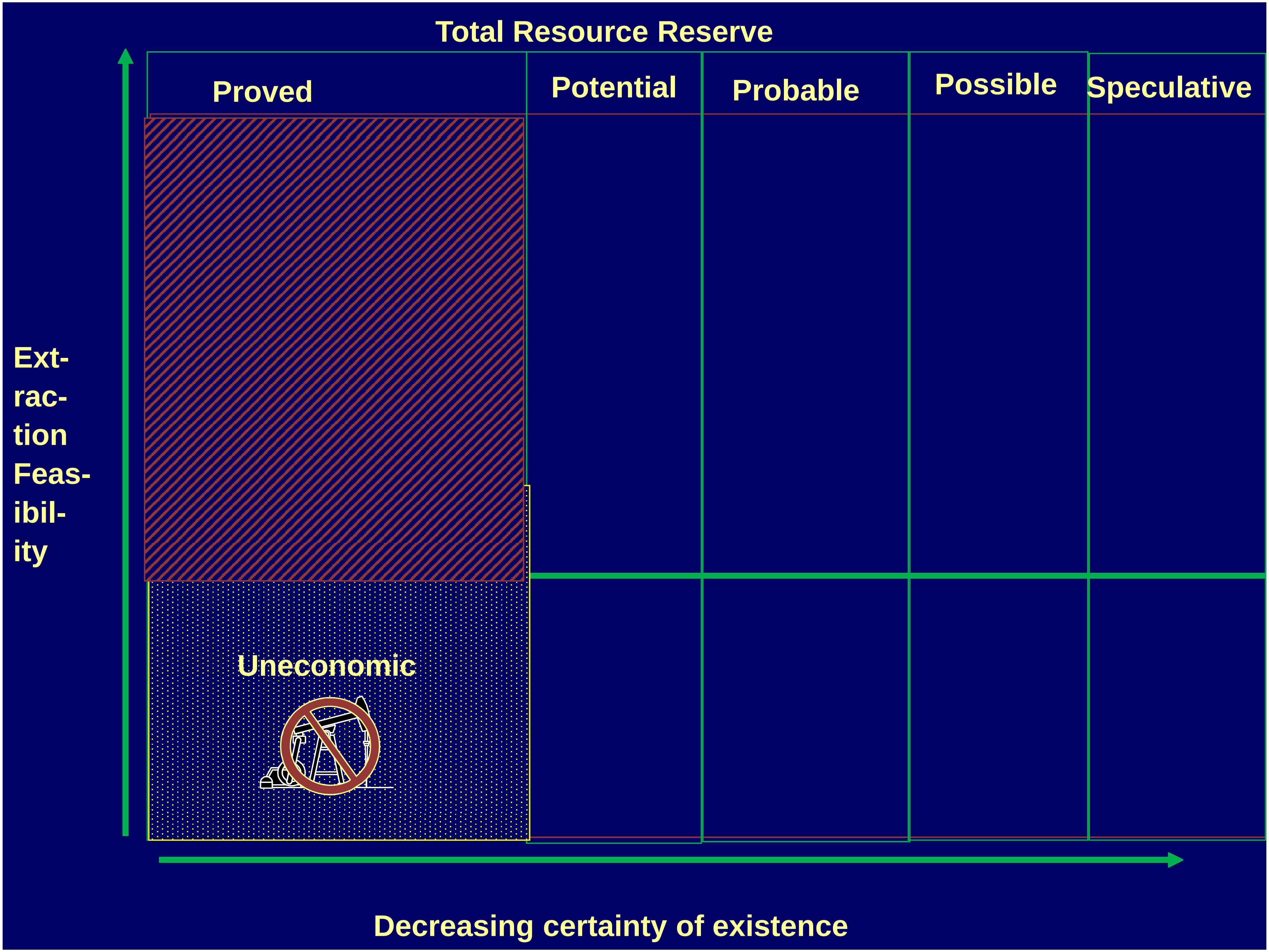

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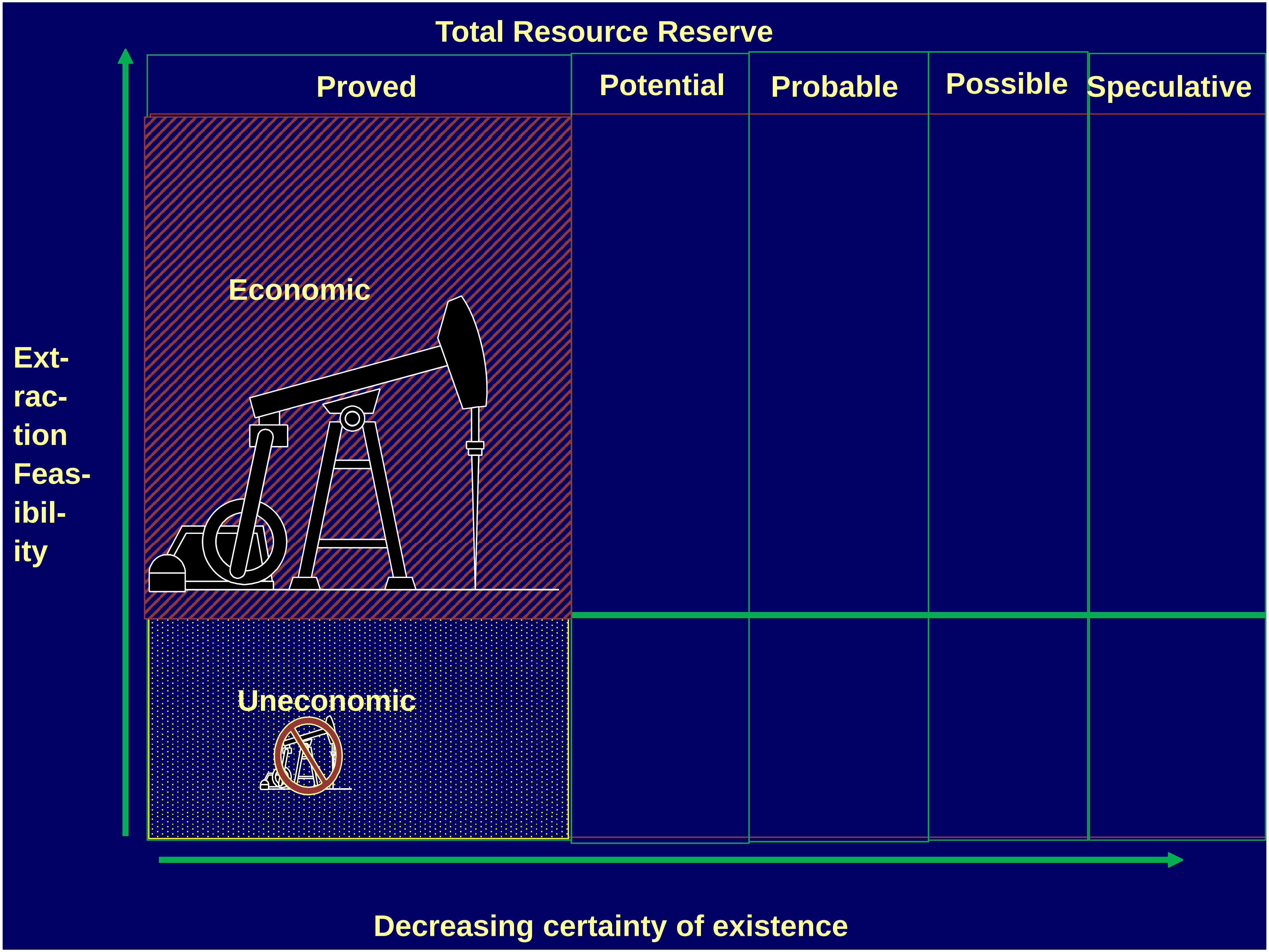
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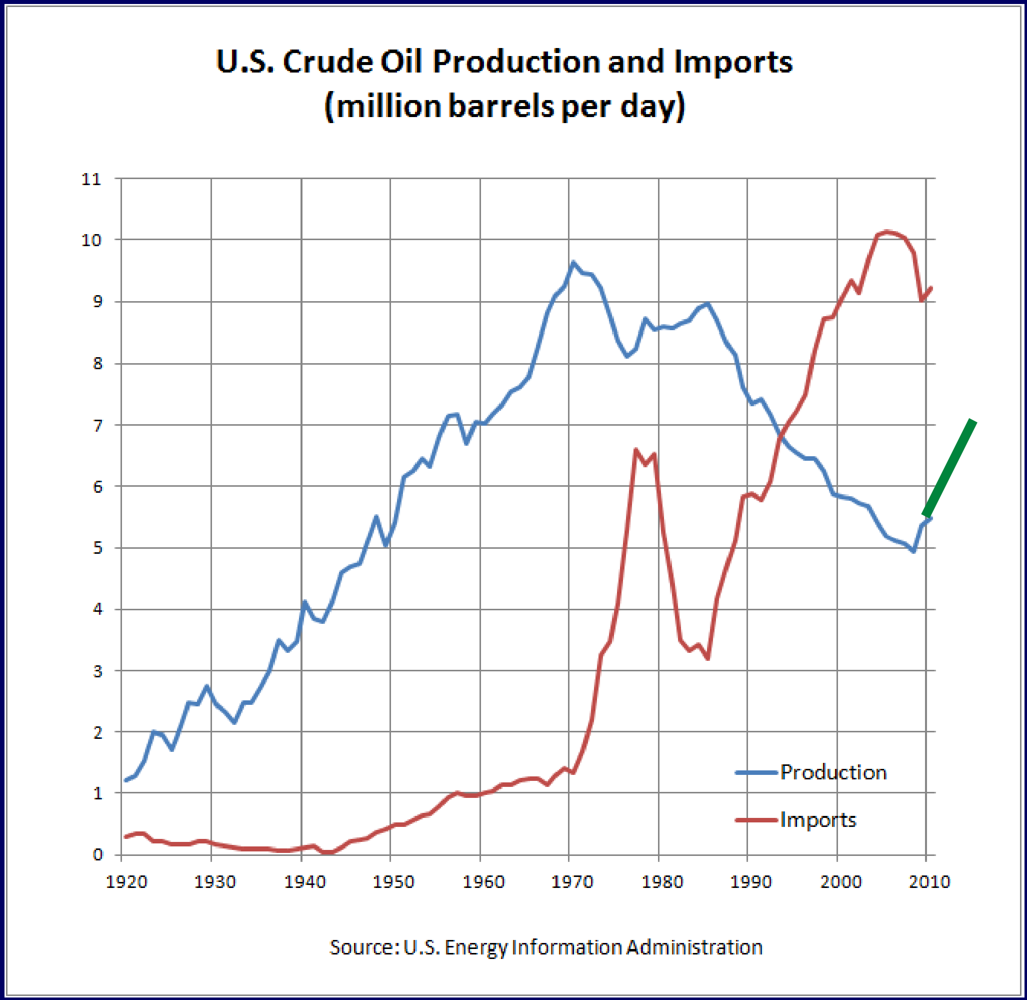
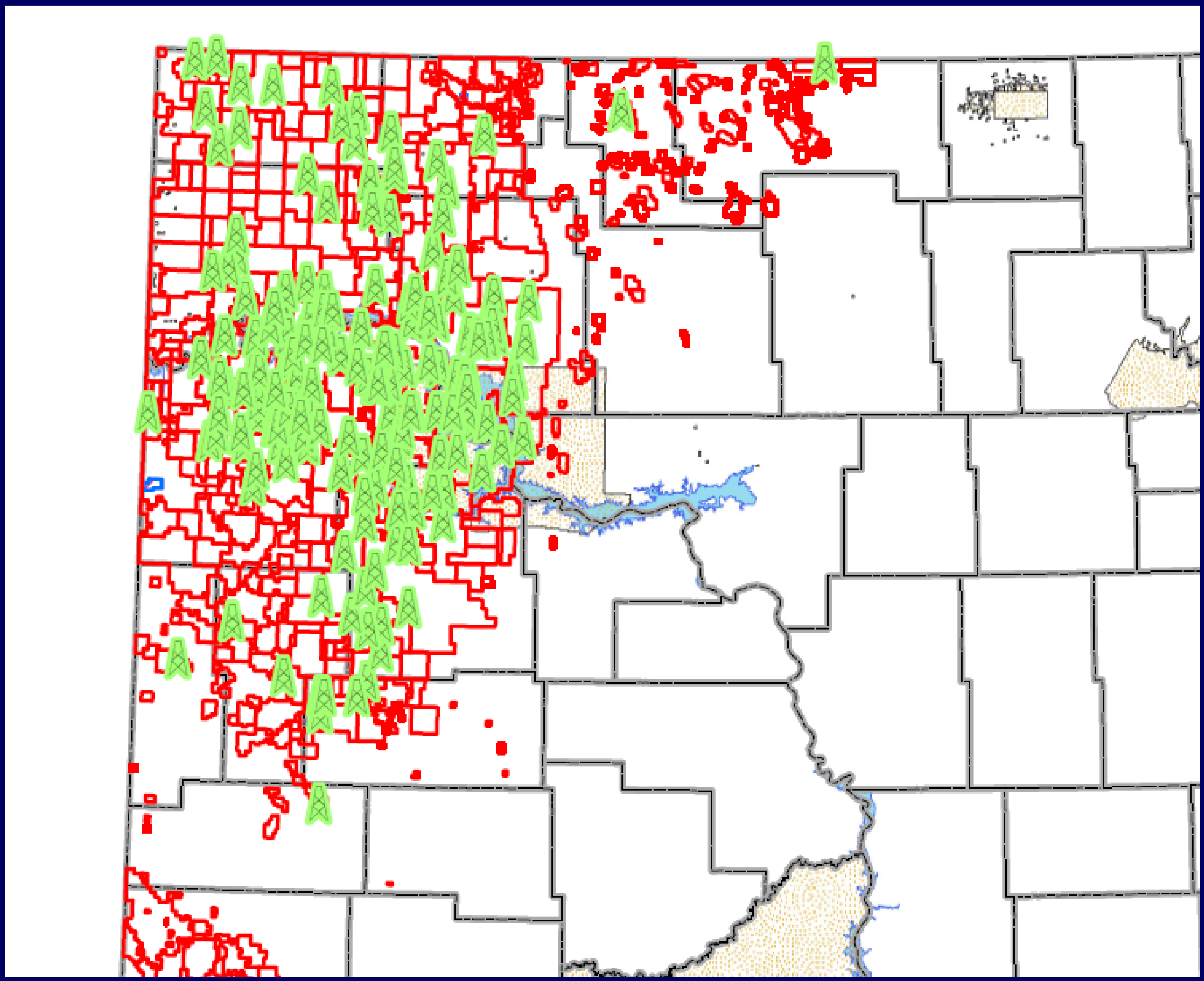
U.S. Oil production is rebounding as imports are falling



2013 U.S. Oil production estimated at over 7 million barrels/day

Oil Rigs in the Bakken Field of Northwest North Dakota (field started 2006)



Conclusion

We do not really "run out" of a nonrenewable resource

As new recovery technology develops some of the resource uneconomic to recover becomes economic to recover

As new discoveries are made some potential reserves become proven reserves

Extraction always feasible at

some price...

But what price??

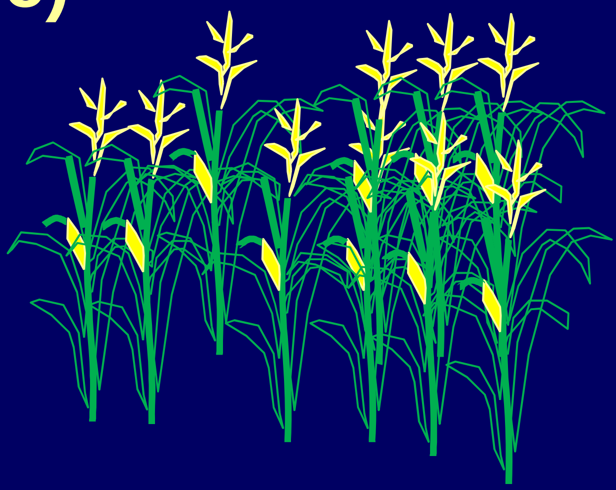
1. cost of extraction

2. extraction + Research & Development costs

3. Imputed value, Implicit worth

(Cost of "next best" alternative)

Arab oil vs grain alcohol



An oil crisis, what happened?

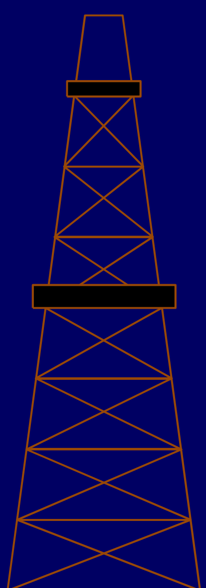
We didn't run out of oil, at least not yet

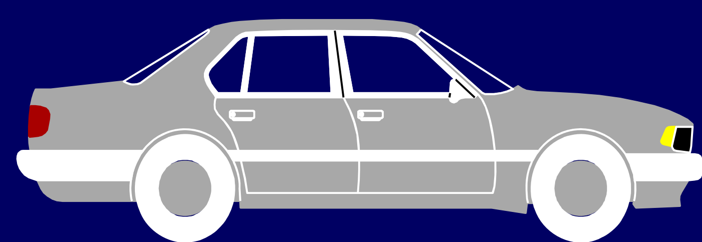
Gasoline prices "reasonable" again

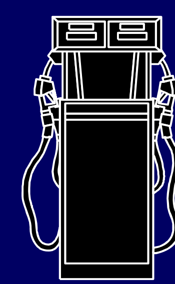
Monopoly power of oil cartel broken

Autos became more fuel-efficient

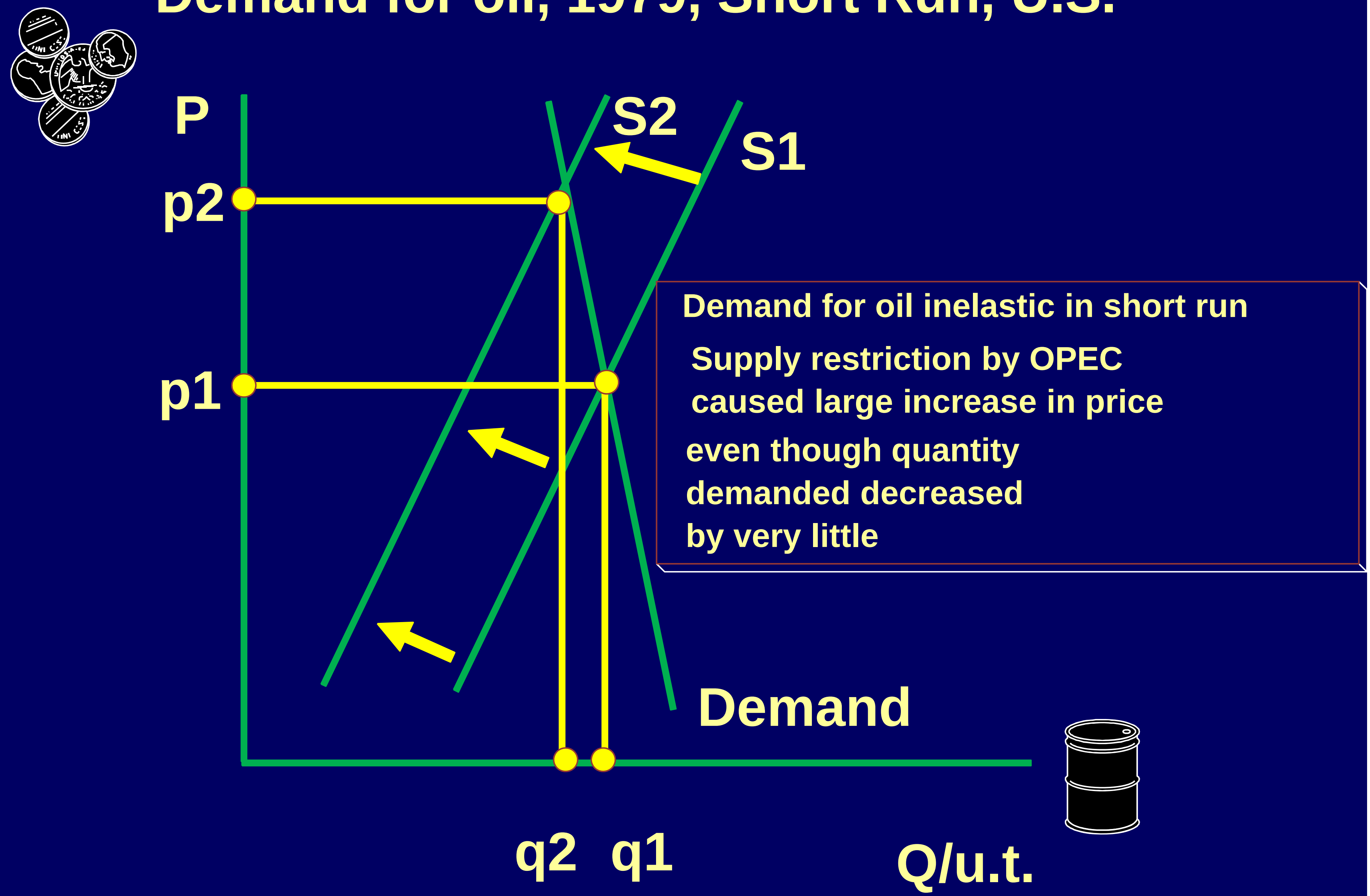
Small shifts in demand caused price reductions



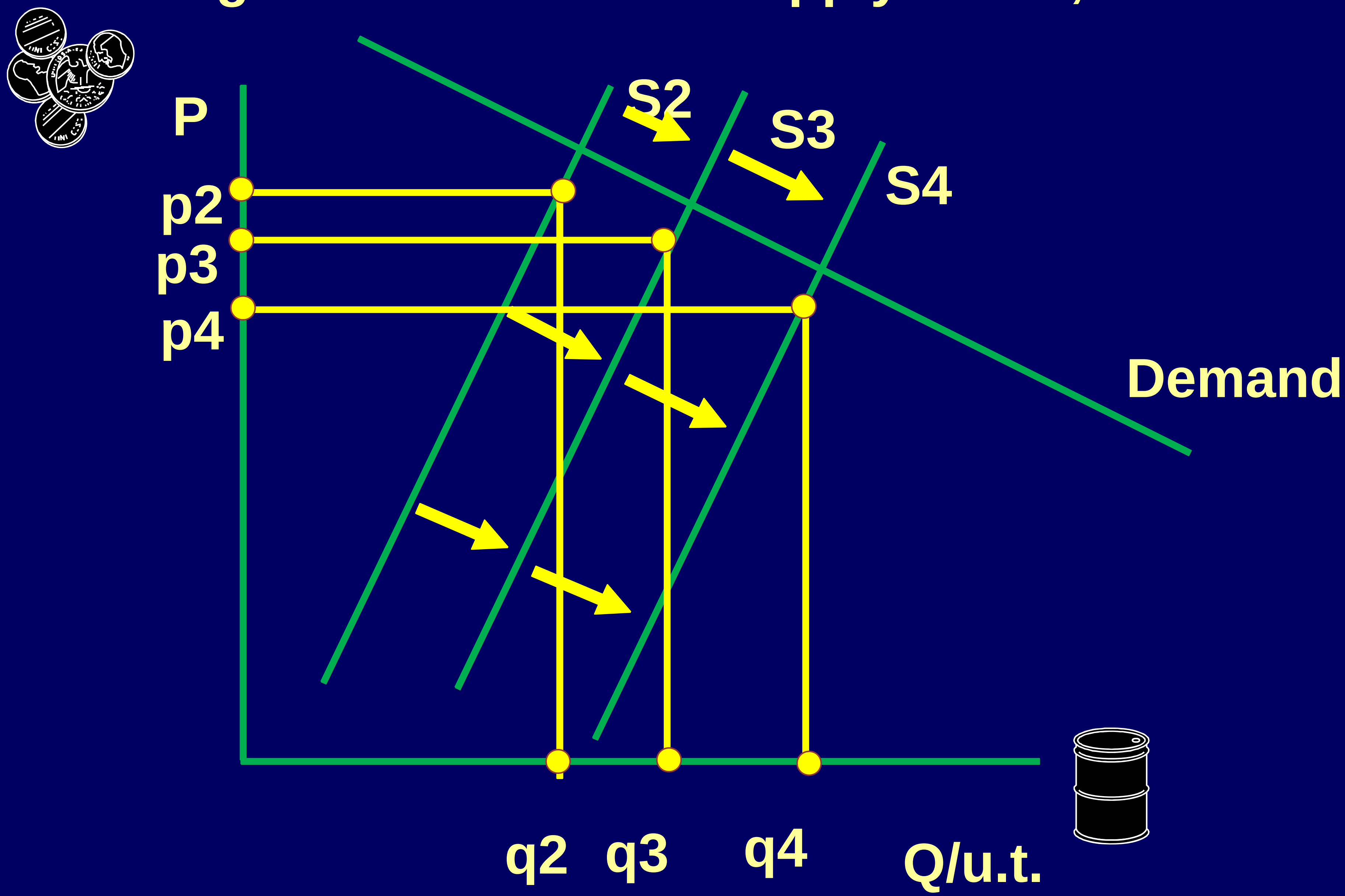




Demand for oil, 1979, Short Run, U.S.

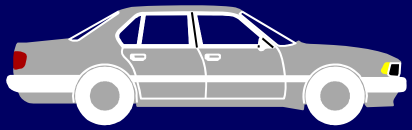


Long-run Demand and Supply for oil, U.S.



In the long run

Demand more price-elastic
as cars become more
fuel -efficient



More substitutes for oil

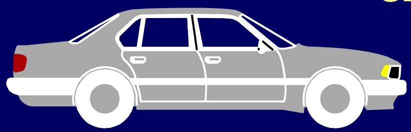
Old, oil-burning furnaces replaced

OPEC monopoly power reduced
less able to restrict supply
as non-OPEC nations produce more

Supply gradually shifts outward

Prices gradually move downward

In the long run



New technology makes previosly uneconomic sources economic (Bakken field in North Dakota)

More substitutes for oil

Supply gradually shifts outward

Electric-powered vehicles

Wind farms

Solar panels

Better insulated homes and factories

More fuel efficient production practices in manufacturing

Soil Conservation

Problem: How do you get farmers to implement soil-conserving practices when they can make more money in the short run by not implementing the practices?

Borrowing from the productivity of land for future generations

Alternatives

1. Scold farmers
   threaten
   cajole

not very effective (usually)

hard to justify if your family is starving

Educational efforts

by Soil Conservation Service

2. Government subsidies

Federal government pays part or all of the cost of the conservation practice

This gets farmers interested (usually)

Why is SCS a government agency?

Farmers, as individuals would not look at long run

Subsidy programs heavily used

CRP is basically soil conservation

3. Develop conservation practices that are economically warranted in the short run

A few conservation practices are more profitable to farmer than conventional practices even in the short run

Min and no-till
- as good or better yields
- lower machinery costs
- soil conserving compared to conventional tillage

Energy and U.S. Agriculture

How is efficiency in agricultural production measured?

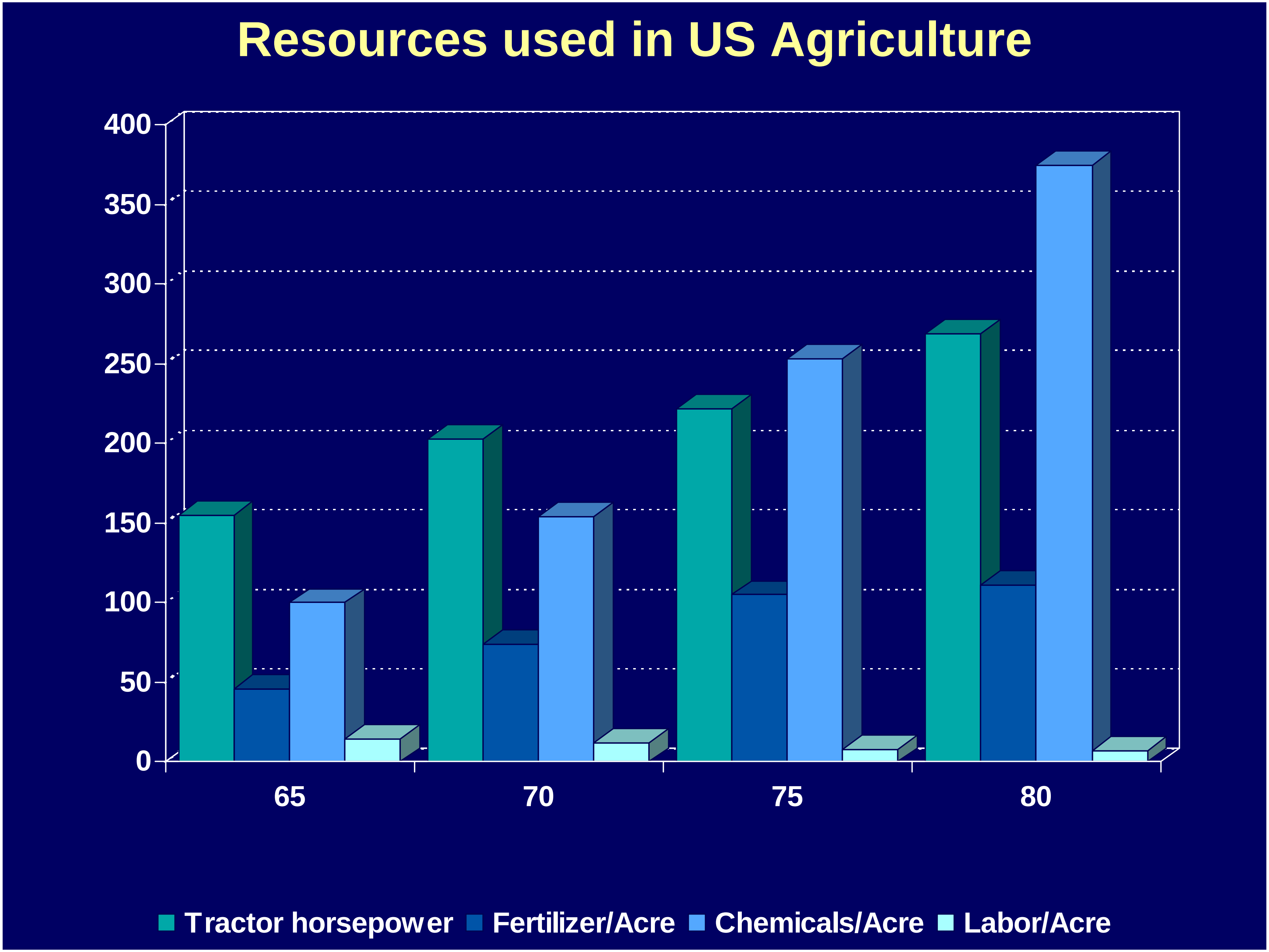
1. Output Per Worker

US agriculture one of the most efficient in the world based on this criterion

Only one measure of efficiency

Assumes that labor is the "high cost" input that must be conserved

May not continue to be the most important measure


Resources used in US Agriculture
400
350
300
250
200
150
100
50
0
65
70
75
80
Tractor horsepower
Fertilizer/Acre
Chemicals/Acre
Labor/Acre

2. Output Per Unit of Fertilizer

3. Output Per Unit of Pesticide

4. Output Per Unit of Capital Invested

5. Output Per Unit of Liquid Fuels Energy

Based on measures 2-5, above, the U.S. probably does not rank high relative to other countries we would view as having more "primitive" agricultures

A major reason for our efficiency
in terms of output per worker
is because of our inefficiency
based on these other measures...

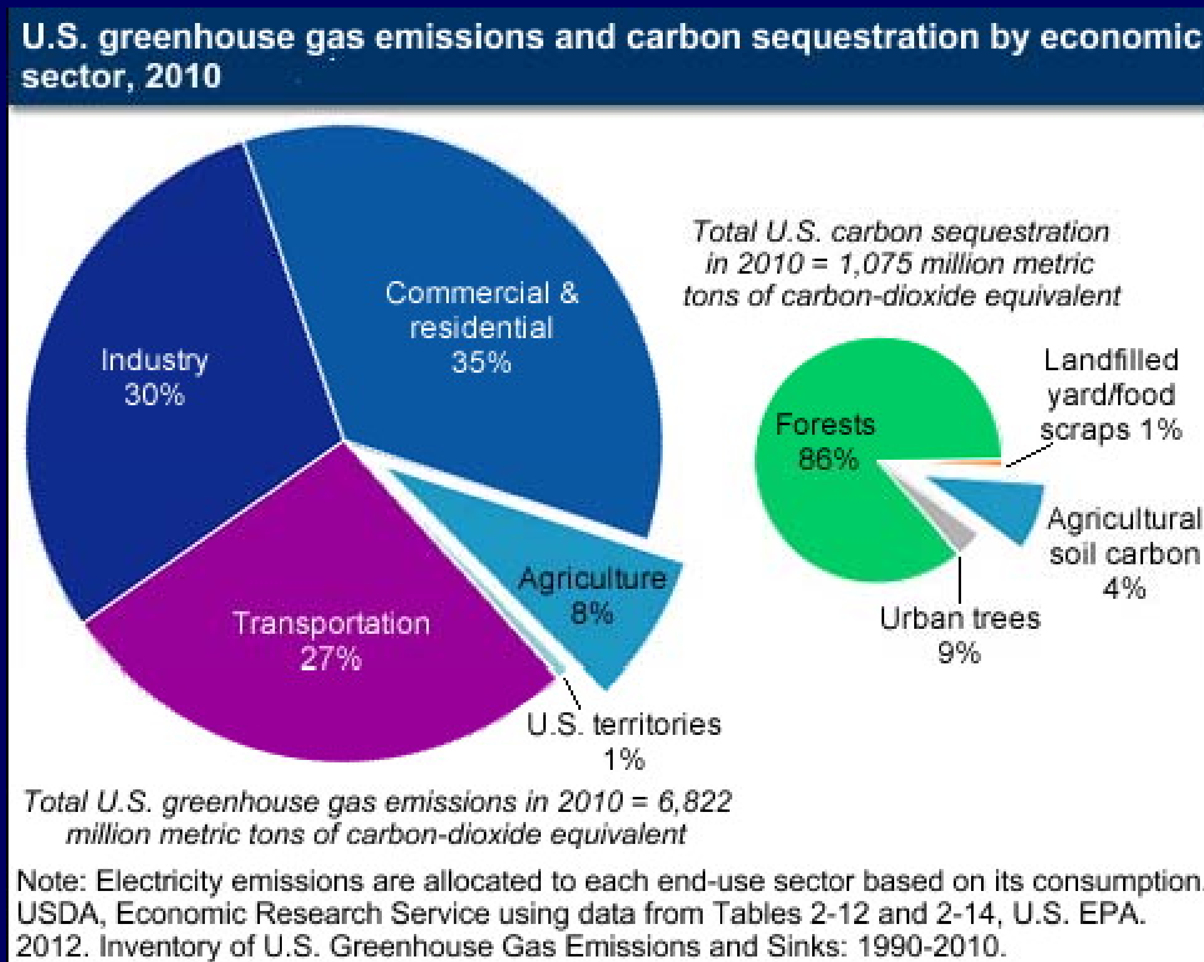
What are the relevant criteria?

Who are we to say that we are right and other
nations are wrong?

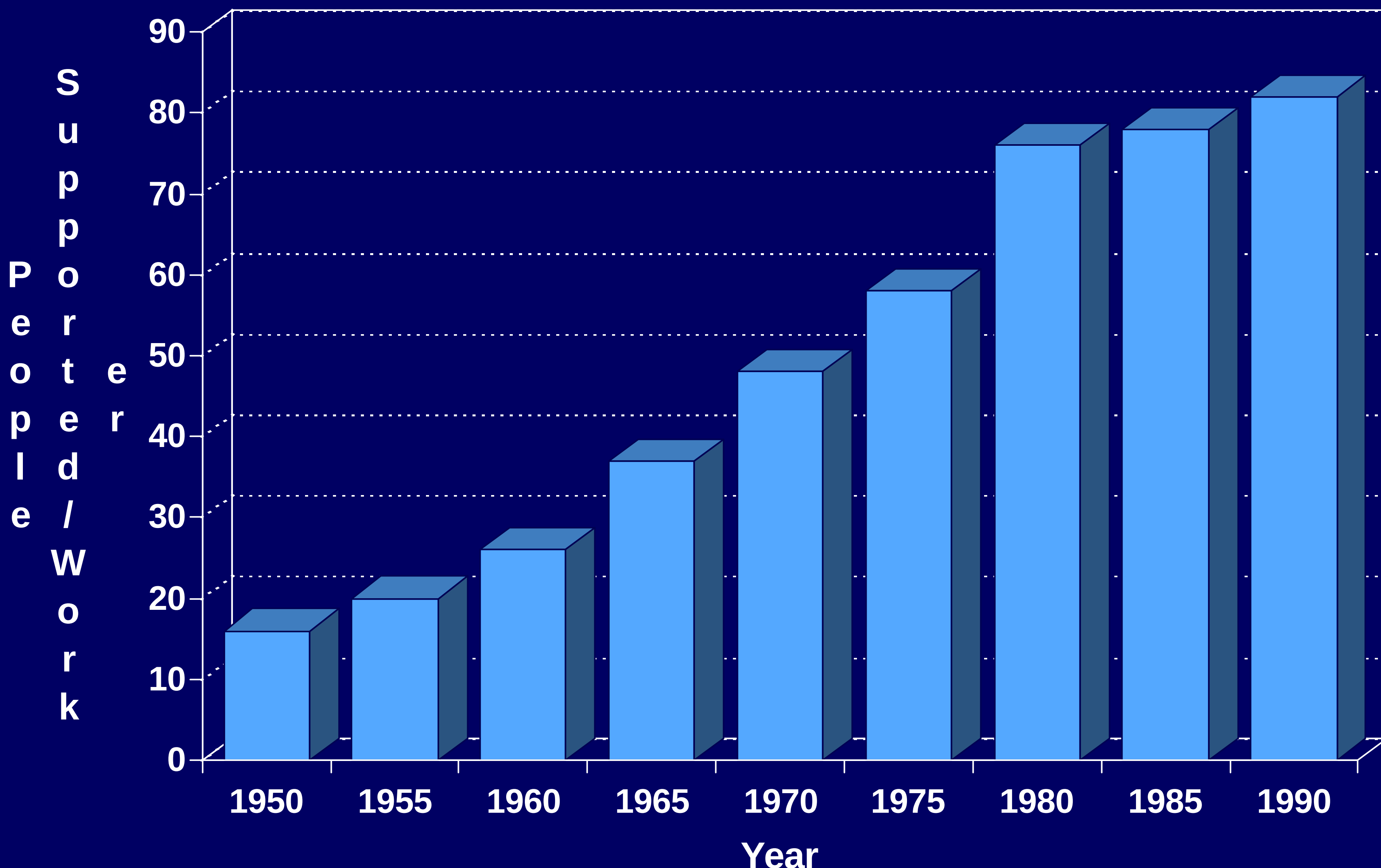
Our agriculture is very wasteful
of nonrenewable resources

Our agriculture pollutes the environment with
chemical fertilizers & pesticides

Role of Agriculture in Greenhouse Gas Emissions

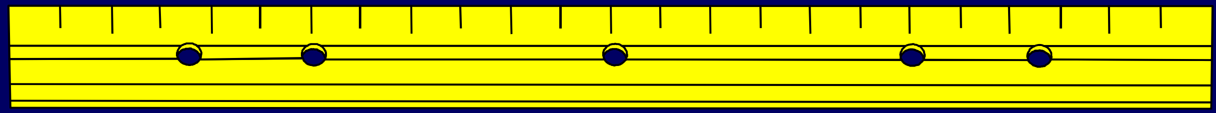


People Supported/Farm Worker, U.S., 1950-90



The current estimate is that each farmer feeds approximately 155 people!

Technologies that improve labor productivity continue to reduce the need for farm labor.



Is output per worker the appropriate

Measuring Stick?

Will this measuring stick

continue to be appropriate?

What about the long term implications?

Nonrenewable resource supplies

Pollution and the environment

Do farmers have a responsibility?

International Trade

Basis for International Trade

Countries should specialize in production for which they have a

Comparative advantage

Why does the U.S. import products requiring large amounts of hand labor?

Oriental rugs

Weaving, baskets, etc.

Labor is cheap in countries producing these products

Products require little capital investment

Americans value hand-made goods

Hand-made goods expensive given U.S. wage rates

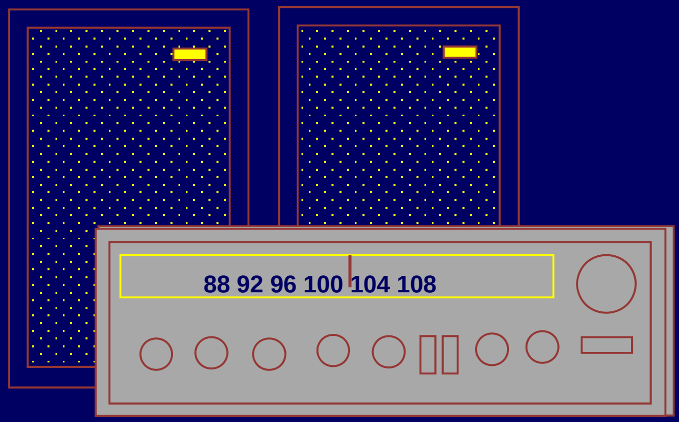
Value of your grandmother's time

Couldn't set up an efficient factory to produce hand-sewn items in U.S.

U.S. imports items from countries with a comparative advantage in producing hand-made goods

U.S. also imports high-tech items

- VCR's
- TV sets
- Camcorders
- CD players



Electronics industry established in places like

- Korea
- Taiwan
- Singapore
- Japan

Investment in automated, efficient plants

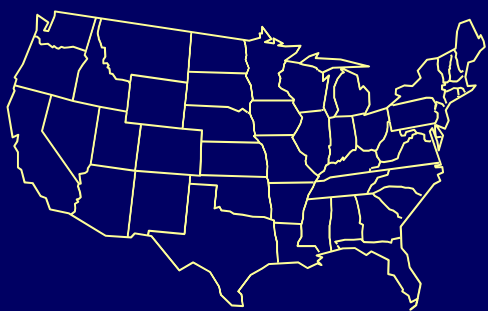
US exports agricultural commodities

Capital-intensive, low cost production of crops

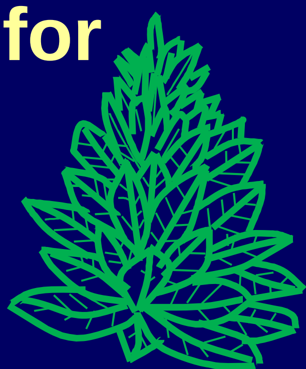
Traditionally, the U.S. is the efficient producer

Comparative advantage in crops, beef, dairy

More threat from foreign competition for



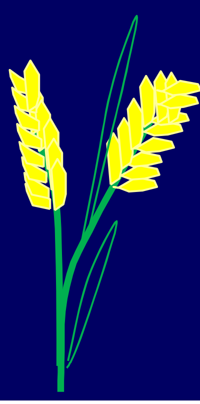
- Labor-intensive crops
- Tobacco
- Horticultural crops



Agriculture improving in much of rest of world

Soybeans--Brazil

Wheat-Saudi Arabia



Korea:

LG

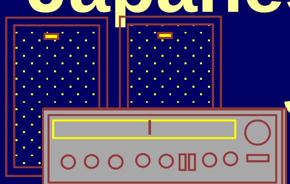
Samsung

Cheaper, but labor rates increasing

Not all made in Korea

Korean-owned firms

“Japanese” electronics almost never made in Japan



Japanese electronics sourced around the world

Why did Toyota invest in US?

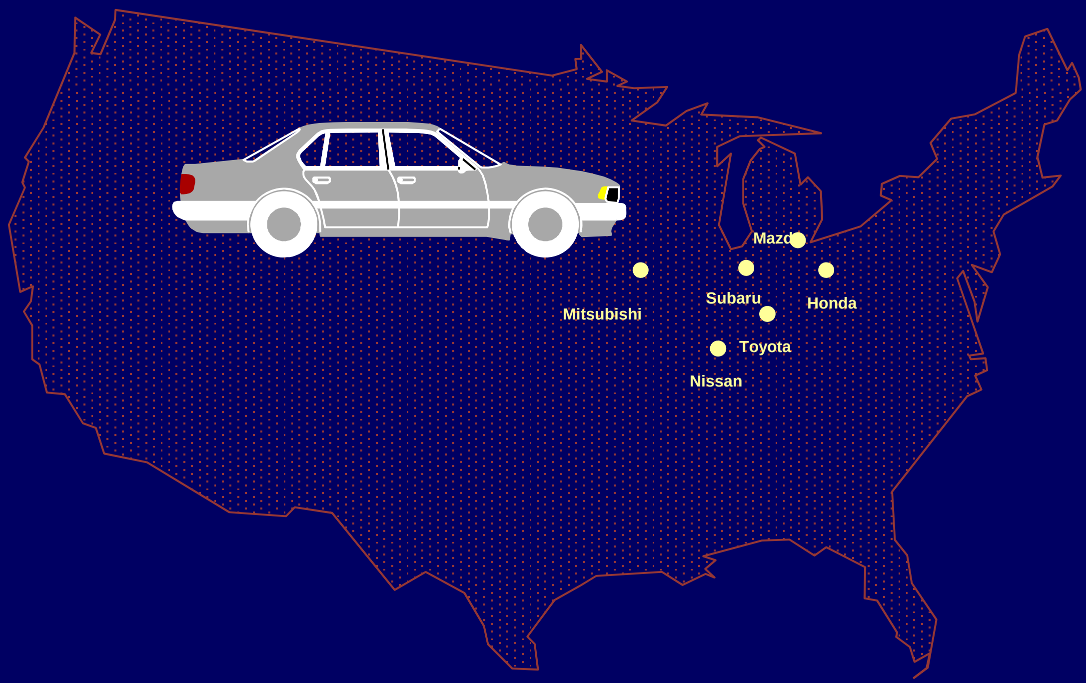
Real wage rates only slightly lower in Japan

Wage differentials no longer a big issue

Import restrictions on cars built outside the U.S.

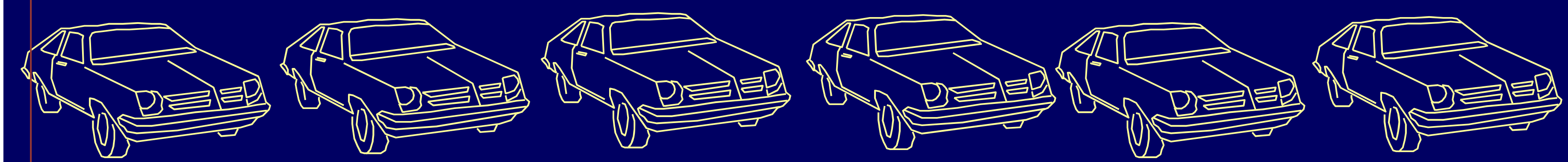
No restrictions on U.S. assembled cars

Honda 3 years ahead of Toyota with Ohio plant



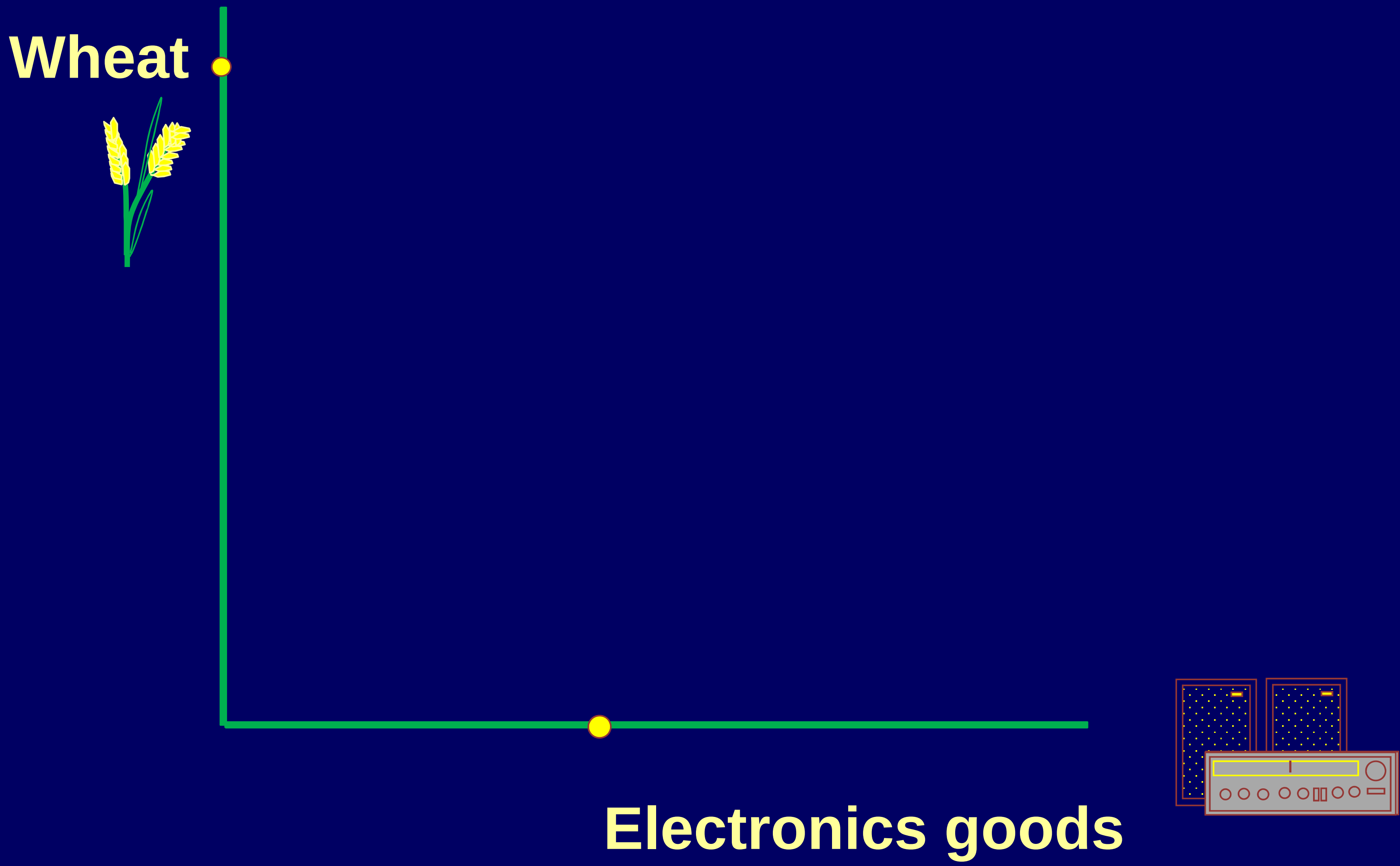
Production of Motor Vehicles

Dodge Journey	Saltillo, Mexico
Chevrolet Silverado	Silao, Mexico
Chevrolet Impala	Oshawa, Canada
Lexus ES 350	Georgetown, KY
Mazda MX-6	Flat Rock, MI
Honda Accord	Marysville, OH
Dodge Dart	Belvedere, IL
Toyota Camry	Georgetown, KY
Volkswagen Passat	Chattanooga, TN
Chevrolet Camaro	Oshawa,Canada

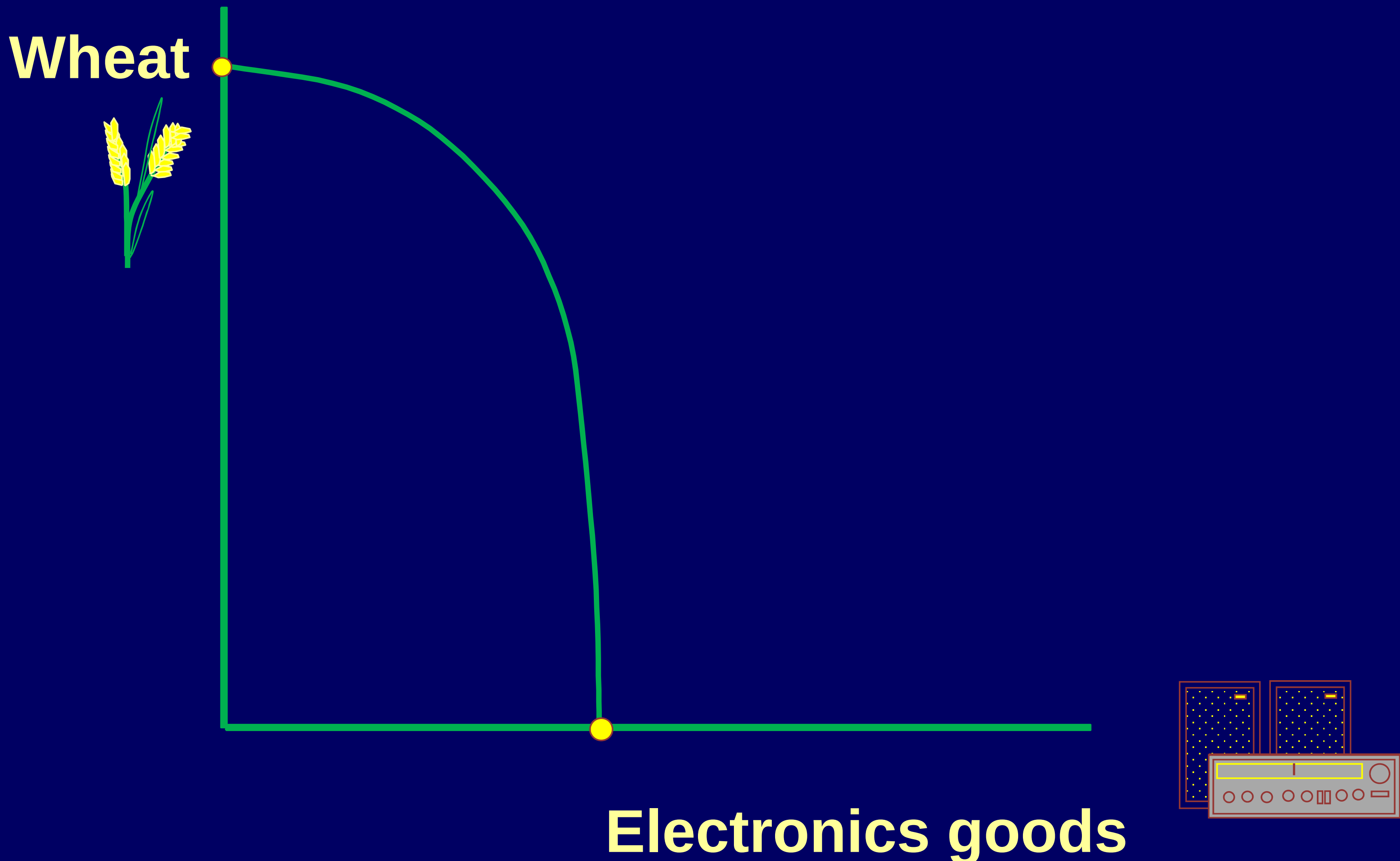


Are you certain your american auto is american
Or your foreign auto is foreign?

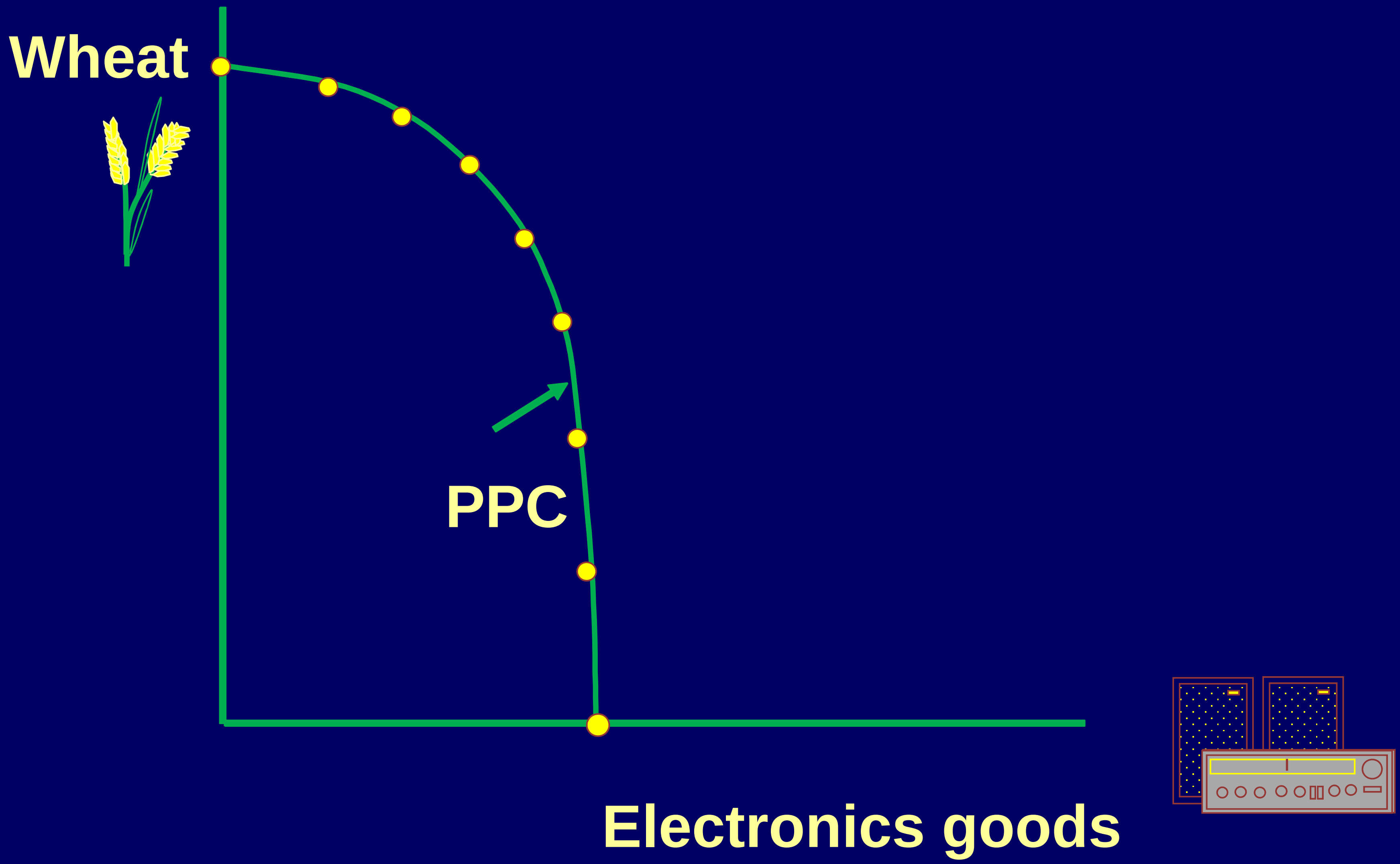
Production Possibilities Curve (U.S.)

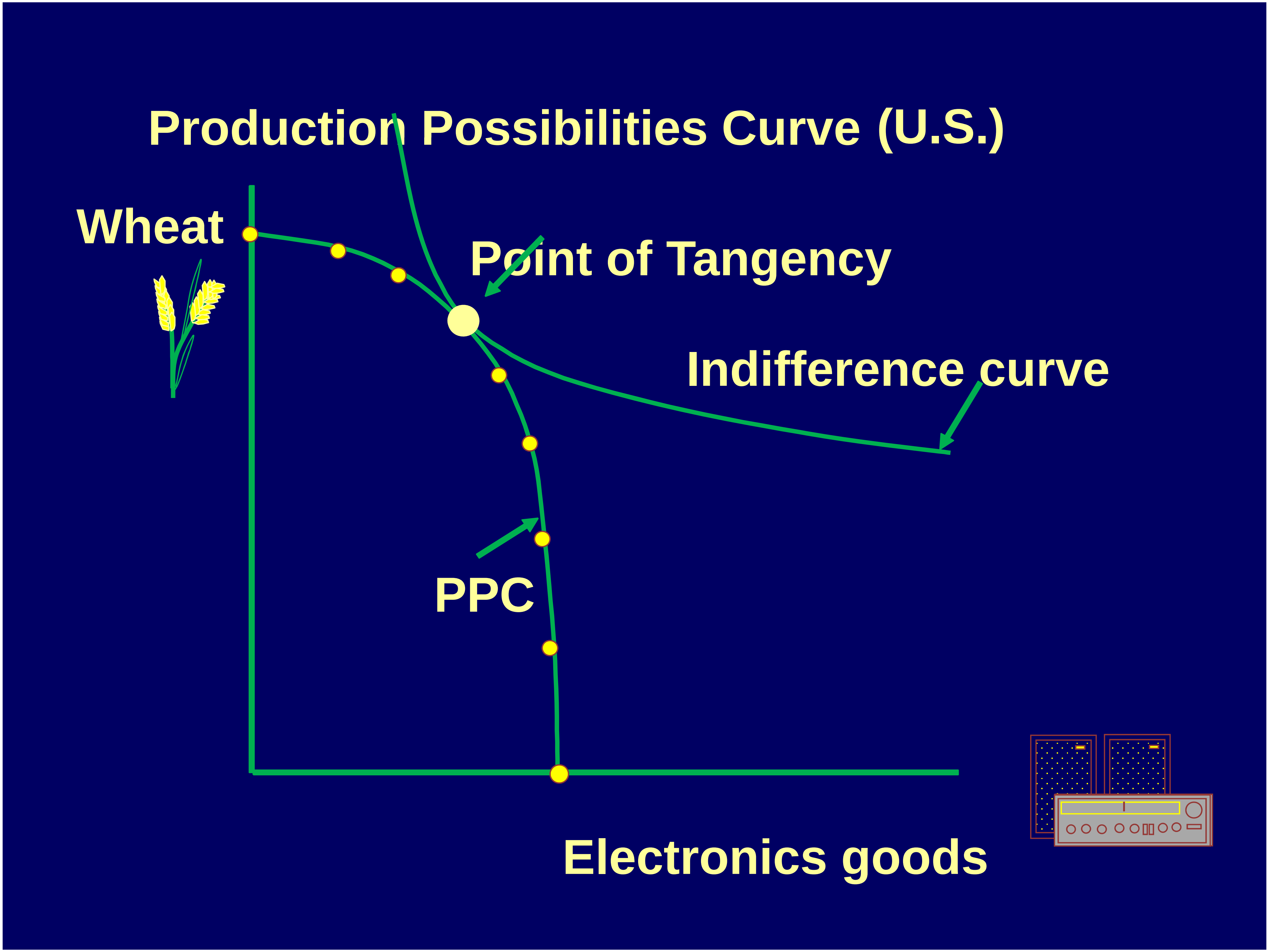


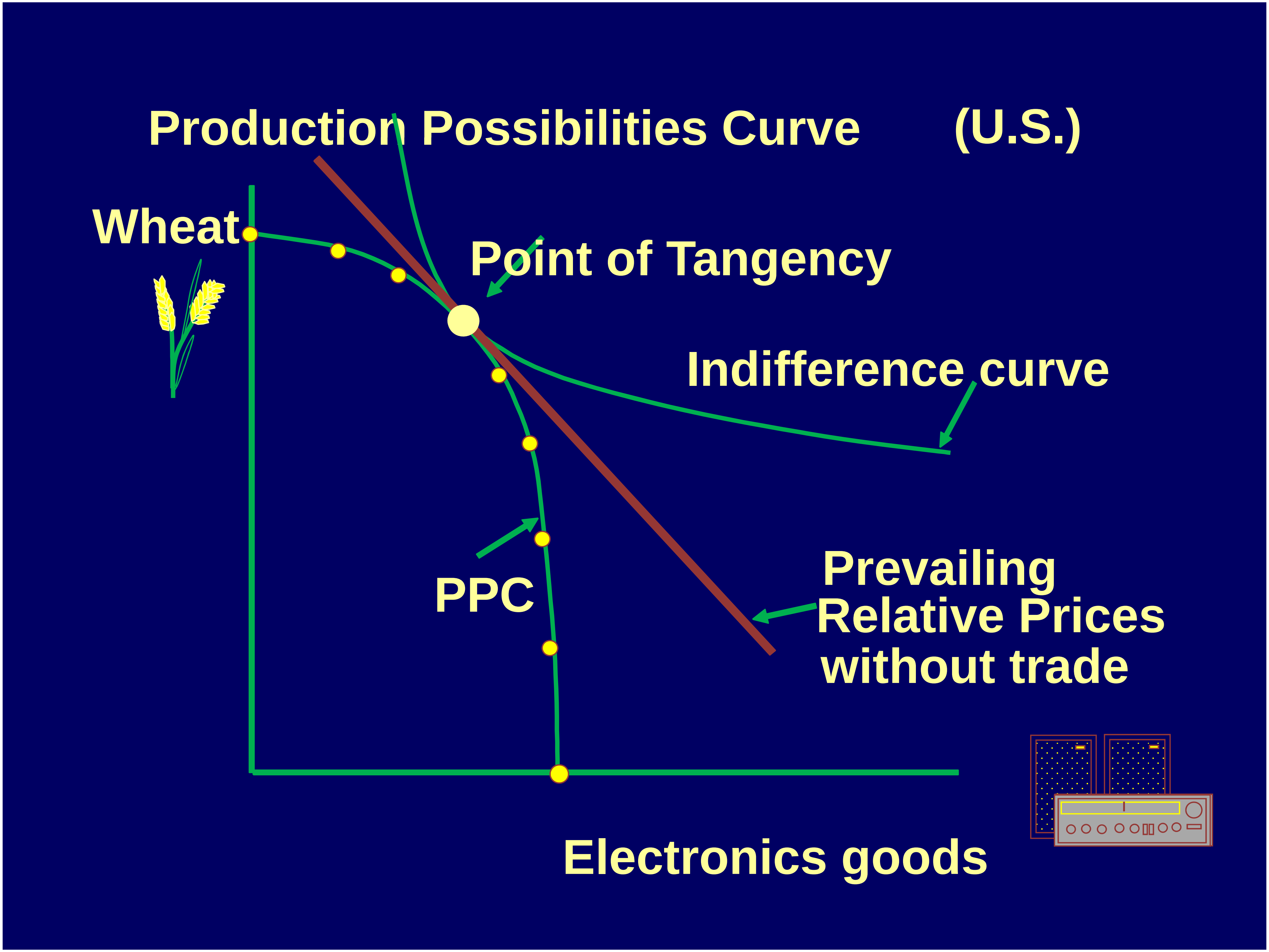
Production Possibilities Curve (U.S.)



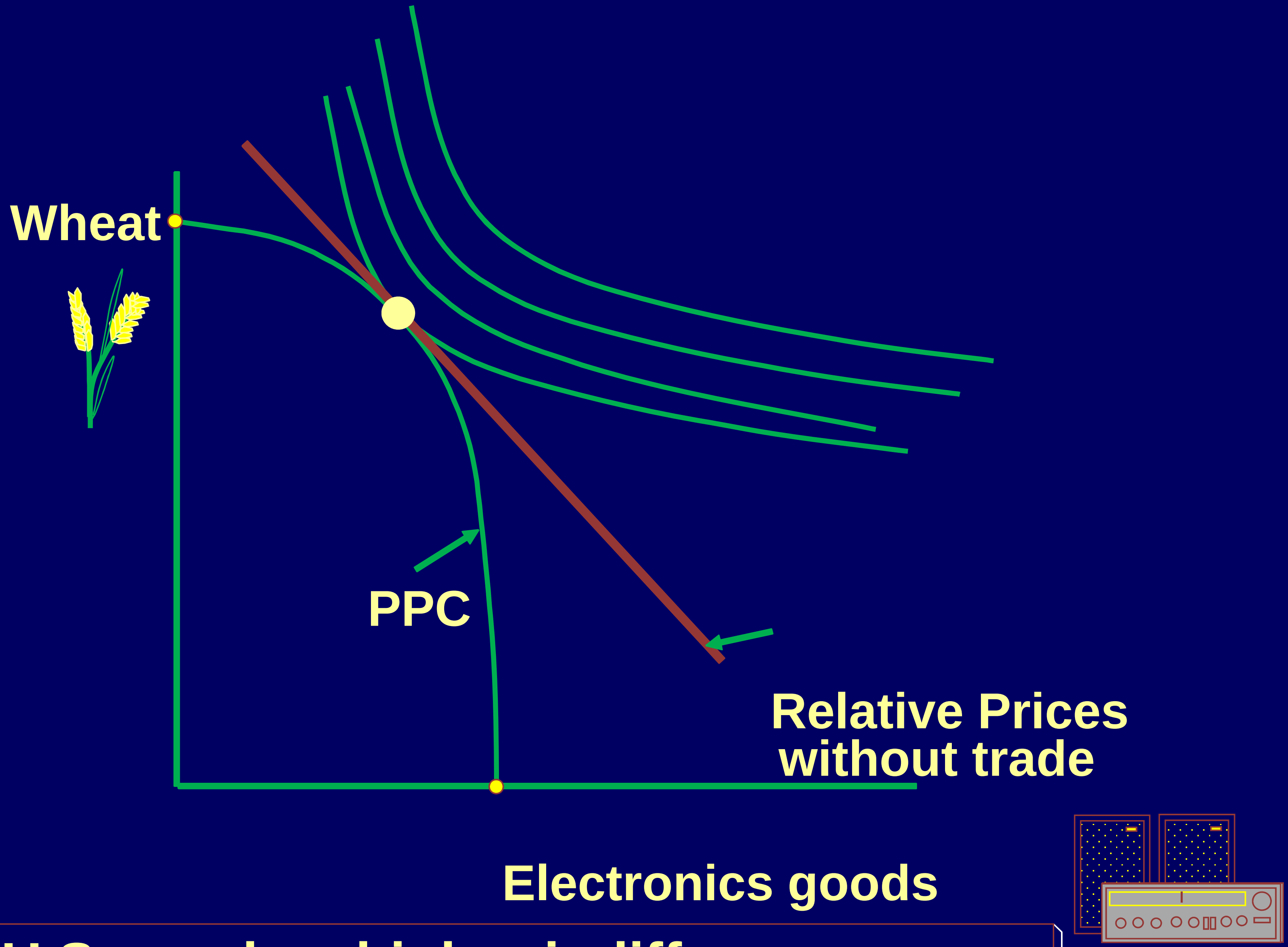
Production Possibilities Curve (U.S.)



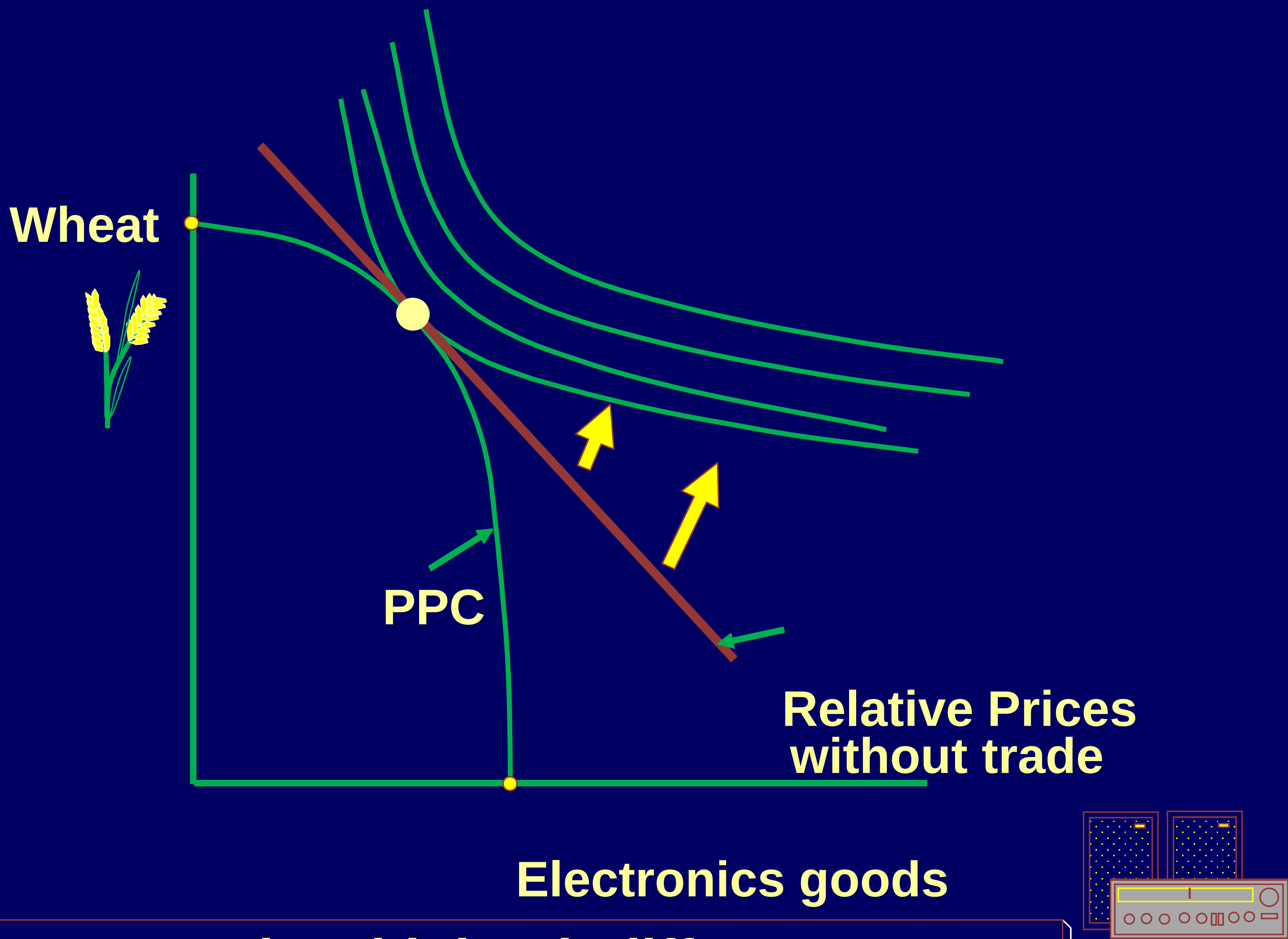

Production Possibilities Curve (U.S.)
Wheat
Point of Tangency
Indifference curve
PPC
Electronics goods



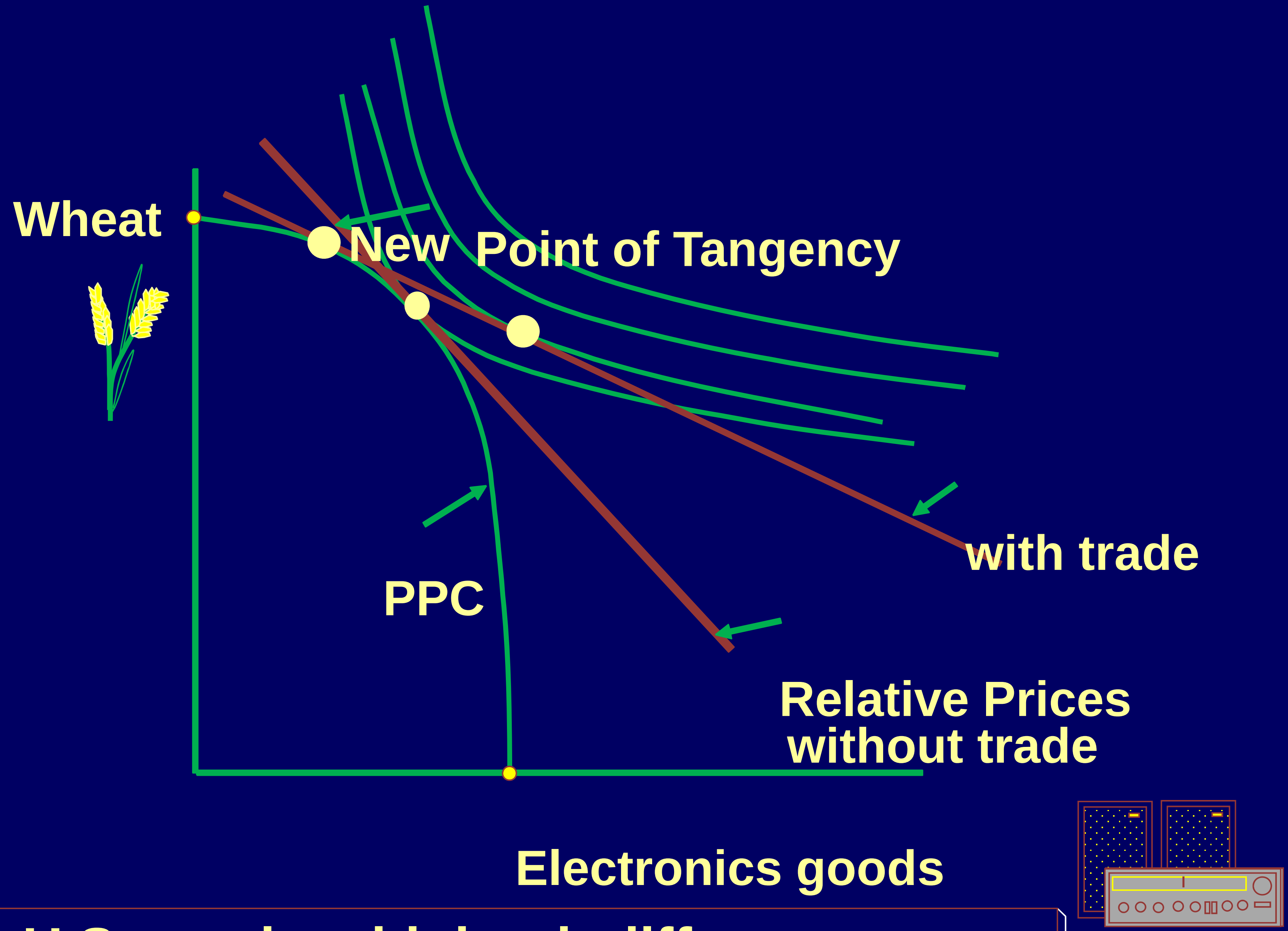
Production Possibilities Curve (U.S.)
Wheat
Point of Tangency
Indifference curve
PPC
Prevailing
Relative Prices
without trade
Electronics goods



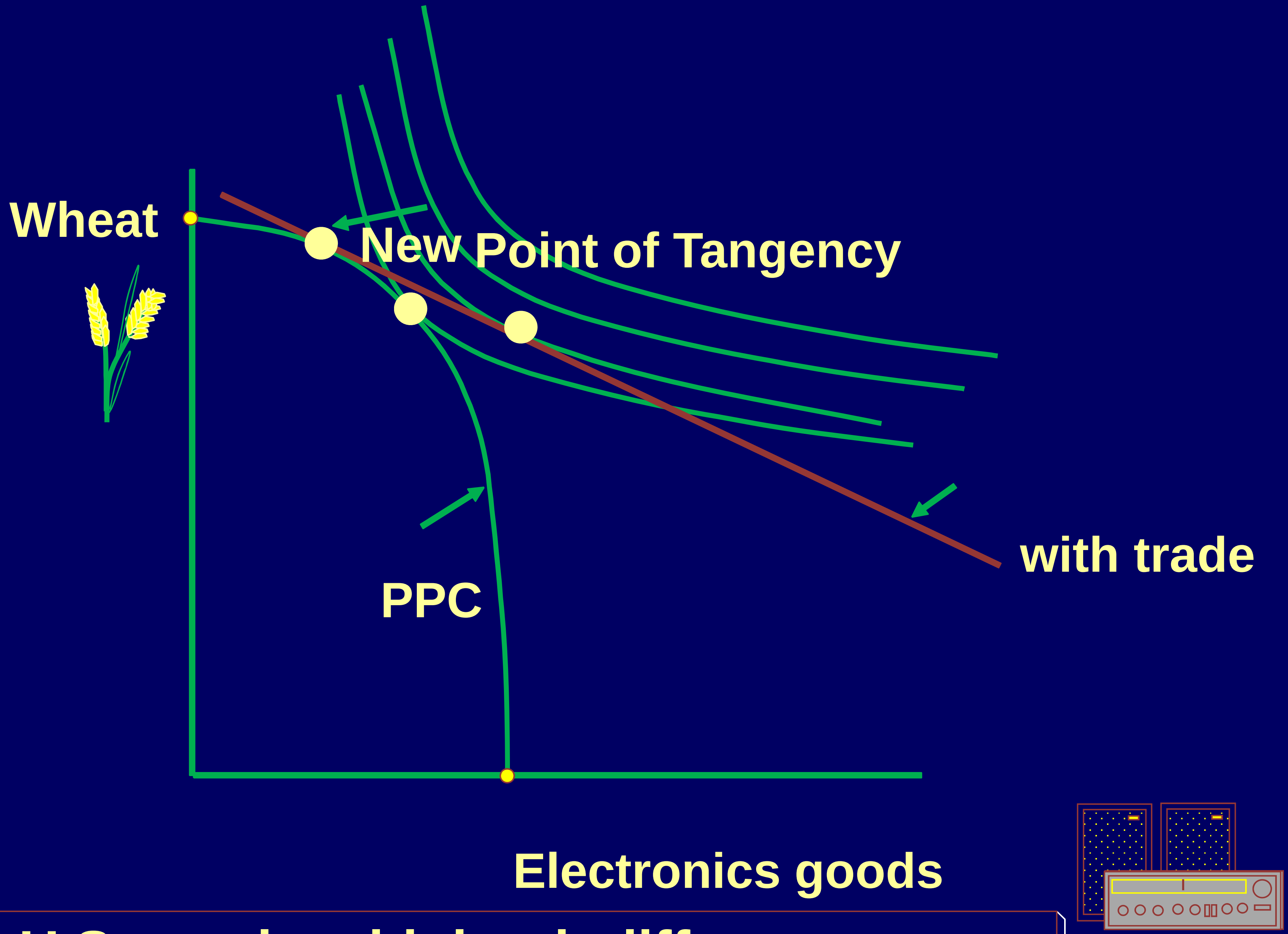
U.S. reaches higher indifference curve by trading wheat for electronics



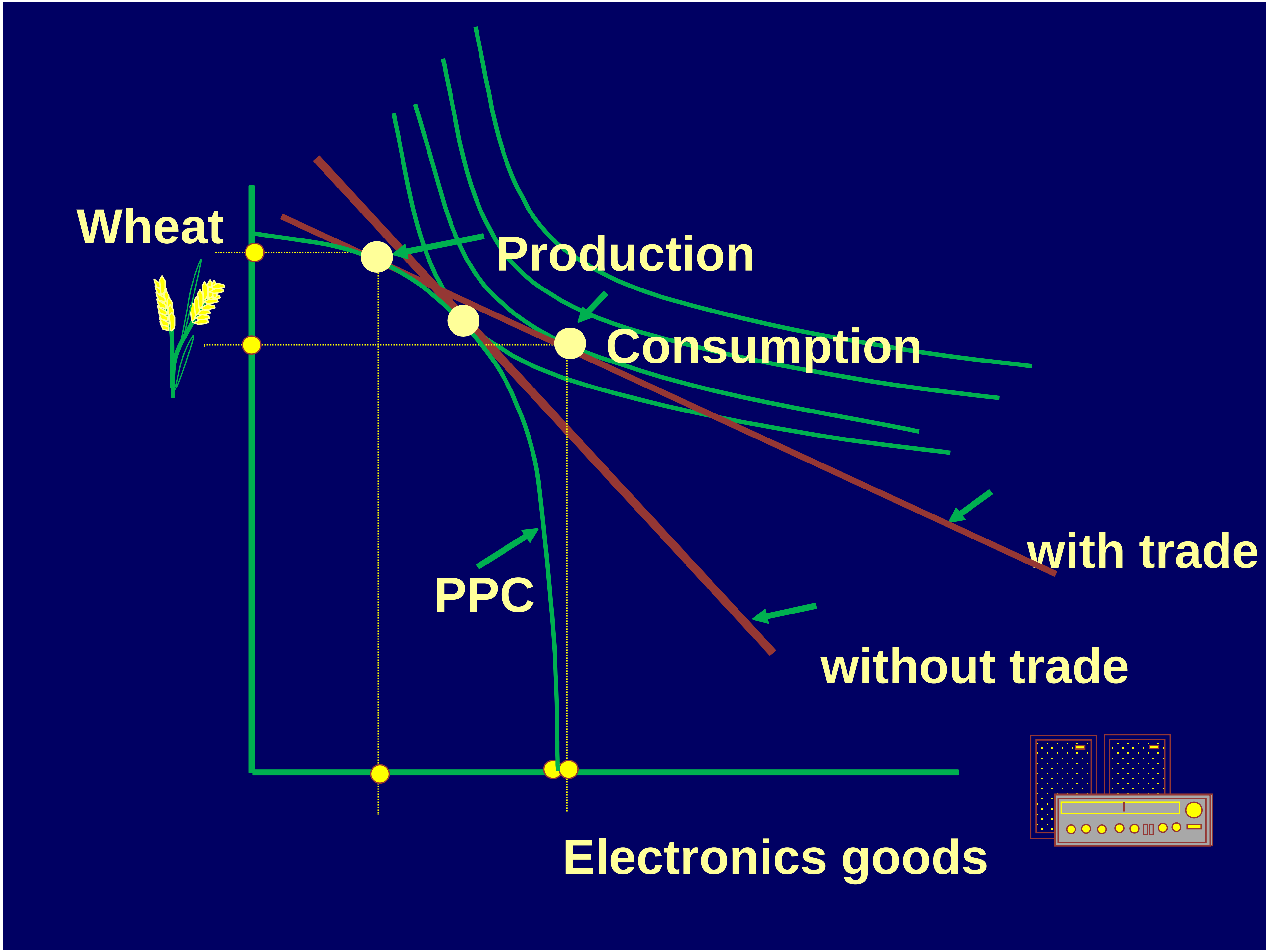
U.S. reaches higher indifference curve by trading wheat for electronics

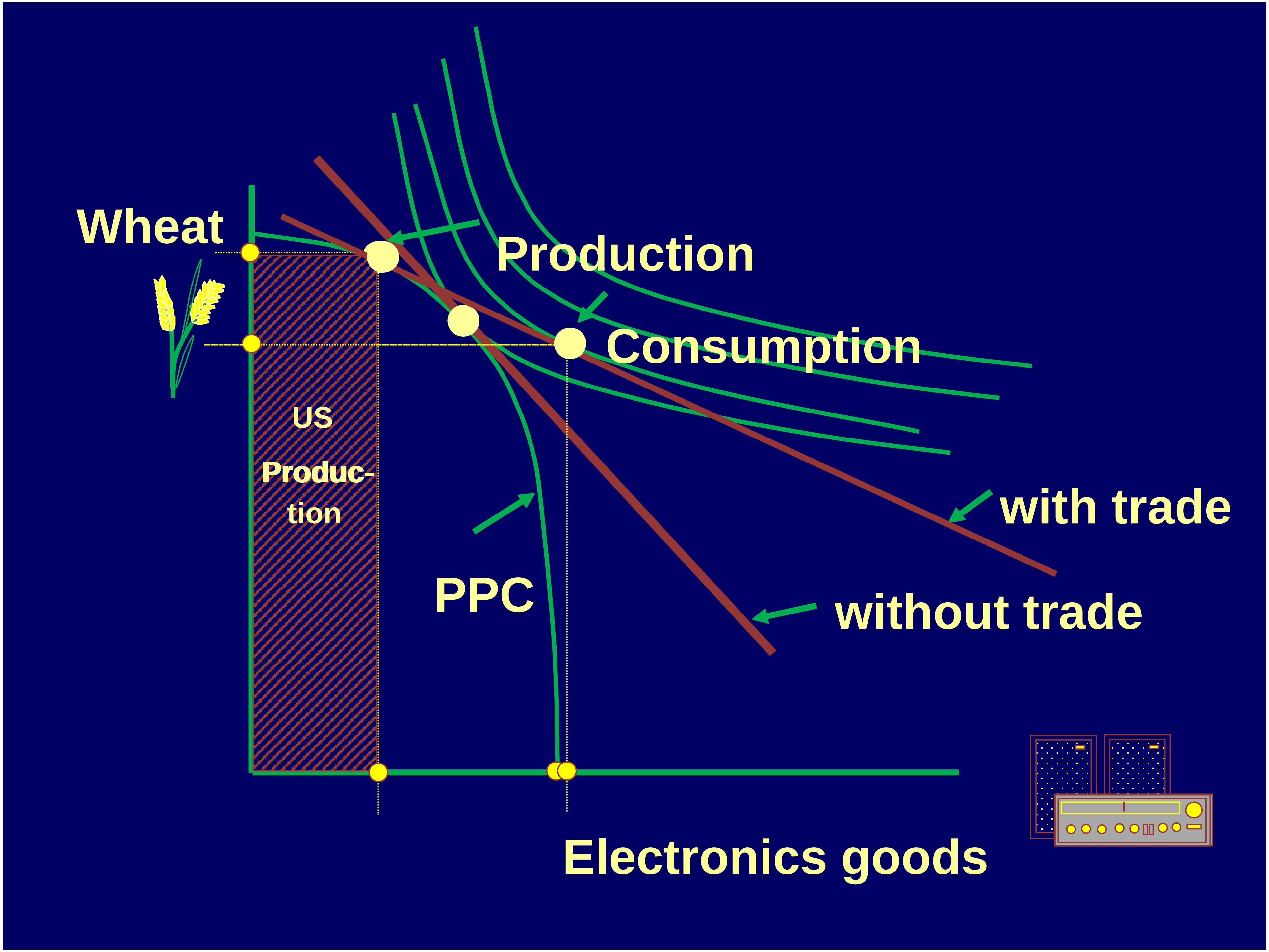


U.S. reaches higher indifference curve by trading wheat for electronics

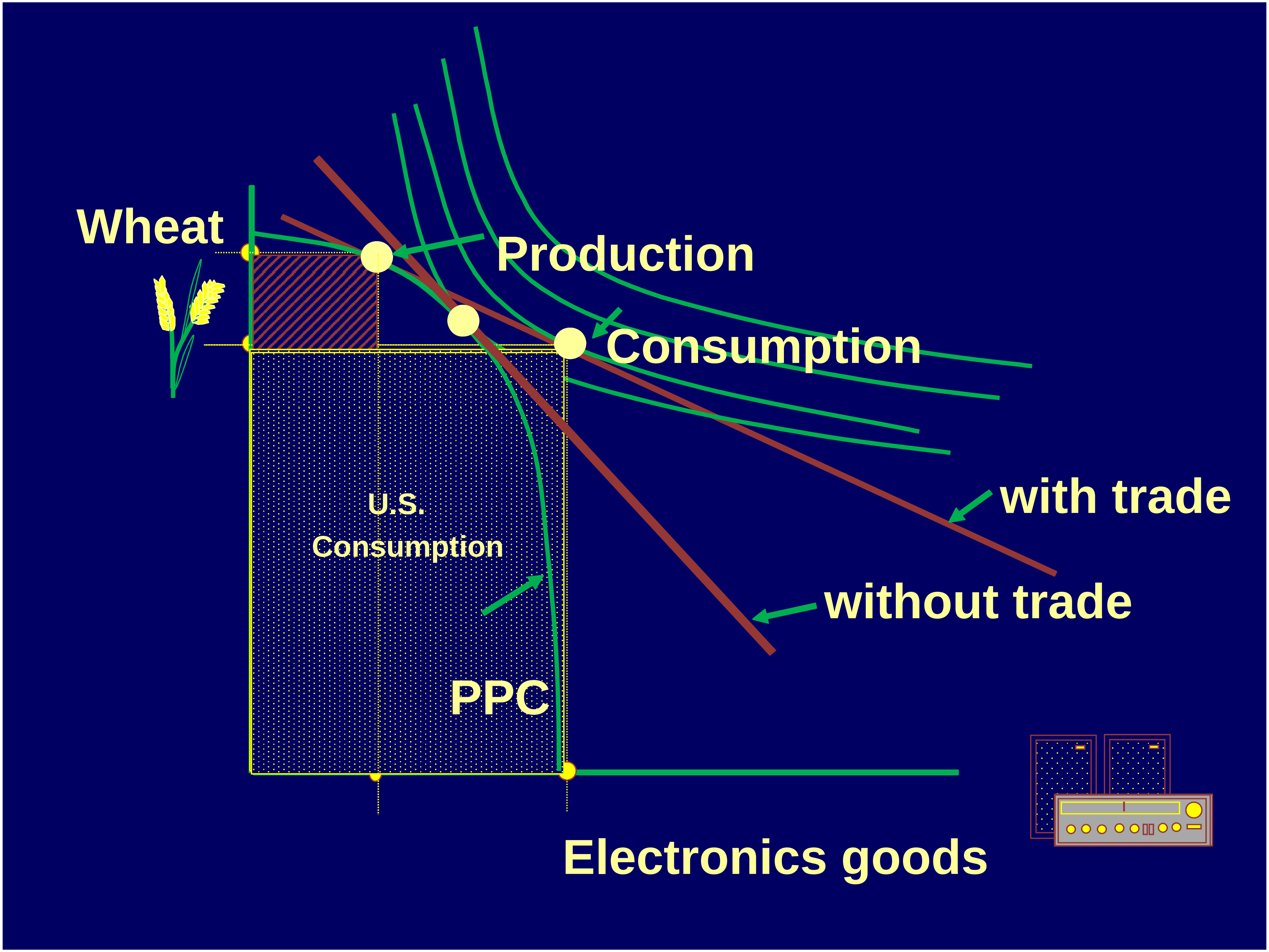


U.S. reaches higher indifference curve by trading wheat for electronics

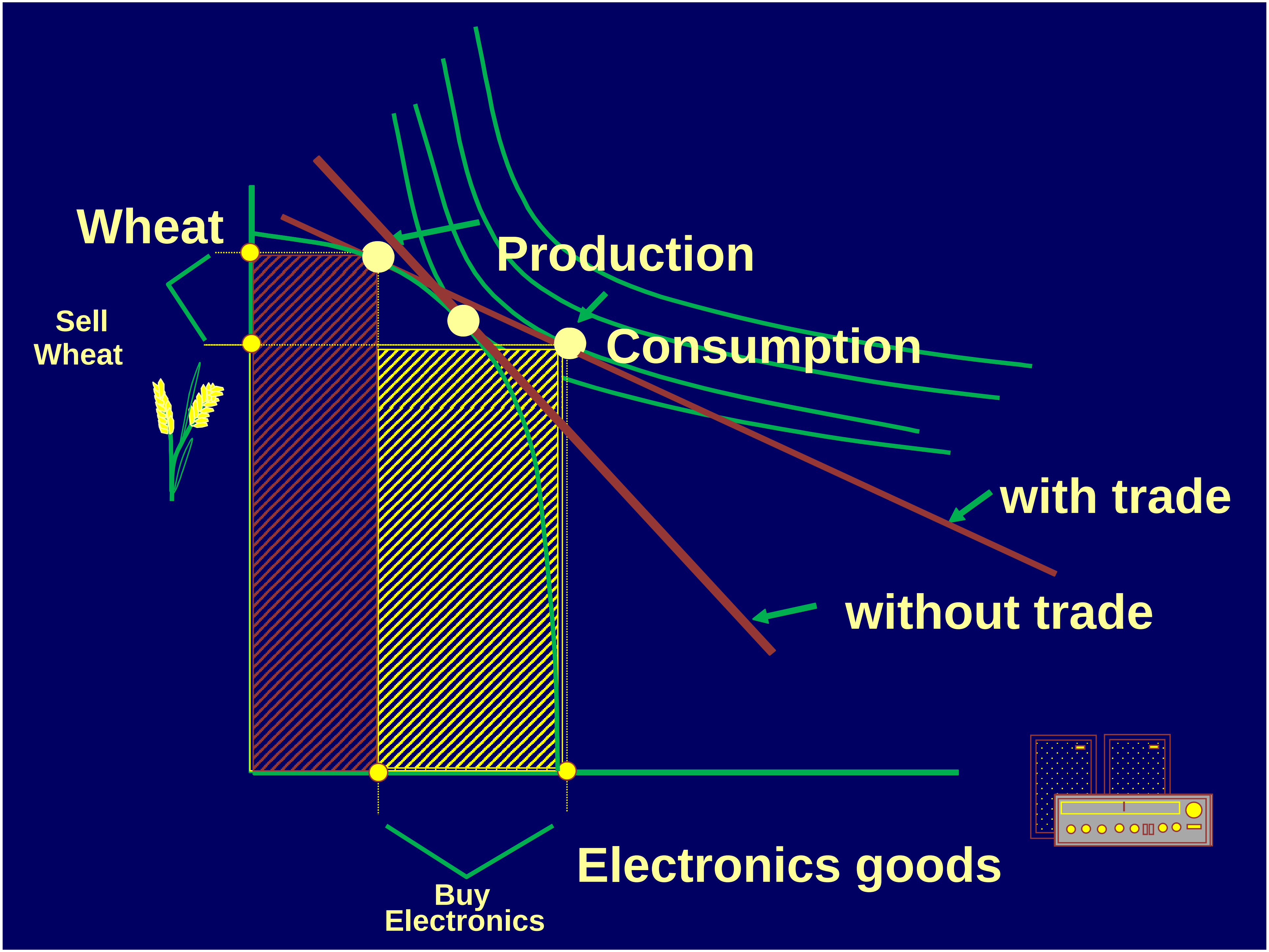

Wheat
Production
Consumption
with trade
PPC
without trade
Electronics goods



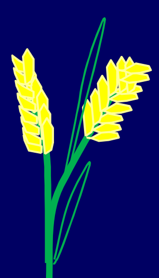
Wheat
Production
Consumption
US
Produc-
tion
with trade
PPC
without trade
Electronics goods

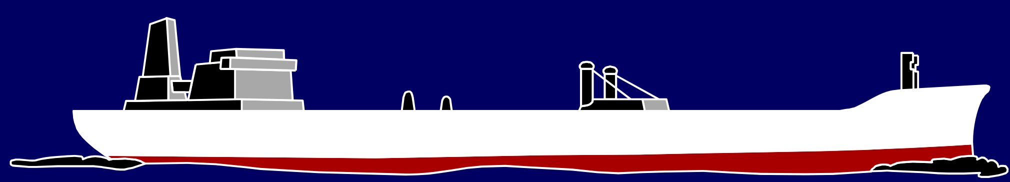


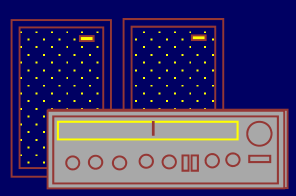
Wheat
Production
Consumption
U.S.
Consumption
with trade
without trade
PPC
Electronics goods


Wheat
Production
Sell Wheat
Consumption
with trade
without trade
Electronics goods
Buy Electronics

International trade will make both countries better off if the relative prices for the two commodities does not correspond with the slope of the production possibility curve at the point of tangency with the corresponding indifference curve.

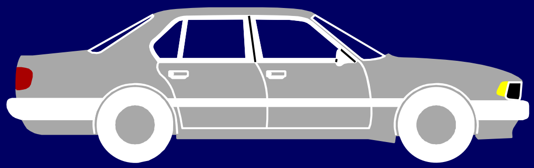




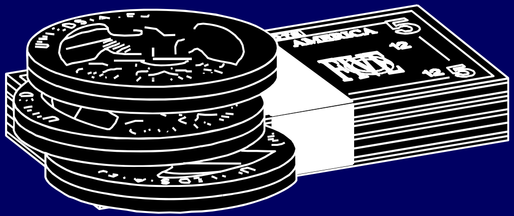


U.S. Balance of Trade

Cheap wheat but
 Americans demand
 foreign cars & CD players



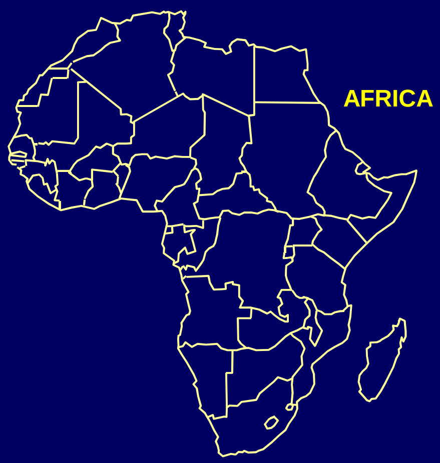
Value of currency ultimately determined
 by the value of goods produced by
 a country in world markets



Cheap wheat--no one wants $ to buy U.S. wheat
European currency valuable to us
 because Europe produces goods we like
German Mercedes & BMW

Currency of third world nation

not valuable because economy does not produce what we want



Low-value currency relative to U.S. dollars

U.S. dollars always in demand

by residents of third-world countries

Russians get U.S. dollars by selling

oil, gold, platinum

nonrenewable natural resources

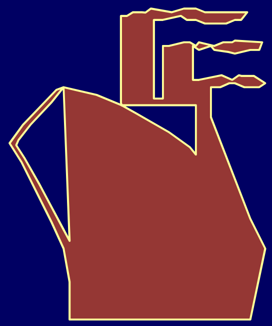
What would you purchase with currency from Mali?

Trade balances self regulating with free exchange rates

If $ overvalued, imports rise, exports decrease

If $ undervalued, exports rise, imports decrease

(high-priced Japanese imports)



Self-equilibrating adjustments

Tariff

A tax on imported items
to make them more expensive to consumers

Justification: protect domestic
industry, but...

Protects domestic industry by
taxing U.S. consumers

What's good for US industry
may not be good for consumers

If some other country can produce an
item cheaper, why worry about where
it is produced?

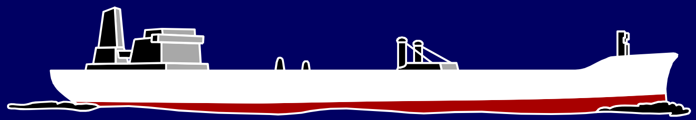
Import quota

Limits quantity of a good that can be imported

Effect similar to a tariff

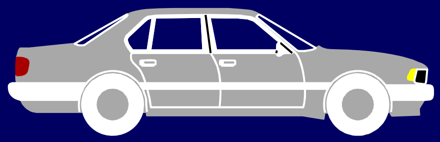
Domestic producers raise prices

Consumer is the loser



Foreign producers raise prices under quota

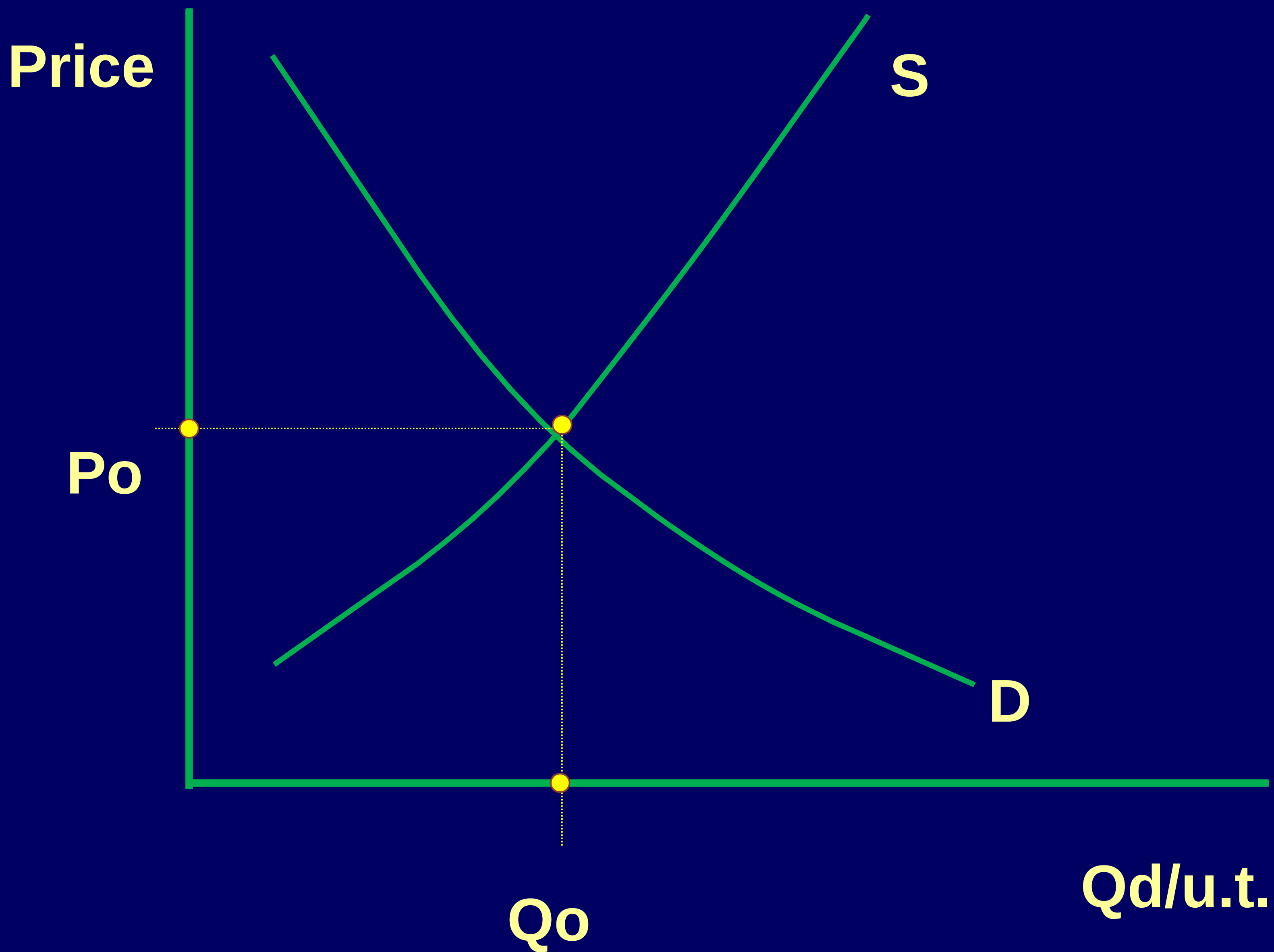
Allows auto dealers to pad prices
of foreign-made autos

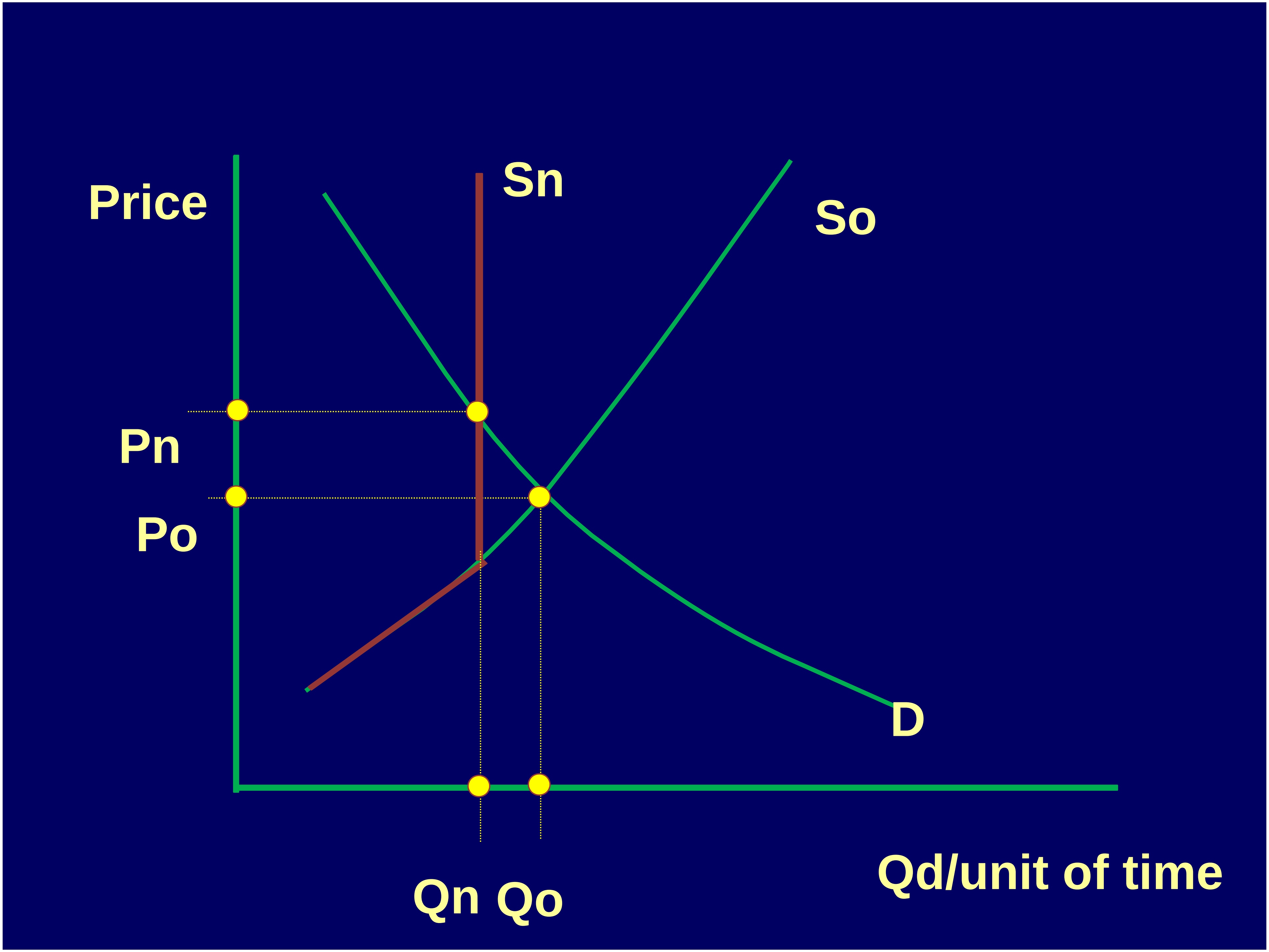


Additional dealer profit, or
Adjusted market value

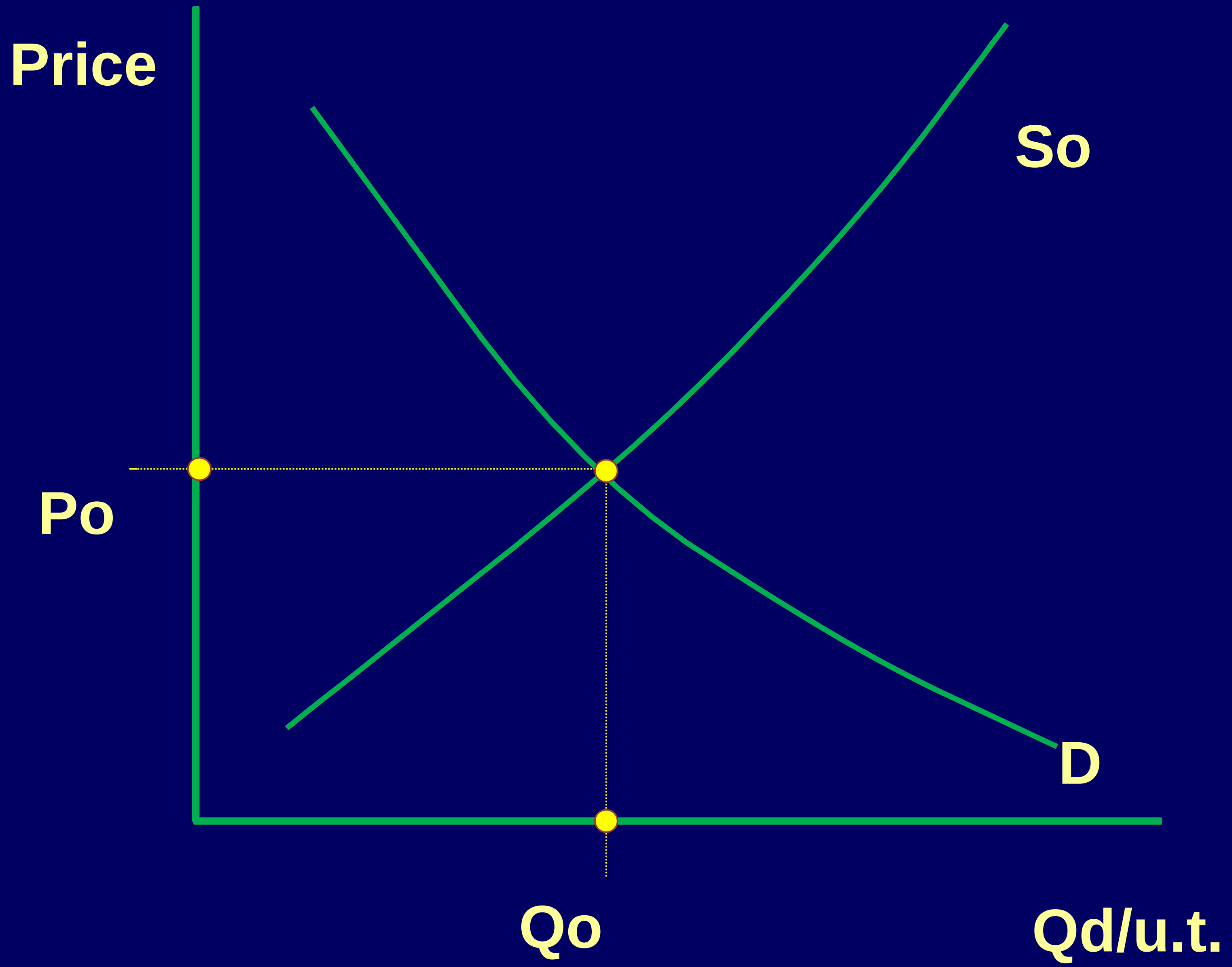
This is a consequence of the quota
on Japanese autos

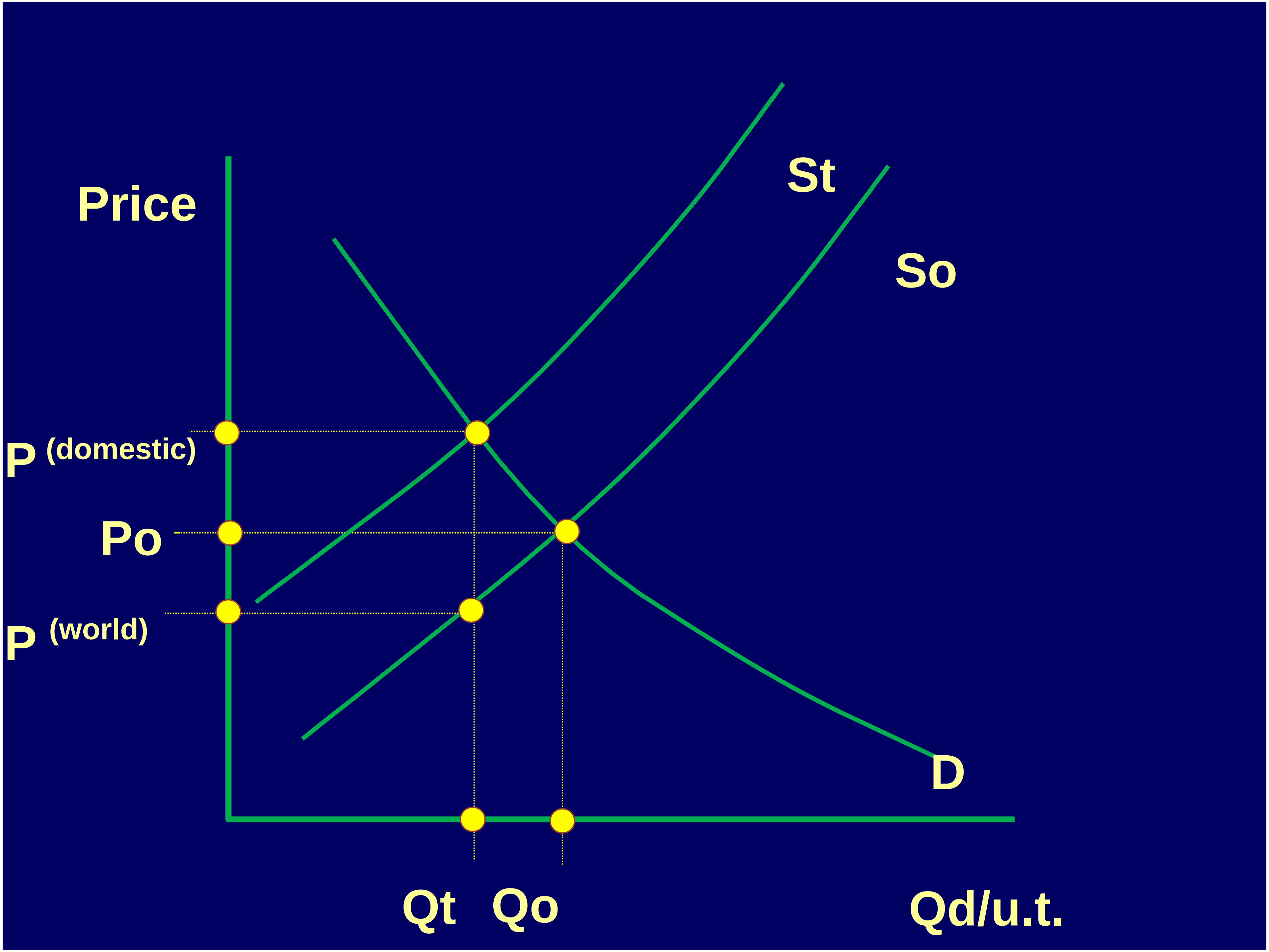
Economic Impact of a Quota




Price
Sn
So
Pn
Po
D
Qn Qo
Qd/unit of time

Economic Impact of a Tariff



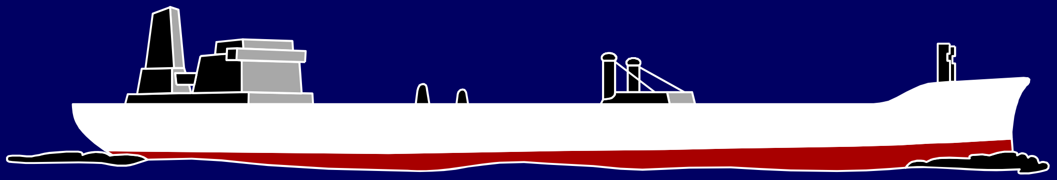


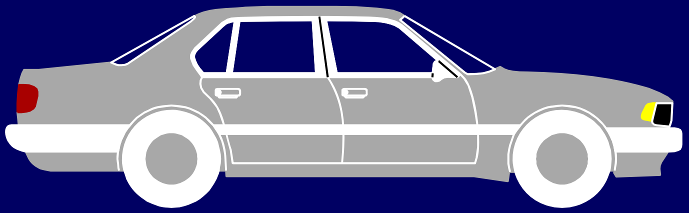
Price
St
So
P (domestic)
Po
P (world)
D
Qt
Qo
Qd/u.t.

Arguments for Protection

- Infant industry
- Protect jobs
- National security
- Unfair competition from cheap foreign labor

Domestic Automobiles only are Available in the U.S.





GATT

General Agreement on Tariffs & Trade

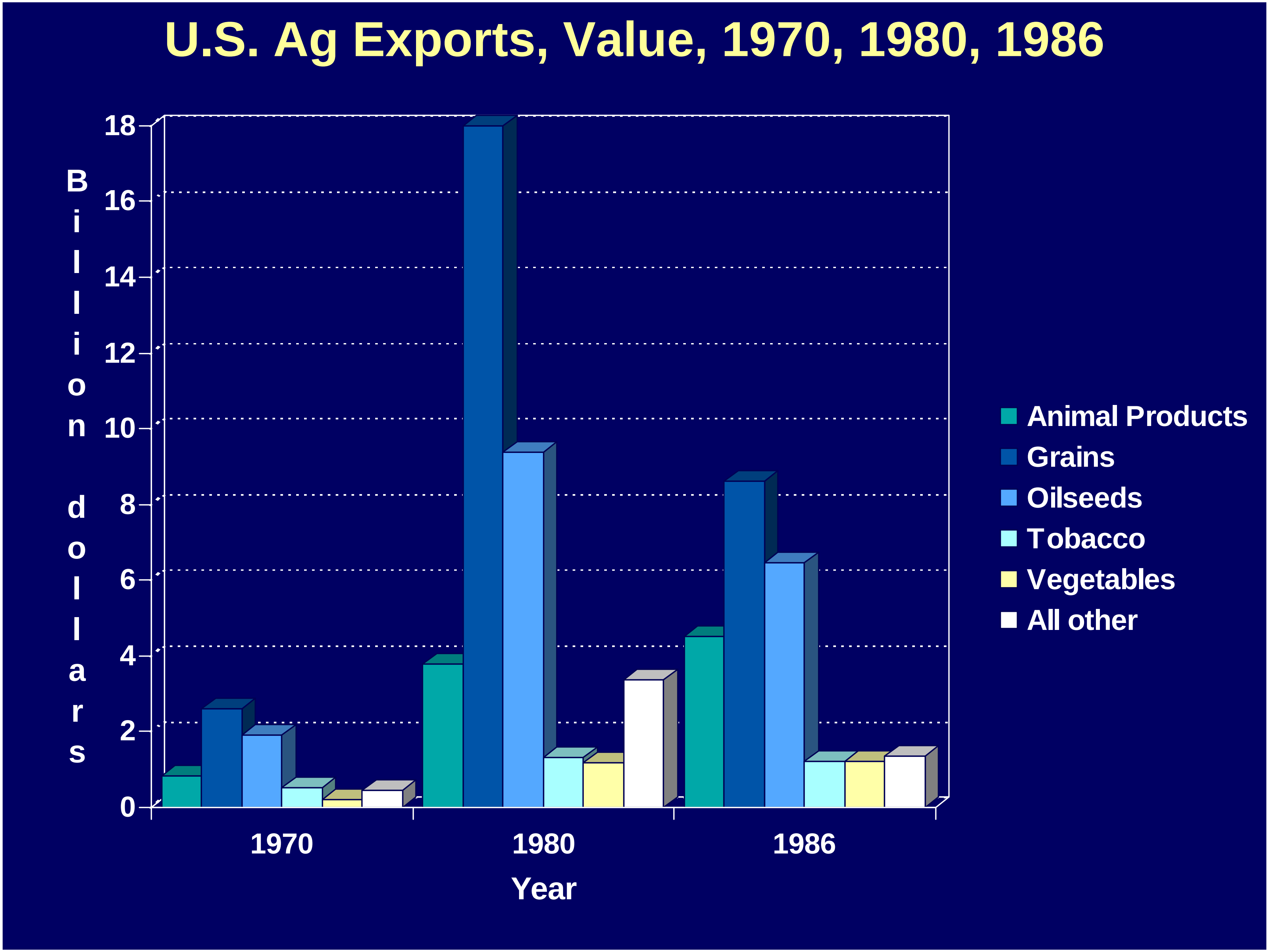
80 + nations

85 % of world trade

Where trade negotiations take place

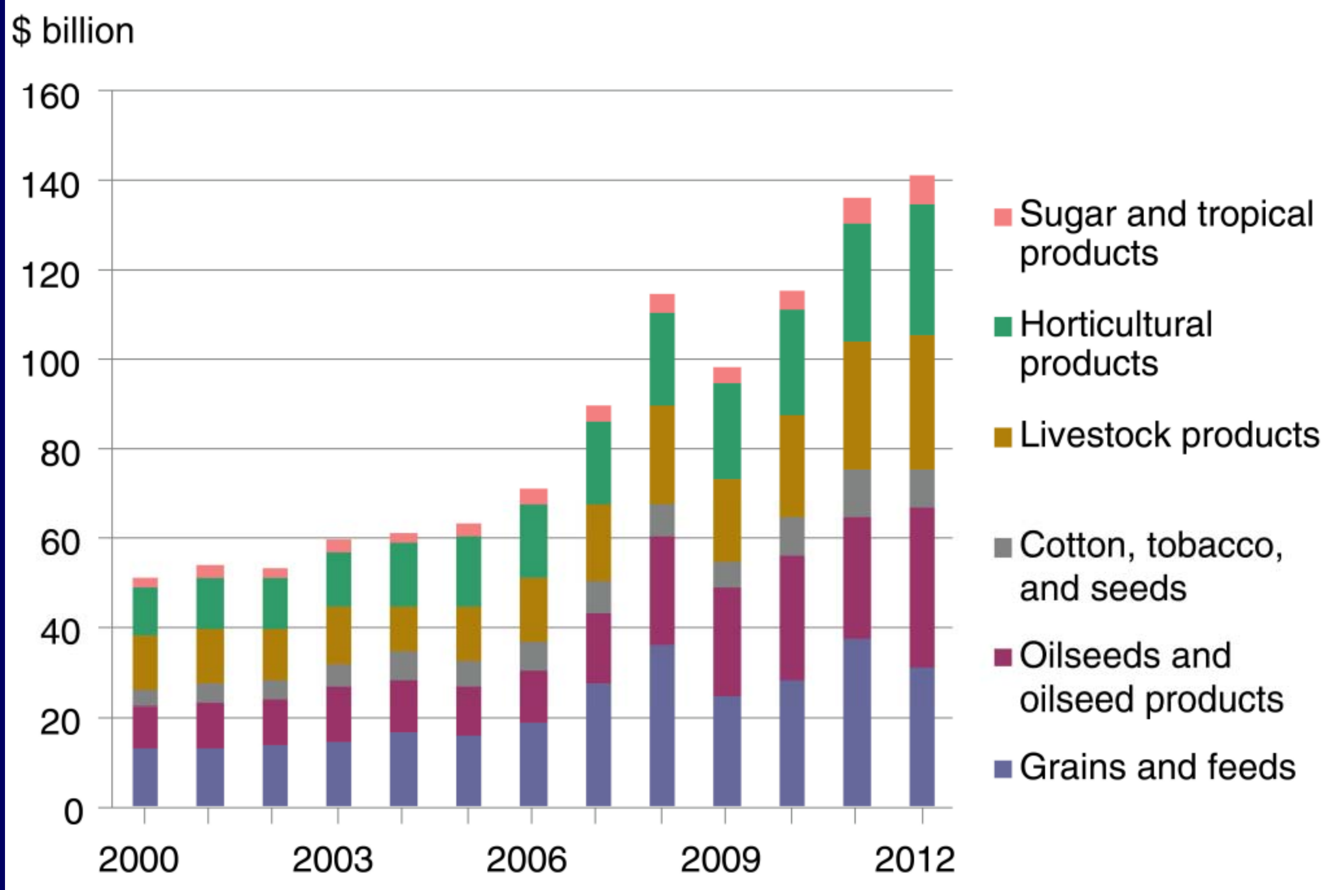
Rules established for the conduct of trade

Rules and regulations agreed upon by member nations



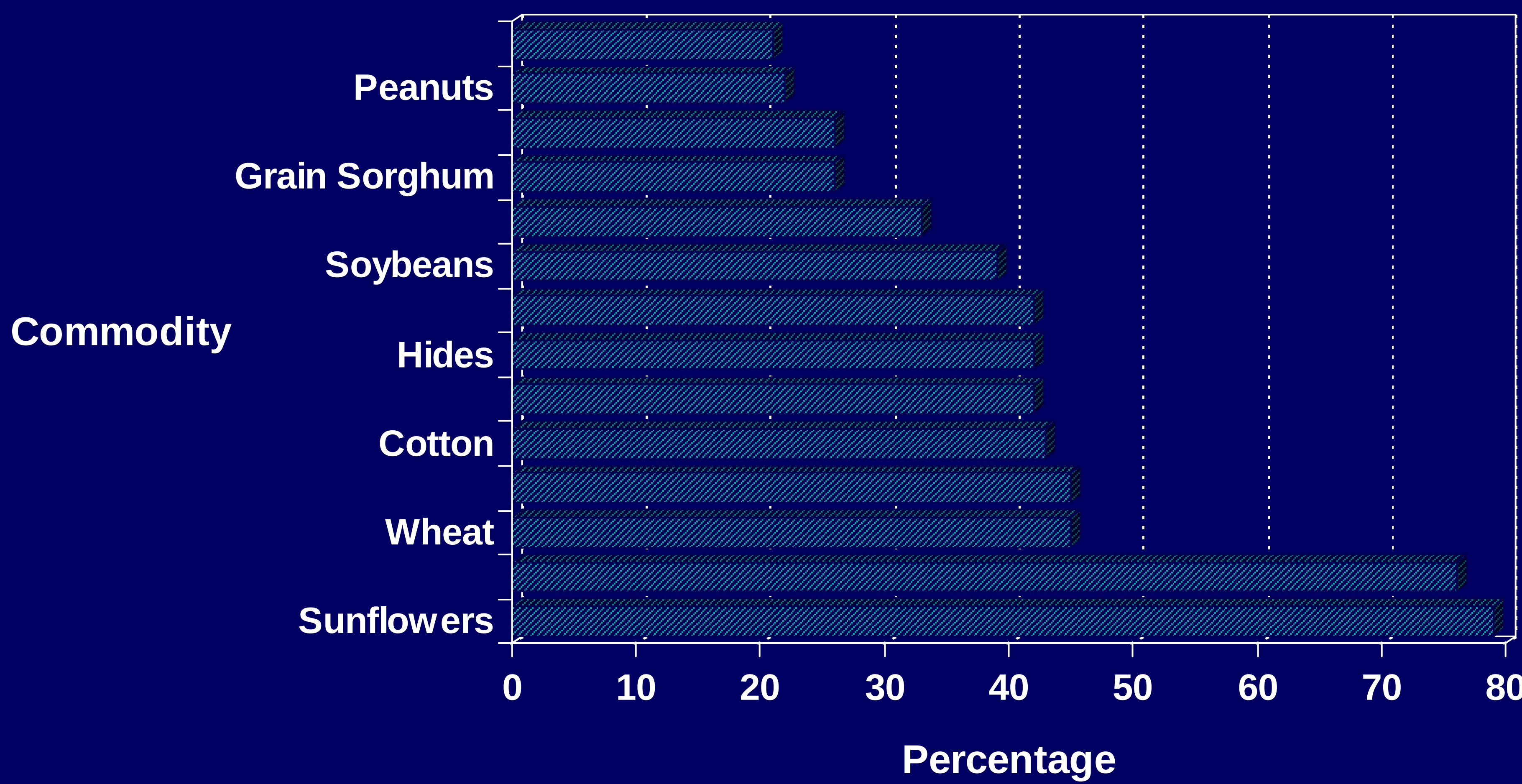
U.S. Ag Exports, Value, 1970, 1980, 1986
Billion dollars
0
2
4
6
8
10
12
14
16
18
1970
1980
1986
Year
Animal Products
Grains
Oilseeds
Tobacco
Vegetables
All other

US Agricultural Exports, 2000-2012

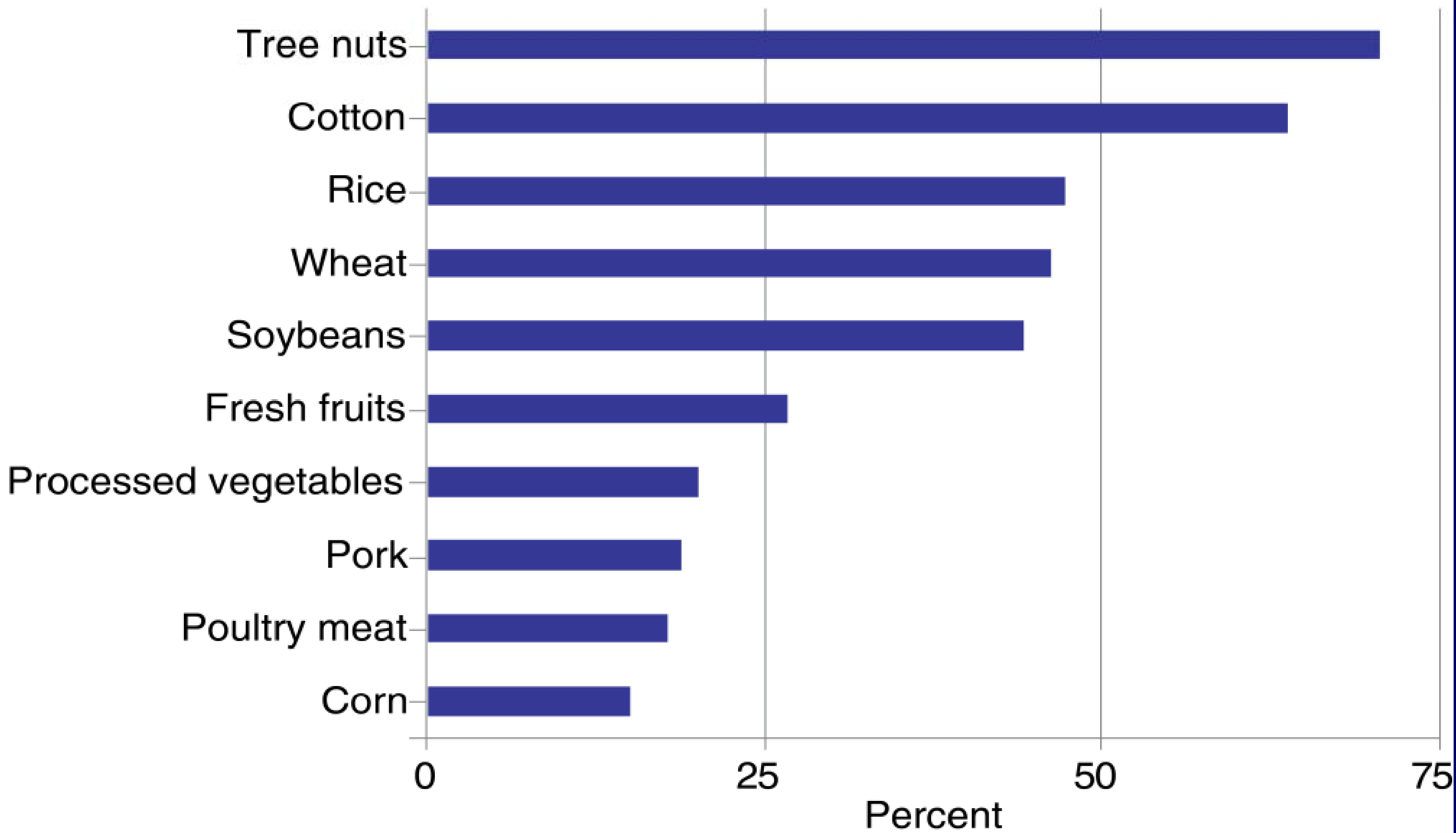


Source: USDA, Economic Research Service using data from U.S. Department of Commerce, U.S. Census Bureau, Foreign Trade Database.

Leading U.S. Ag. Exports as a Percent of Total Production, 1985



Exports as a Share of Total US Ag. Production, Average, 2008-2010



Source: USDA, Economic Research Service calculations based on data from U.S. Department of Commerce, U.S. Census Bureau, Foreign Trade Database; and USDA, National Agricultural Statistics Service, various reports.

Comparative Economic Systems

Fundamental Questions

1. What should be produced?
2. How Should it be produced?

   (production technology)

3. How should it be distributed?

These questions must be answered by any economic system

??

Types of Economic Systems:

1. Capitalism

Government not involved in decisionmaking

Producers produce what the consumers want

Production technology--low cost way

Market determines prices & output

Production resources owned by individuals not the government

Goods are distributed based on incomes of consumers

2. *Pure Socialism*

Government (people, collectively) own all the resources

No individual ownership

Government determines what is produced

Government determines production technology

Government allocates production to individuals

Family income irrelevant (not needed)

No market incentives

Shortages of goods desired by consumers

Government vs consumer utility function

Requires careful planning

Economic incentives lacking

3. *Mixed economic systems*

Mixture of private & public ownership

Allocation by government and according to incomes of consumers

Mixture of market signals and government planning

Production technology determined by mix of public & private decisionmakers

Ours is a *mixed economy*

Capitalism
(Pure)

Mixed Economic Systems

Socialism
(pure)

United States

Germany

France

Japan

Norway

Sweden

South Korea

Greece

Italy

Republic of China

Viet Nam

Cuba

North Korea

Poland

Russia?

Czechoslovakia

Hungary

Baltic States

Yugoslavia

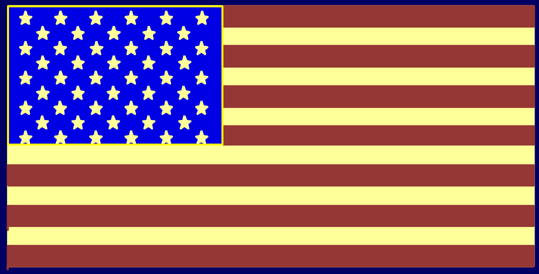
Socialism in the U.S.

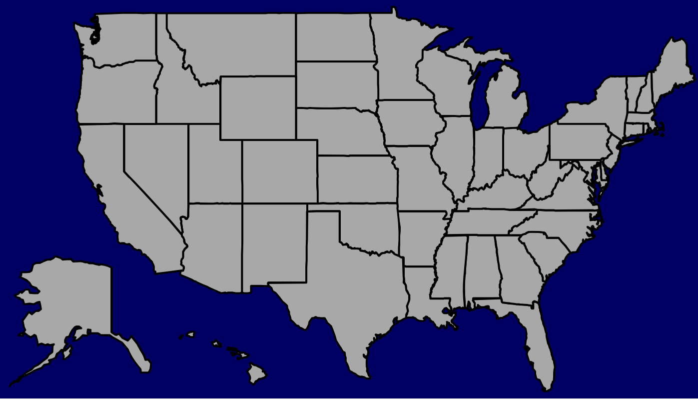
Public welfare programs for disadvantaged

Nationalized Medicare health insurance

More government rules and regulations
affecting how goods are produced

Increased emphasis on government
intervention rather than market price signals





Captialism

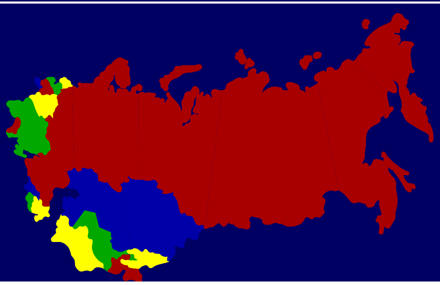
in Eastern Europe

Production decisions increasingly based on what consumers want

Increased private ownership of resources

Market signals & economic incentives

Income, not need, determines how goods are allocated among consumers



History of Russian Farms

1. Collective farms

Large-scale

Hundreds of workers

Emphasis on capital investment

Technology lags behind U.S.

Farmers allowed to sell output from small plots on the individual farms

Small plots important source of production

Vestigal capitalism was present even before the breakup of the Soviet Union

2. State Farms

Even bigger than collective farms

Run like factories

Average size-- 65,000 acres

Private plots also allowed

Average size declining as new farms are formed near urban centers

Efforts underway to "privatize" ownership of resources and use markets and prices to encourage production.

Markets for agricultural commodities are no longer assured.

Agriculture in other parts of the Former Soviet Union

Not as well endowed as U.S. with rich farmland and ample rainfall

Ukraine more comparable to Kansas or North Dakota than to Indiana or Iowa

Much yield variation because of weather variation

Technology for ag. traditionally lost out compared to space & military projects

Crop failure leads to higher imports on world markets but this takes scarce foreign currency

The people want improved diets
More meat- less grain
Very costly to improve

Grain fed to cattle cannot be fed to humans

Lots of awareness of the need to
improve the productivity of agriculture

Need for capital investment
and economic incentives for the
individual worker

Central plan for agriculture
versus consumer utility function

Important issues remain.

On what basis should land and other resources be divided?

To what extent should farmers be protected from the "cold winds" of the competitive marketplace?

Should food prices to consumers fully reflect costs of production and market conditions?

Important transportation and distributional problems are of concern.

Supermarkets limited and the transportation from production areas is often poor!

Since the Breakup of the Soviet Union:

State and Collective farms have become largely stockholder-owned operations, with stock owned by the former state and collective farm workers

Shares to not represent titles to individual tracts of land, but are paper representing private ownership of a portion of the entire farm

Peasant farms: farmers own title to a small individual tract of land. With the breakup these were expected to become very popular, but it hasn't happened that way

Since the Breakup:

During the late 1990s, Russian agriculture fared poorly, without government guaranteed prices for both inputs and output. Yields and output were below levels of the collective and state farms

Since 2000, the situation has gradually improved,
Output is up, and Russian farms are gradually faring better.

Free-market capitalism does not necessarily solve all problems, at least not over short periods of time!

A Changing Structure of Russian Agriculture

Indicator	Farm type	1990	1995	2000	2005
Agricultural land	Corporate farms	98	90	87	80
	Household plots	2	5	6	10
	Peasant farms	0	5	7	10
Cattle	Corporate farms	83	70	60	52
	Household plots	17	29	38	44
	Peasant farms	0	1	2	4
Agricultural production	Corporate farms	74	50	43	41
	Household plots	26	48	54	53
	Peasant farms	0	2	3	6

Shares of agricultural land, cattle headcount, and gross agricultural Output for farms of different types (in percent of respective totals)

Source: "Russian Agriculture" Wikipedia. For additional information, read the entire article!

Chinese Agriculture

How do you feed 1.4 billion people?
Not at the Burger King!

Arable land moved from state-own farms to private plots

Has not traditionally relied heavily on food imports

Increased recent emphasis on market system

Land for agriculture is becoming land for industry

Since the late 1990s

China's domestic food production has not kept Up with demand as rising incomes from Industrialization has occurred

China now imports and exports a variety of Agricultural commodities

Has not traditionally relied heavily on food imports

Increased recent emphasis on market system

Land for agriculture is becoming land for industry

China exports high-value manufactured goods, goods that would be expensive to produce with US labor, and uses part of the proceeds to buy agricultural commodities needed, especially those needed to and meat (mainly pork and chicken) to the diets of the Chniese people.

Labor costs are rising, and China may not long be the low-cost producer of manufactured goods such as electronics. This could be a problem for US ag exports.

The Wikipedia article “agriculture in China” is a most interesting reading and is recommended reading if you want to know more about Chinese agriculture, its structure and productivity.

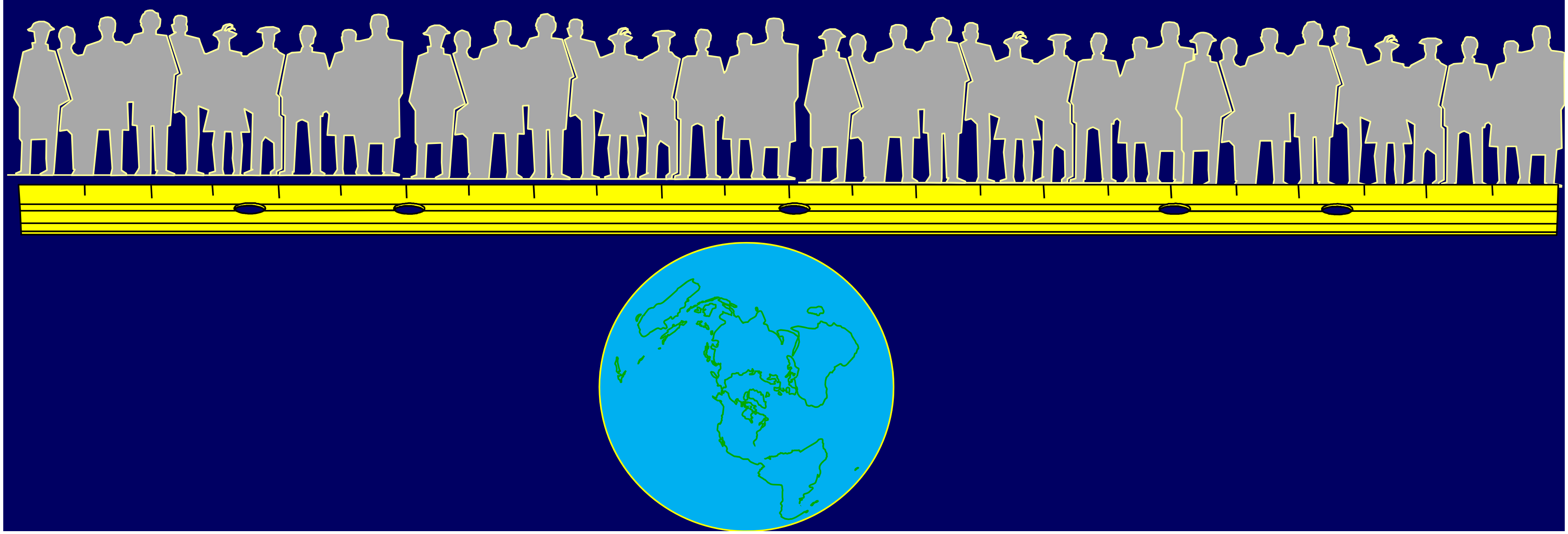
Chapter 16: World Food

World Food Issues

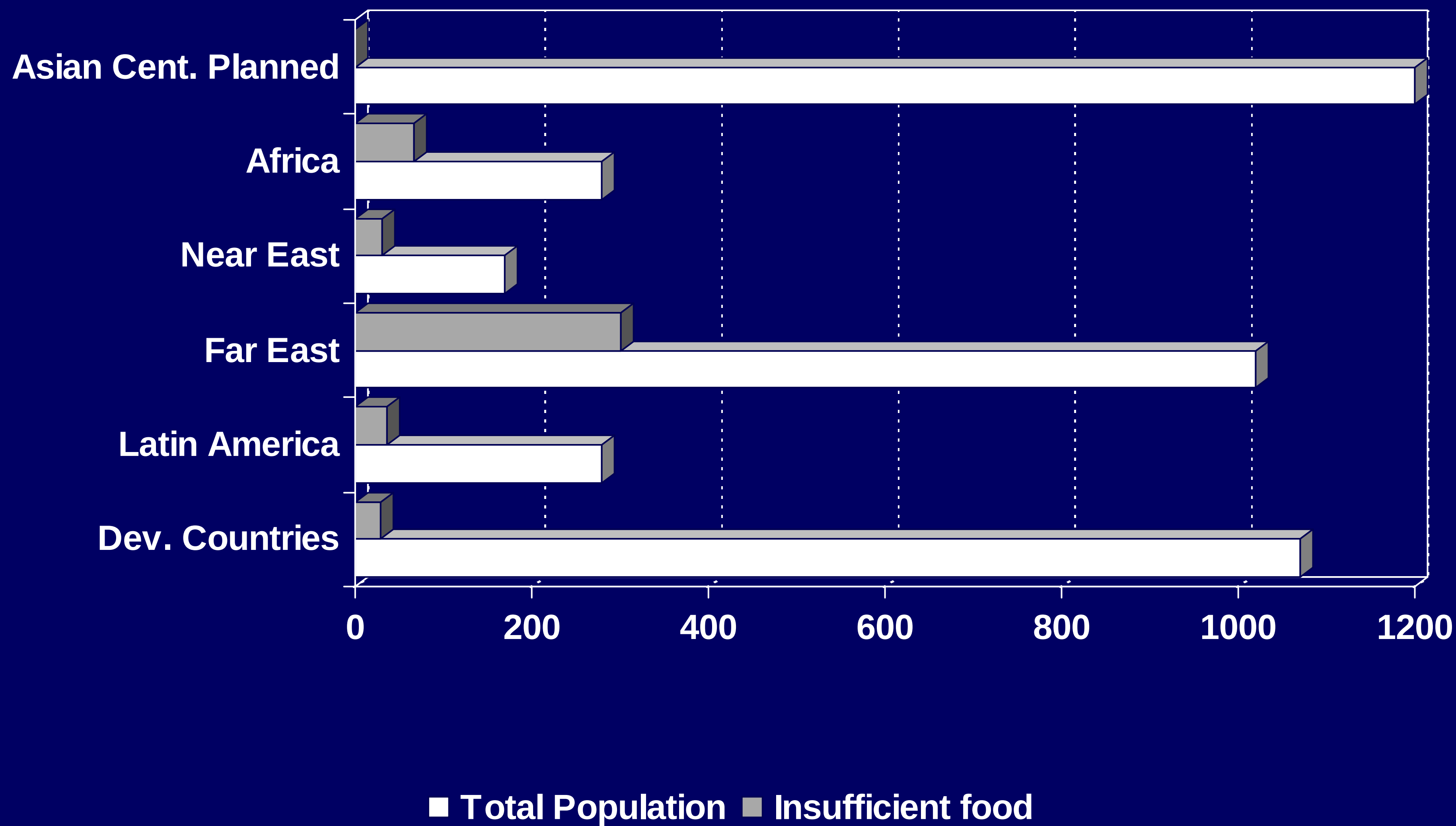
World population 4.83 billion or more

Perhaps 500 million or more undernourished

(plus those in centrally planned economies)

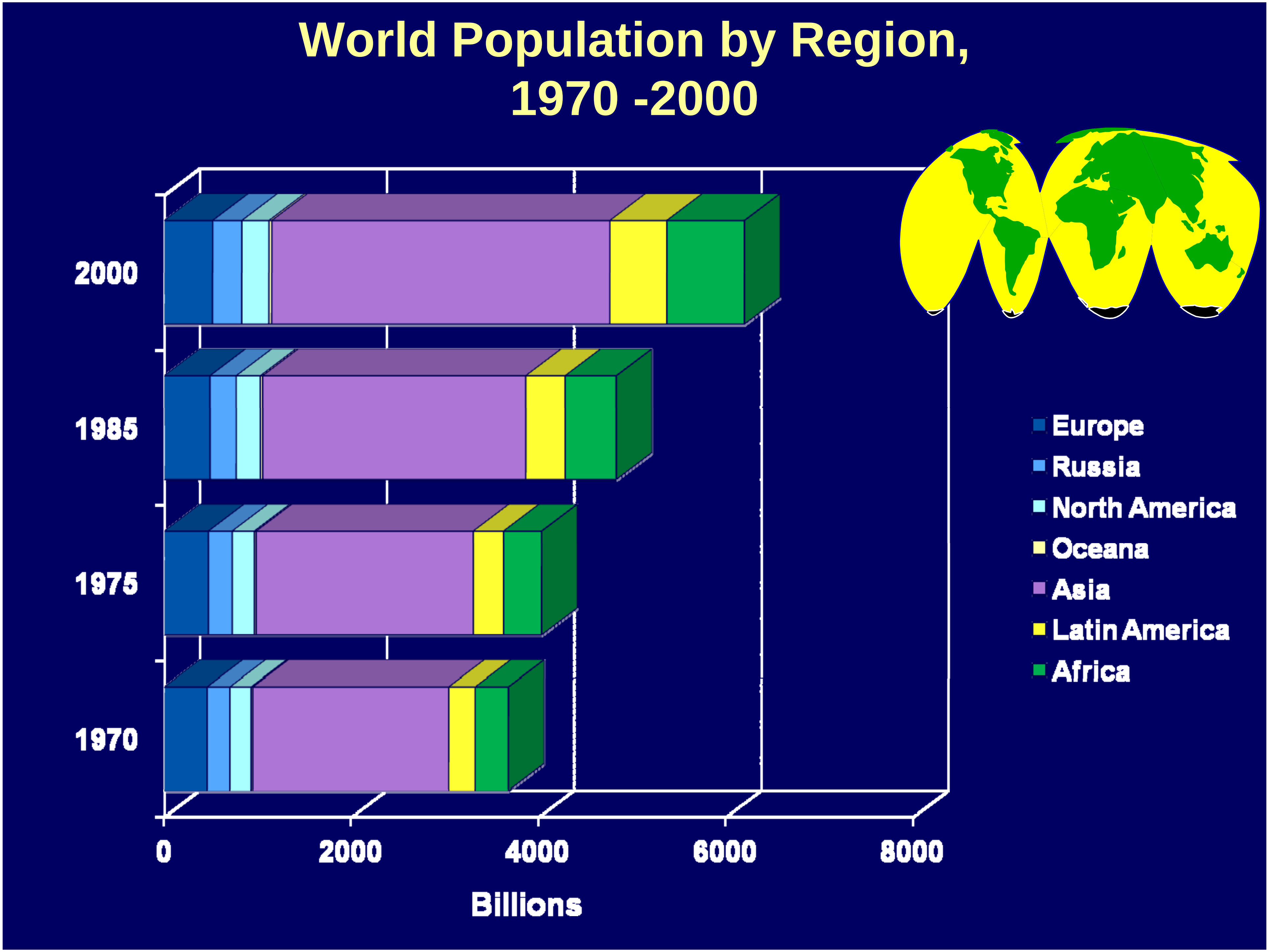


Estimated number of People with Insufficient Protein/Energy Supply by Regions (1974)



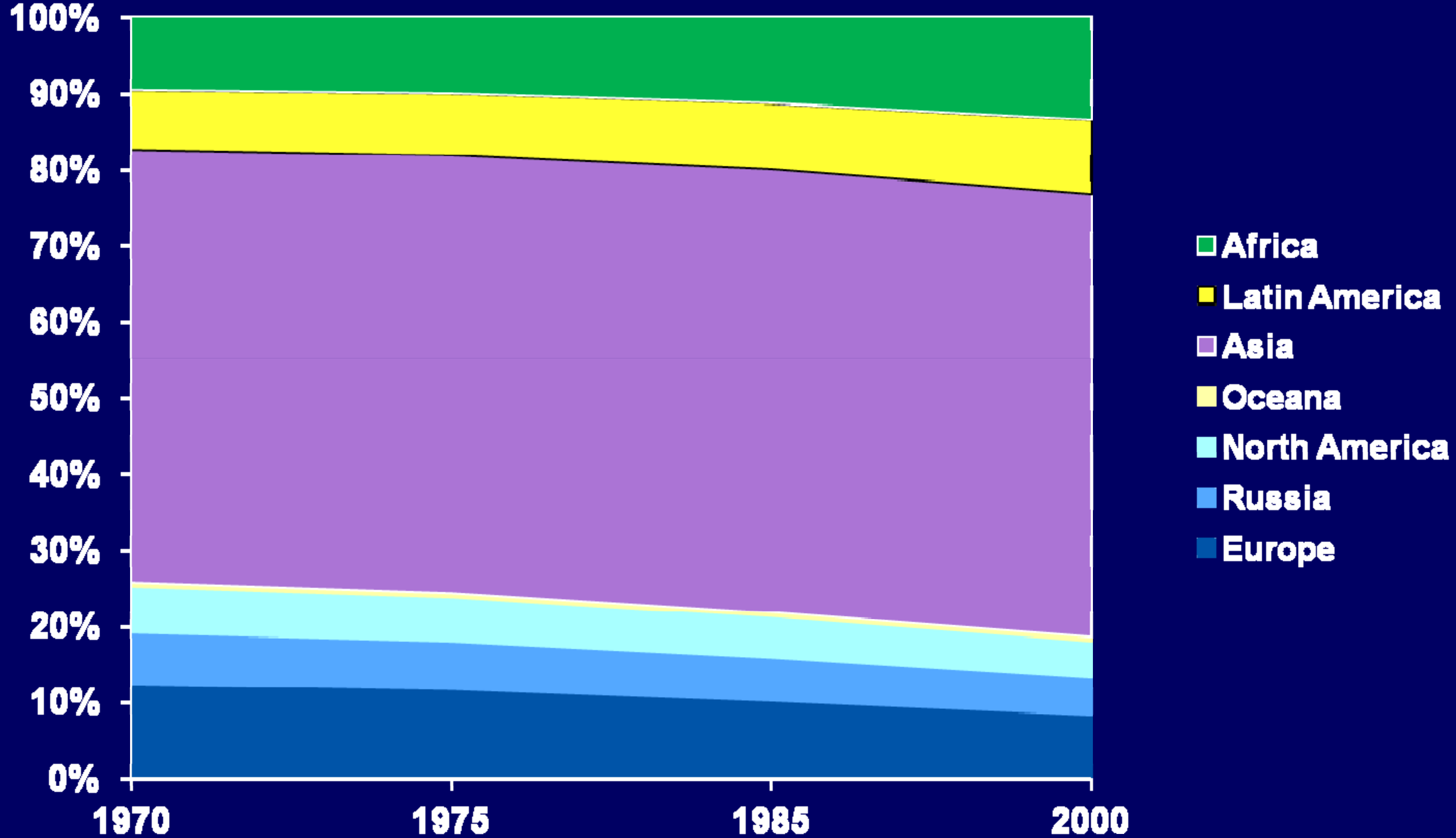
Since 1974, China has made great strides in feeding its people, and there is less hunger in Latin America than was true 50 years ago

Less developed african nations remain the most important areas of the world for insufficient caloric intake, plus certain countries in other parts of the world, such as Haiti and the Dominican Republic

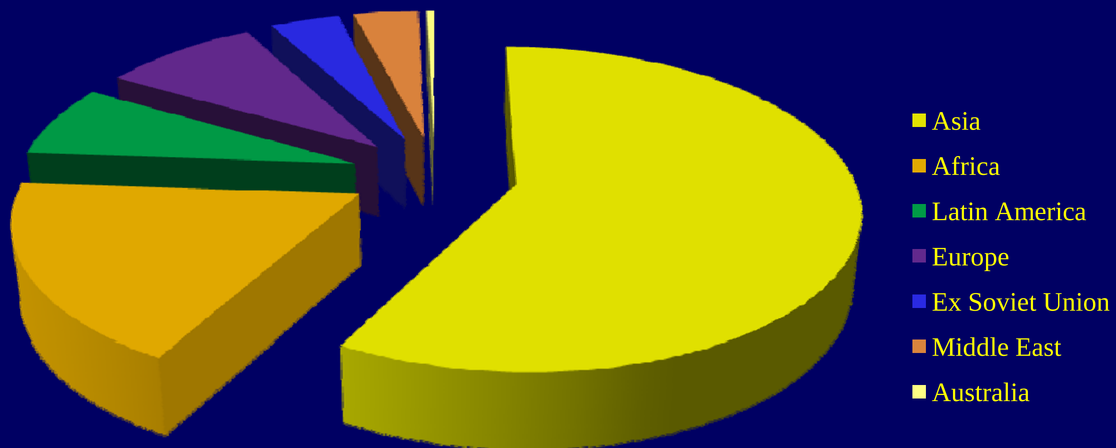

World Population by Region,
1970 -2000
2000
1985
1975
1970
0
2000
4000
6000
8000
Billions
Europe
Russia
North America
Oceana
Asia
Latin America
Africa

Africa, Latin America and parts of Asia are still experiencing the most rapid growth in population, and these are areas where world hunger persists

World Population by Region, As a % of Total Population



Approximately 7.1 billion people currently living in the world (US Bureau of the Census, 2010)

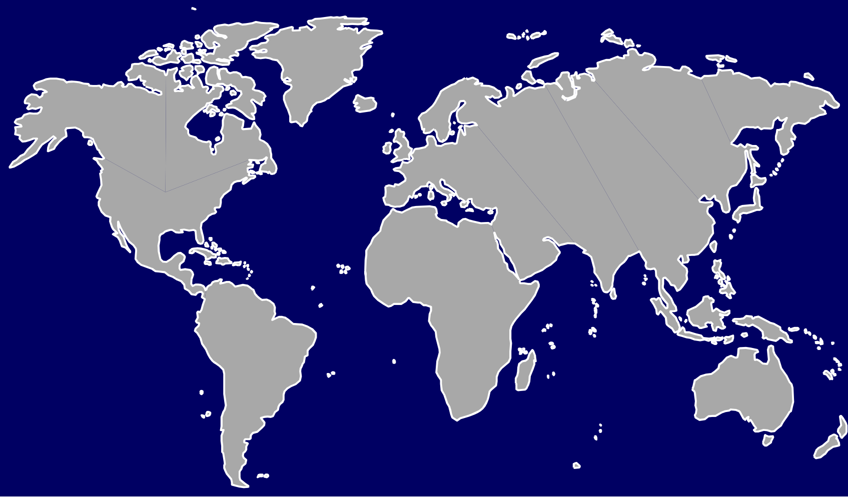


58.2%	Asia
18.2%	Africa
7.3%	Latin America
8.8%	Europe
3.9%	Ex Soviet Union
3.6%	Middle East
0.4%	Australia

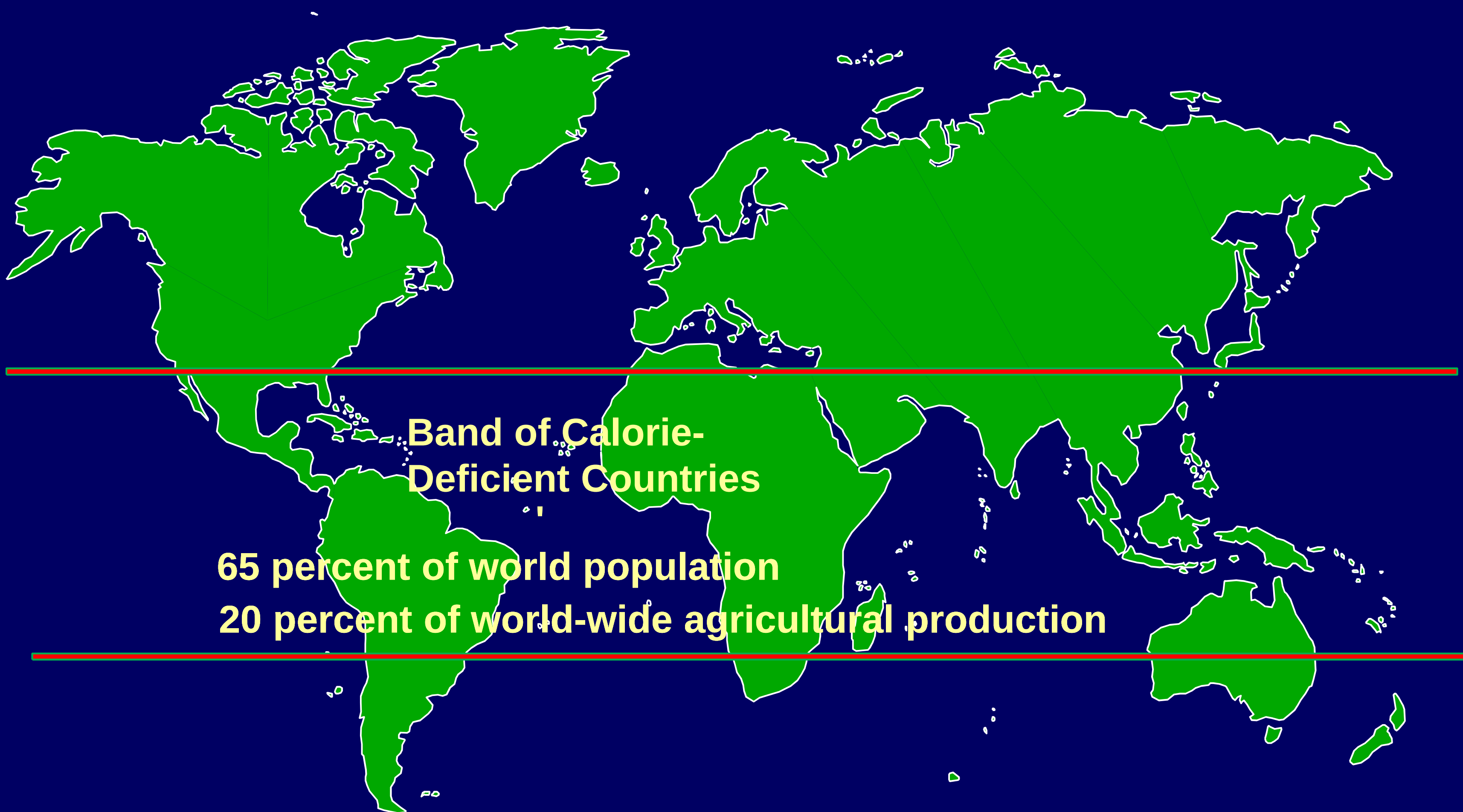
Population in North America, Europe, Oceana, and parts of Asia increasing slowly

Africa, Latin America and parts of Asia increasing rapidly

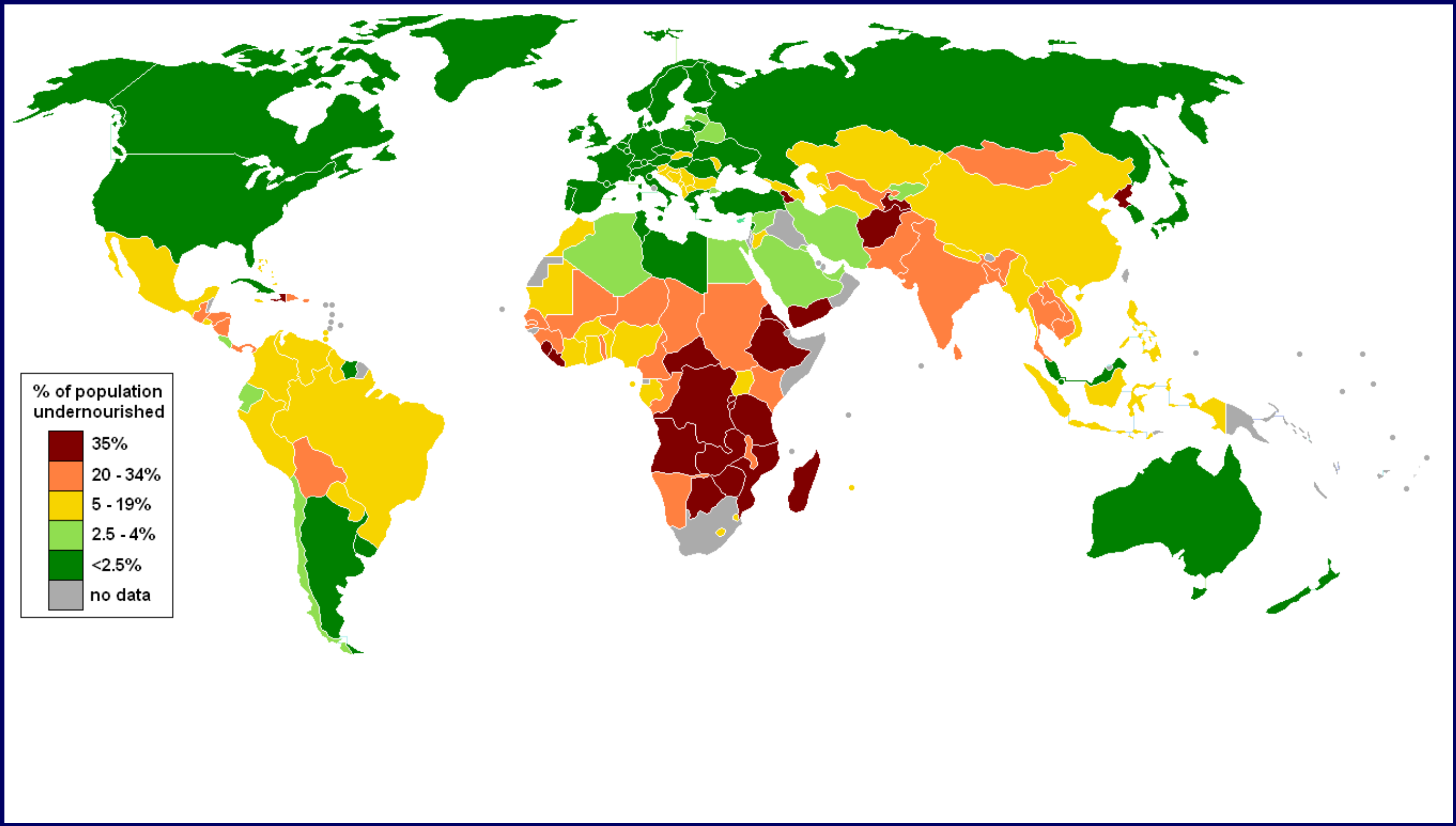
Greatest population growth in countries least able to feed themselves



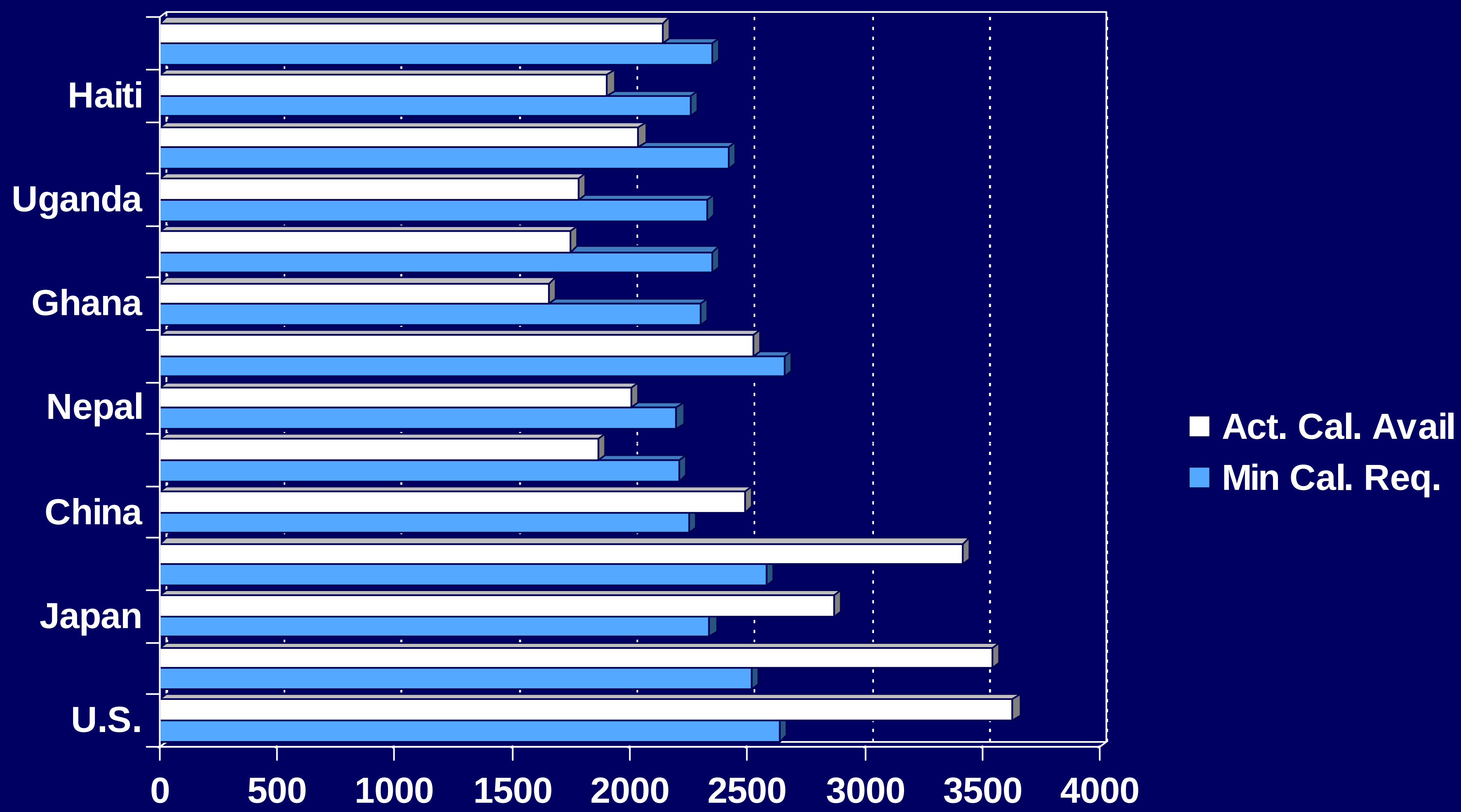
Geographical Distribution of World Food Problem, 1985



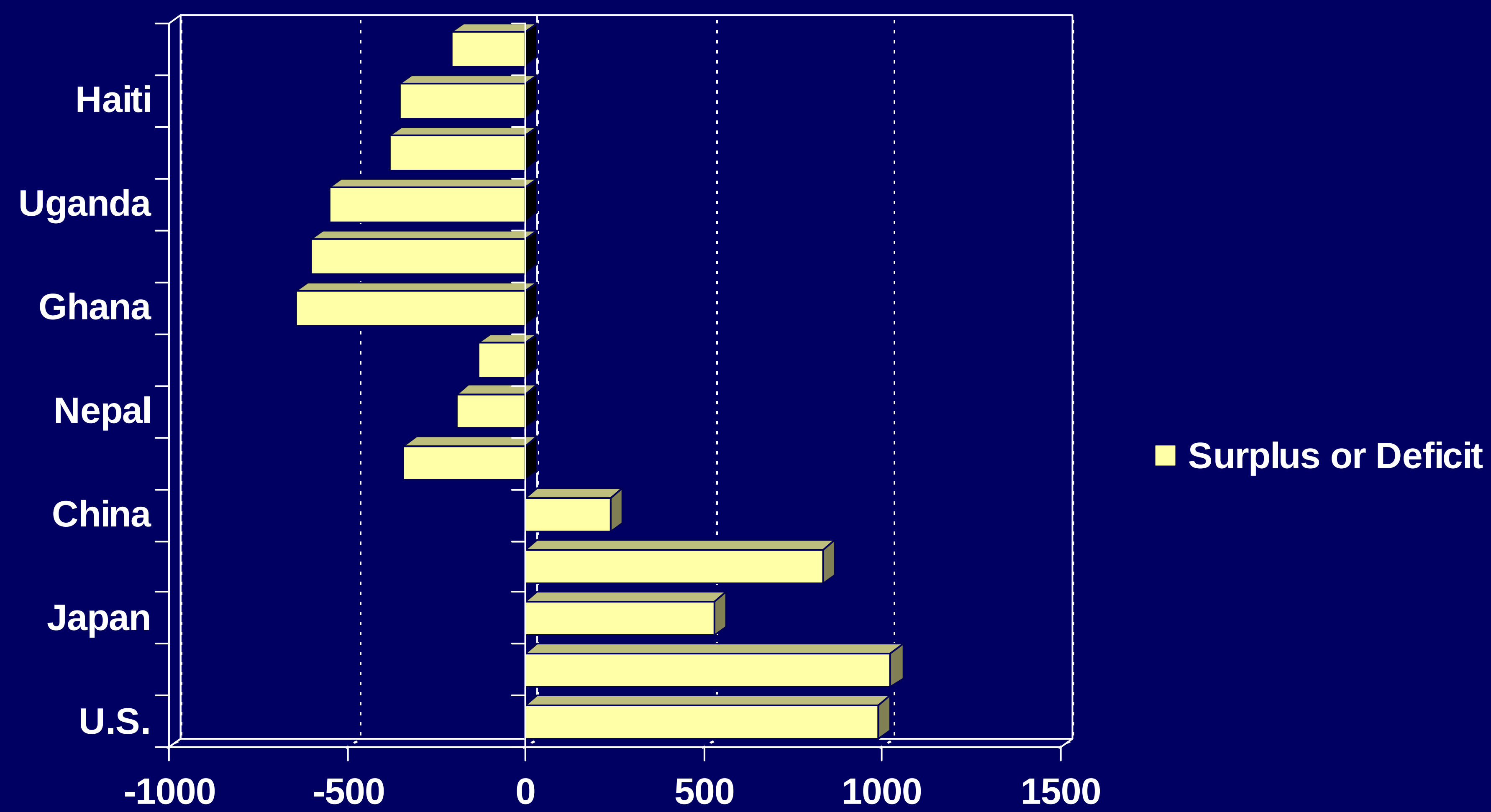
Percent of Population Undernourished according to UN Statistics (Wikipedia, "malnutrition")



Caloric Food Requirements & Availability Per Capita



Caloric Food Requirements & Availability Per Capita



Diets in Developed Countries

High in Meat & Animal Products

High animal protein

High fat

Diets in Third World countries

Low in Meat & Animal Products

Lack Animal Protein

Soybeans, Rice

Low-fat high carbohydrate

protein balance

Calories not enough

Issues in increasing world food supply

Land where needs are greatest not well suited to food production

Capital investment to improve production efficiency

Where does capital come from?

Foreign currency issues

Economic development

Export market development

Genetic improvements

Cultural, Institutional, Religious concerns (sacred cows)

U.S. Efforts:

1. Food give-aways

   Public Law 480 "food for peace"

2. Private donations & assistance
3. Technical assistance

   Federal government (AID)

   Universities

4. Loans & Grants for capital investment
5. Efforts at genetic improvement

   (help grow food, not give them food)

Barriers:

1. Acts of god (hurricane, flood)
2. Cultural & Religious barriers
3. Limitations due to poor soil

   inadequate rainfall
4. Financial barriers

   (loans become grants)
5. Institutional barriers

   Financial incentives to farmers

   "Low cost" food for consumers

Possibilities:

1. Genetic Breakthroughs
2. Exports of nonfood items by third world countries as a source of foreign currency to buy food
3. Increase arable land base
irrigation
Saudi Arabia did it but requires major capital investment
Cutting the rainforest!
4. Political & Institutional changes
"Farm policy" of third world nation
5. Fish farming and food from the Sea

Limits:

1. Generosity of the US & other developed countries
2. Phenomenal genetic breakthroughs occur infrequently and are often unplanned
3. Only huge capital investments could make some land suitable for ag use
4. Greenhouse effect, ozone layer other environmental concerns
5. Bounty of the sea not limitless

Malthus--food supply grows arithmetically population geometrically

Chapter 17: Rural Economic Development

Rural Development

Rural Development--

Efforts aimed at improving the quality of life in rural America (farm & nonfarm)

Economic development--

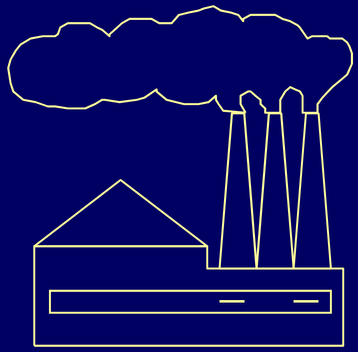
Efforts aimed at increasing per-capita income levels

Community development

Public policy at the local level

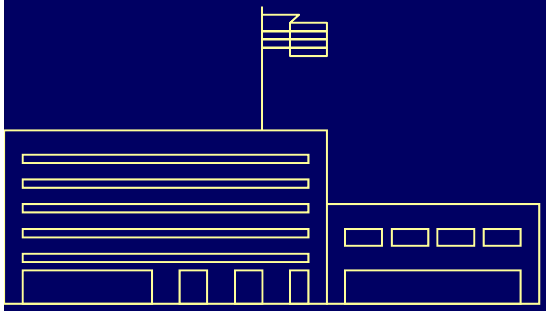
Public policy at the local level is frequently concerned with improving incomes and the quality of life for rural residents

Facets of Rural Development



Rural industrialization

brings (hopefully) higher paying jobs to rural residents



Public service delivery

improved education

fire, police protection

libraries, recreational facilities

hospitals, medical services

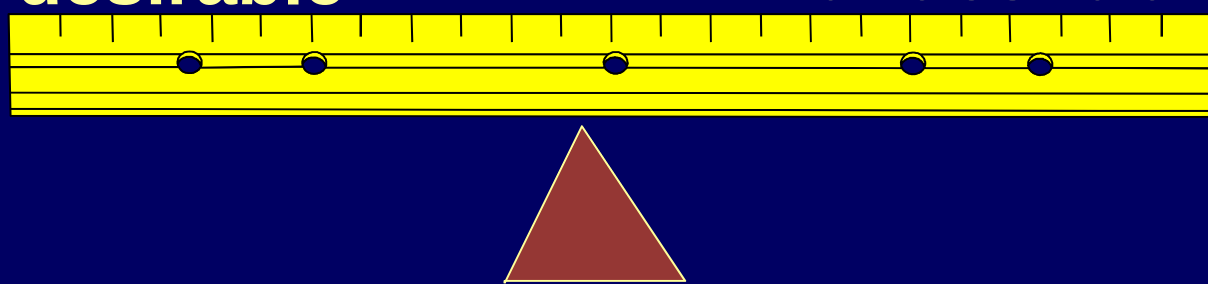
other needed services

Rural Development issues:

What does the community need to do in order to attract new industry?

Consequences of population growth?

desirable **undesirable**



Who pays for upgraded public services?

taxpayer revolt

How do you deal with outsiders?

Brain drain from rural communities

Population growth:

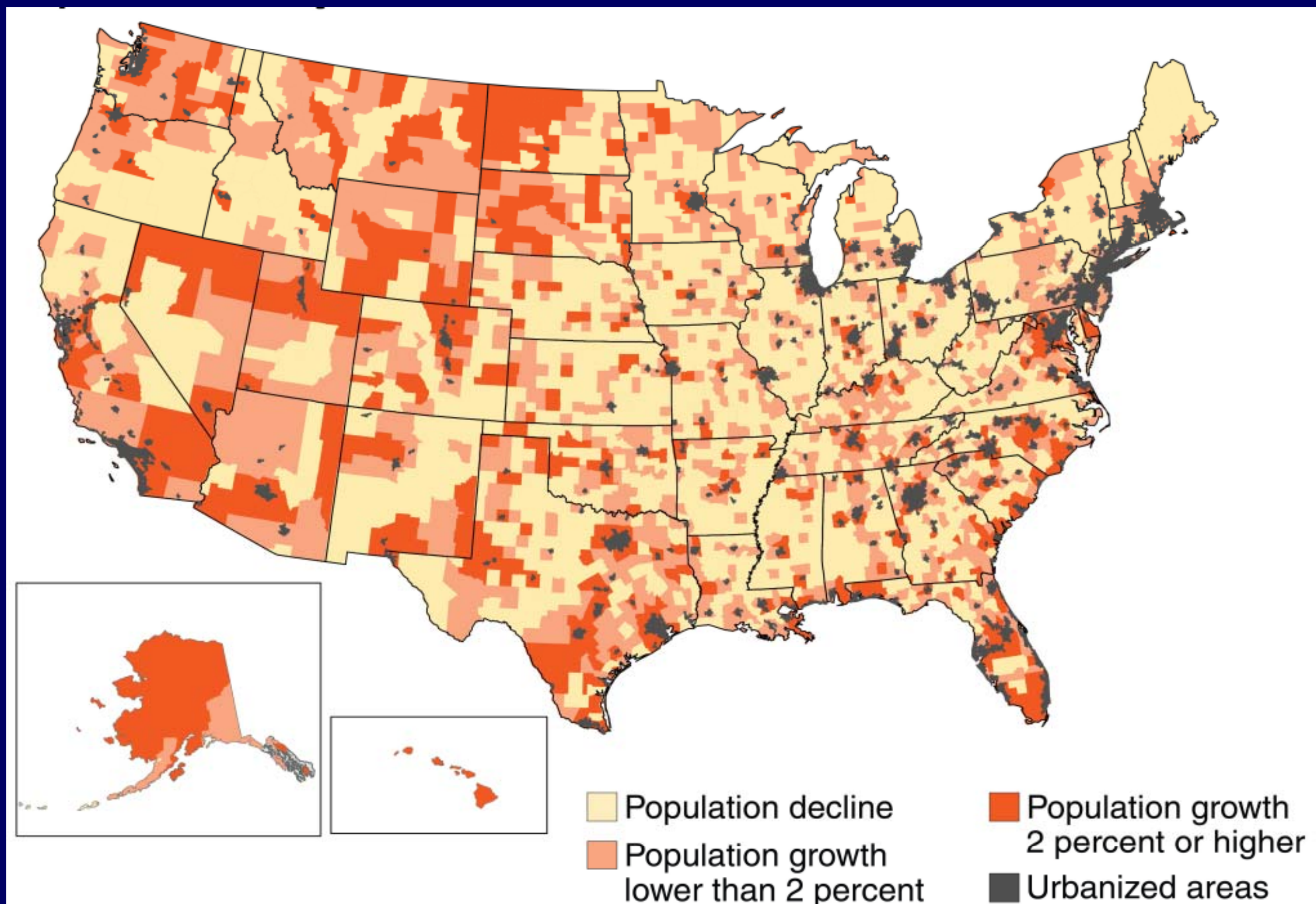
generally greatest in the counties
near a metro area

Urban employment and income
with rural lifestyle

Industry interested in locating near
(but not necessarily in) an urban center

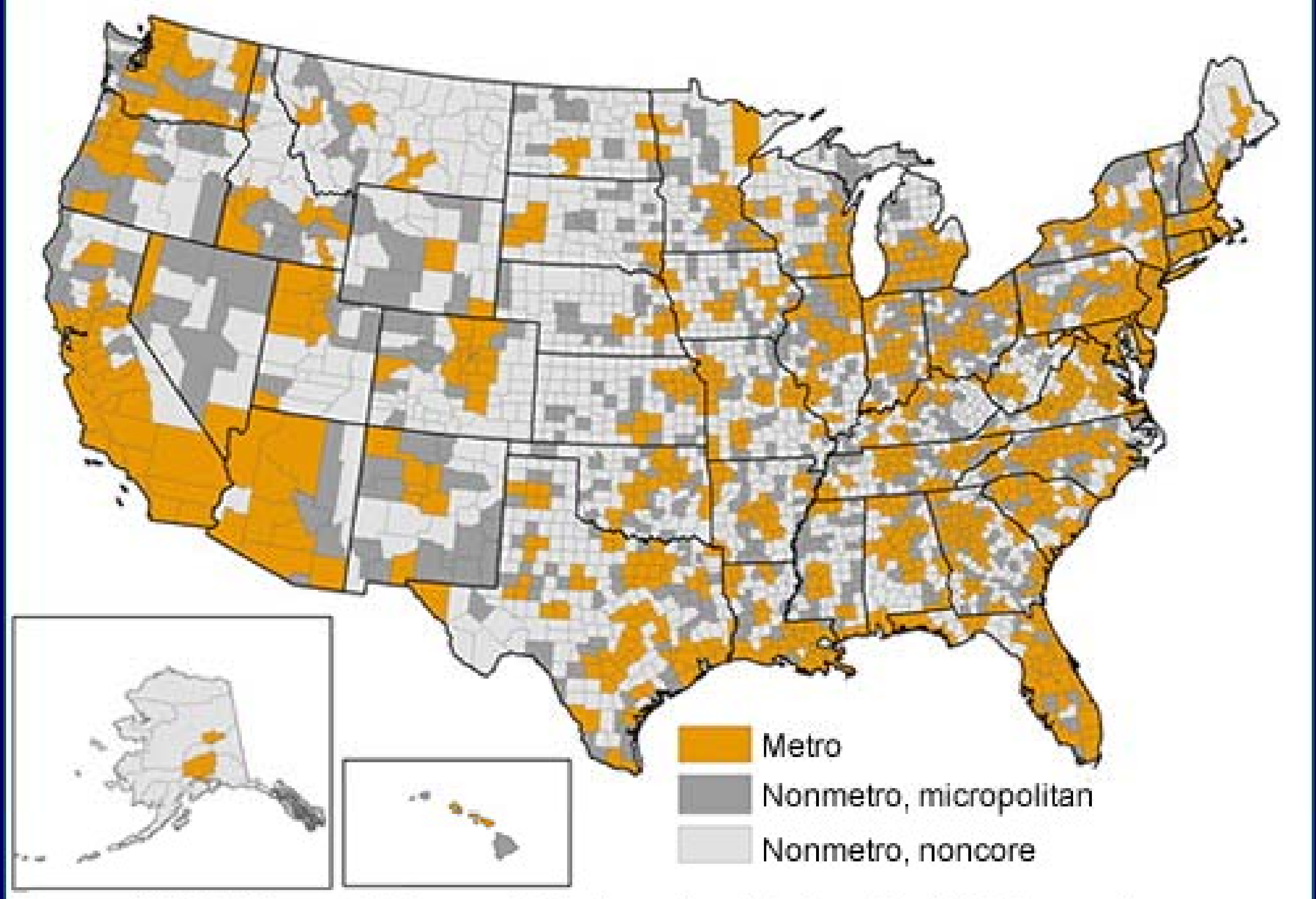
How can public services
be efficiently delivered
in a nonmetro county
detached from but near
an urban center?

Some Rural Counties are Experiencing Population Growth: Others are Losing People (percent change, 2010-2012)



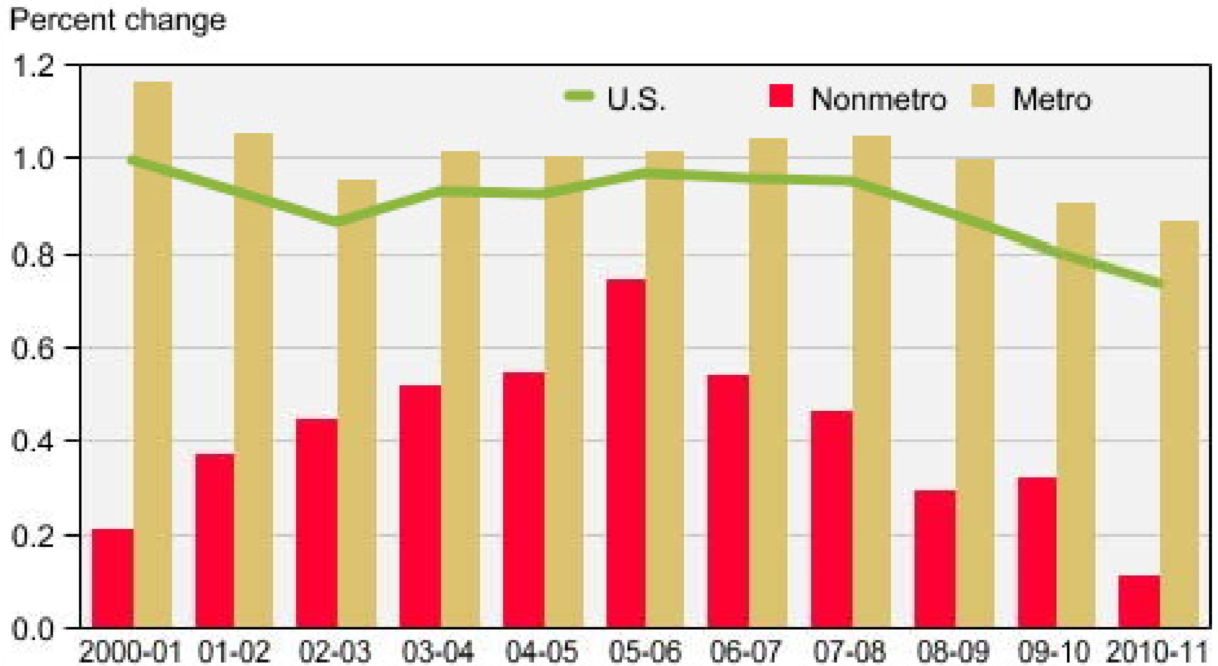
Source: USDA, Economic Research Service using data from U.S. Census Bureau.

Metro, Non-Metro and Micropolitan Counties, 2013



Source: USDA, Economic Research Service using data from the U.S. Census Bureau.

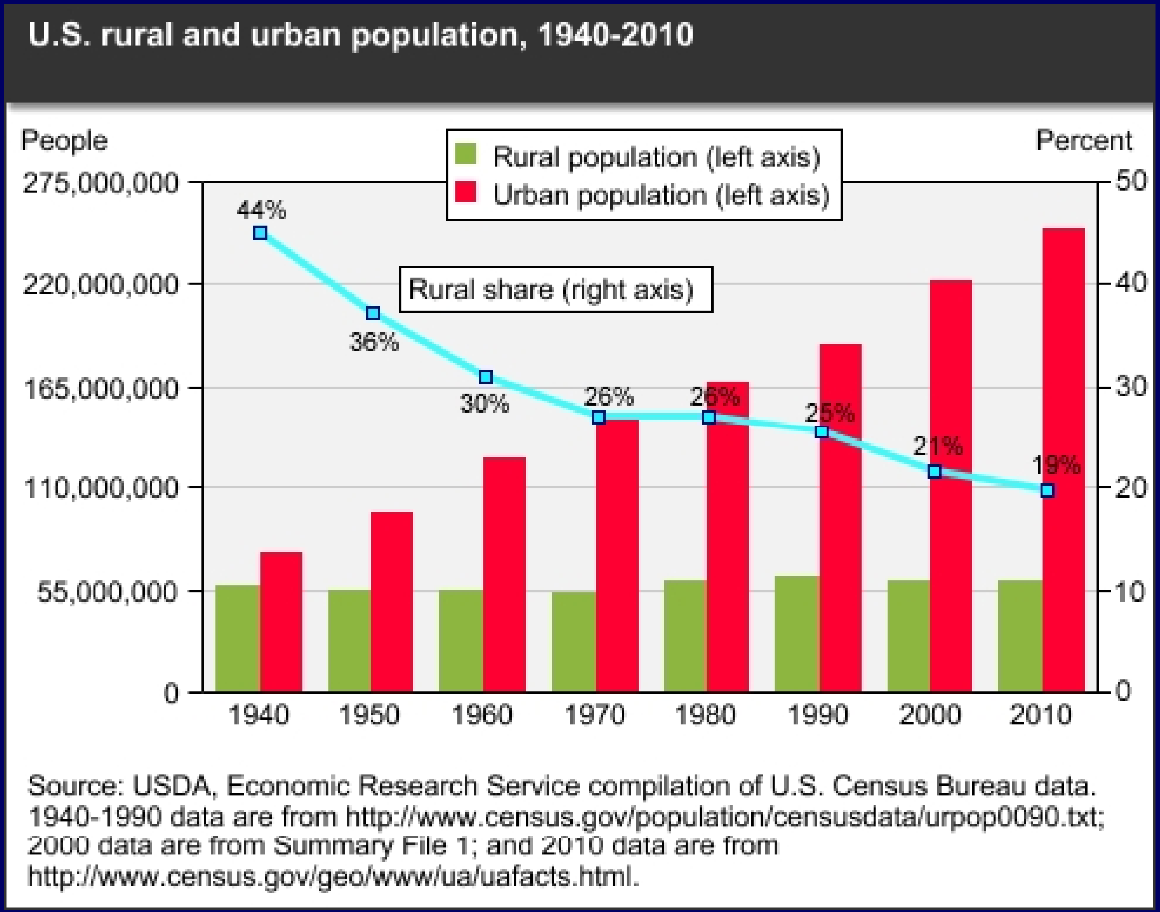
Annual Population Growth Rates for Metro and Non-Metro Areas, 2000-2010



Note: Adjustments to county population estimates following the 2010 Census may partly explain the divergence in nonmetro trends during 2009-10 and 2010-11. It is probably more realistic to assume a steadier decline in nonmetro population rates since 2008-09, in line with national trends.
Source: USDA, Economic Research Service, using data from the U.S. Census Bureau.

Between 2000 and 2010, metro areas Far outdistanced Non-metro areas In population growth. This has changed Since 2010

The Rate of Population Loss in Rural Areas to Metro Areas is Slowing



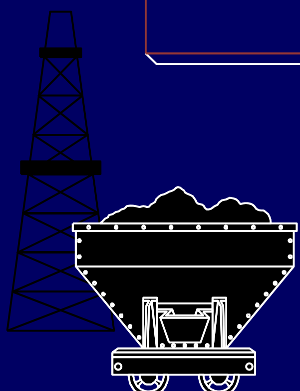
By 2011, about 51 million people lived in rural areas

Rural communities located far from urban centers must rely on agriculture as a primary source of income

Businesses in these towns are frequently somehow linked to agriculture

USDA "farming dependent" counties

For these counties, their fate is linked to the economic conditions facing agriculture

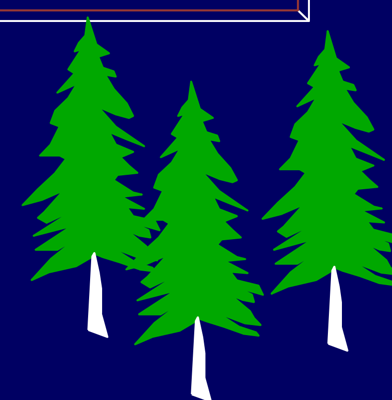


Boom & Bust

Energy-related industry

Coal & Oil

Forestry & Timber



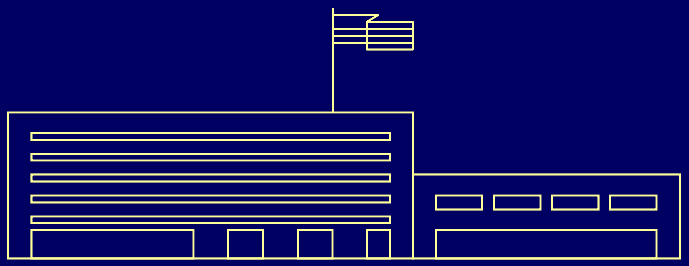
Education in rural areas:

Expensive on a per pupil basis as the cost of teachers spread over relatively few students

Attitudes toward education in rural areas vary considerably from state to state and region to region

Limited course offerings compared with urban schools

Loss of most talented students to high paying jobs in urban areas



Medical care in rural areas:

Frequently limited in availability

family physician in rural community

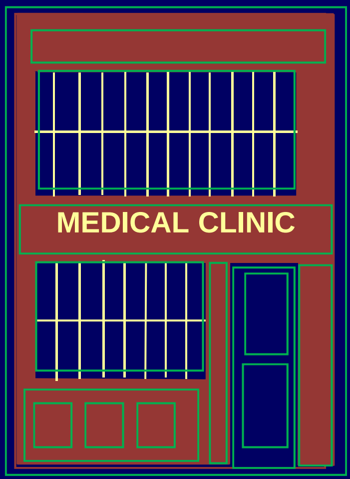
in private practice declining

Physicians like high-paying

jobs in urban clinics

Care of elderly may be a problem

in rural areas



Housing in rural areas:

Deemed substandard if it lacks indoor plumbing

Under 28 million rural housing units total

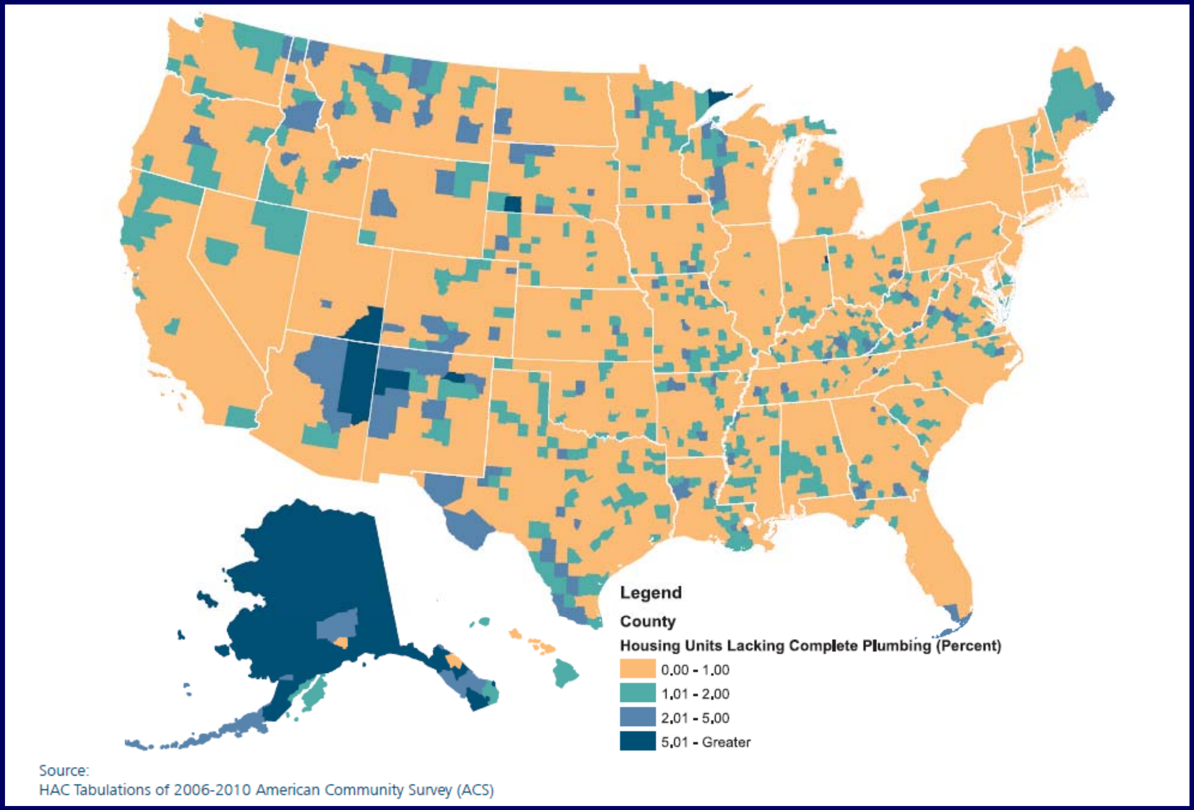
a million substandard

substandard units--59% 1959

less than 5% now

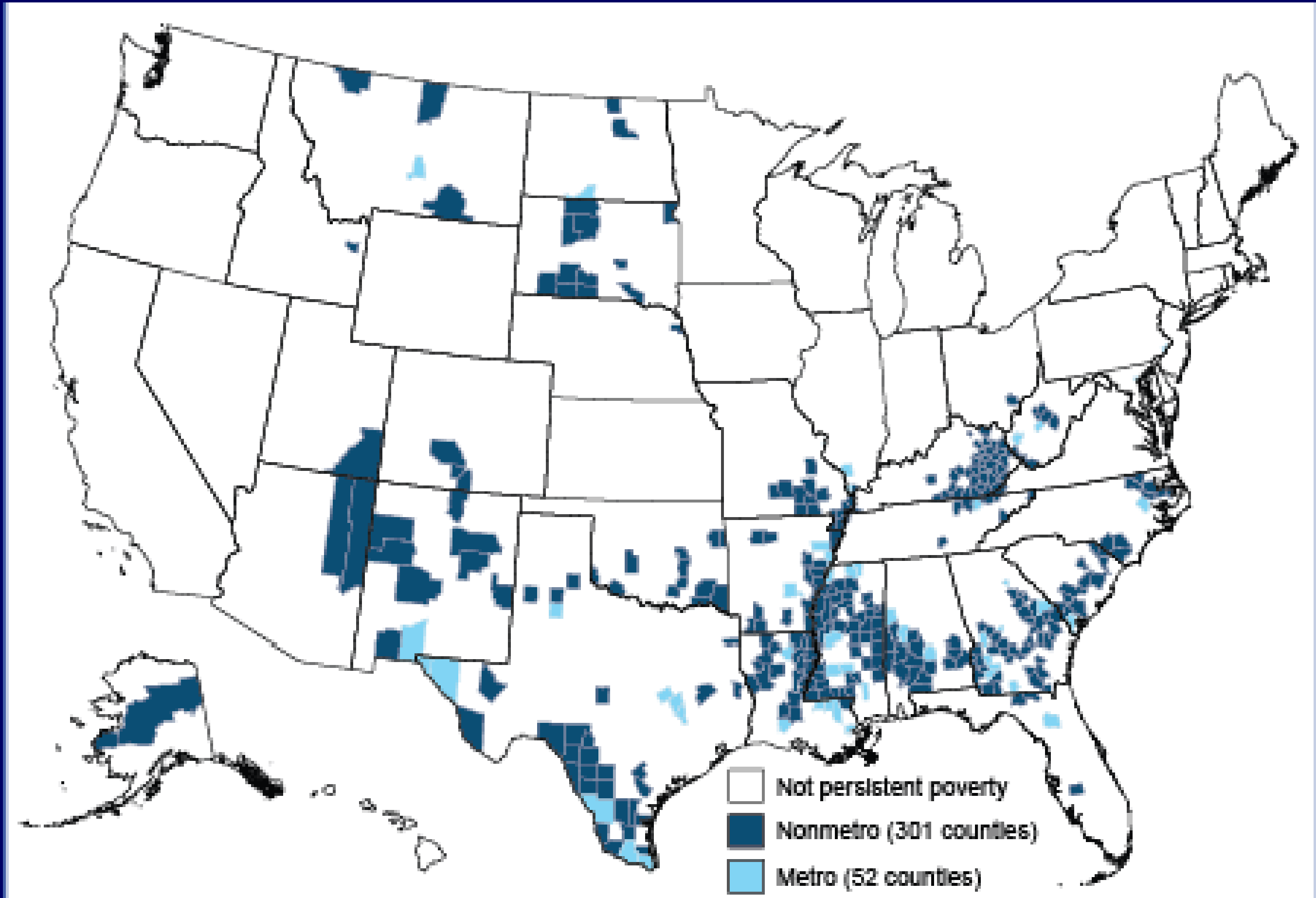
A number of rural counties still have significant numbers of substandard homes….

Rural Housing Units Lacking Complete Plumbing by County, 2010 (Percent)



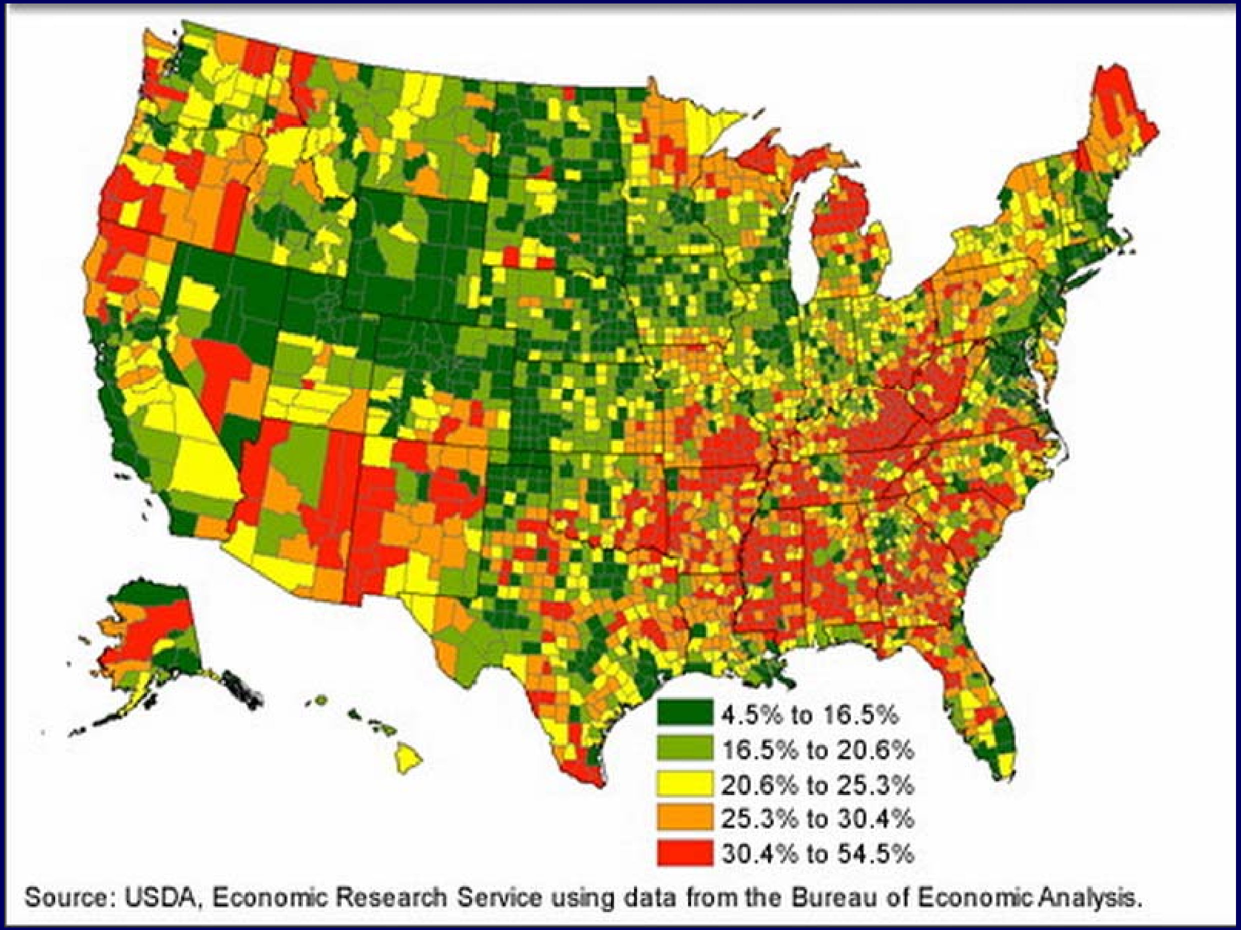
Source: Housing Assistance Council “Taking Stock” Report

Persistent Poverty Counties, Metro and Non-Metro



Source: USDA, Economic Research Service. Persistent poverty counties had poverty rates of at least 20 percent in each U.S. Census 1980, 1990, and 2000, and American Community Survey 5-year estimates, 2007-11.

Government transfer payments to individuals as a percent of total county personal income, 2011



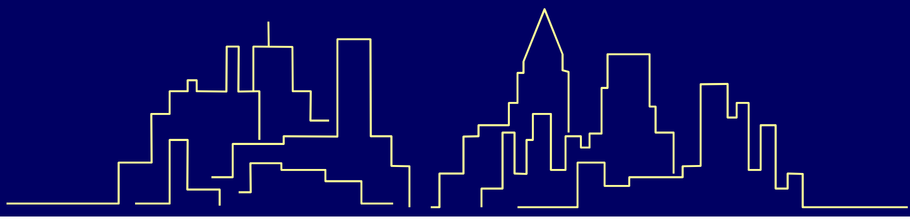
Rural areas do not get their proportionate share of federal aid

Urban congressmen support programs for urban poor

Rural congressmen are concerned with government assistance for farmers

Rural poor are often ignored

Renewed efforts are underway to redirect federal funds to rural areas



Rural Development Strategies:

1. More economic assistance to rural residents other than farmers (i.e. food stamps)
2. Additional state and federal aid to rural schools to account for externalities and spillovers
3. Strategic plans for quality medical service delivery irrespective of where you live
4. Programs designed to further improve housing in rural areas
5. Assistance to local governments in community improvements

6. Redirection of federal projects
toward remote rural areas

7. Assistance in developing plans for
attracting new industry

Fewer than 5 million people live on farms
but
59 million people live in non-farm rural areas

Public policy will be increasingly directed toward meeting the needs of non-farm rural residents.