ECON B225: ECONOMIC DEVELOPMENT

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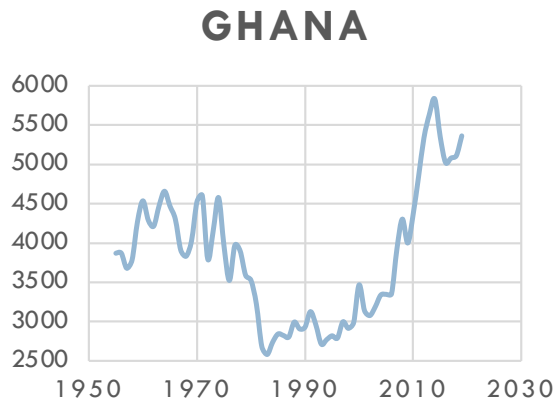
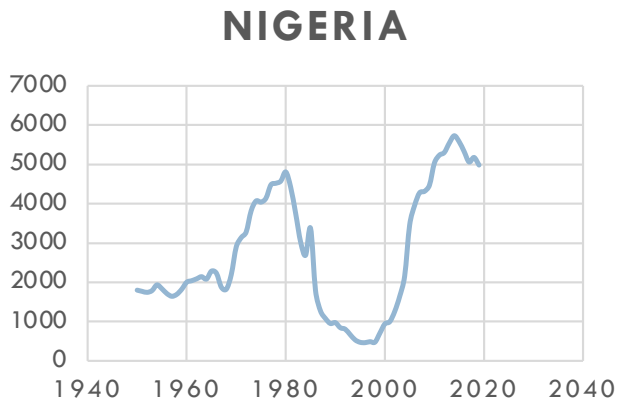
The Australian Model

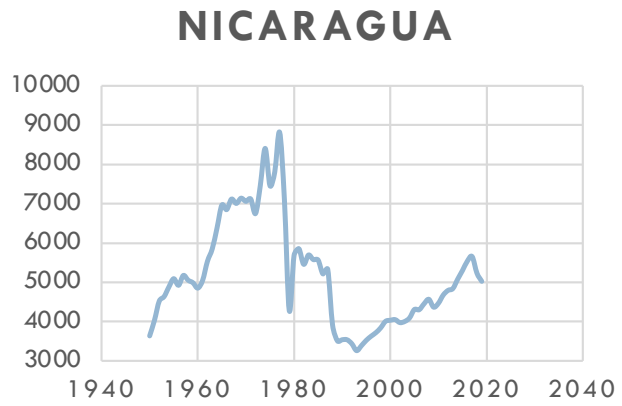
Motivation

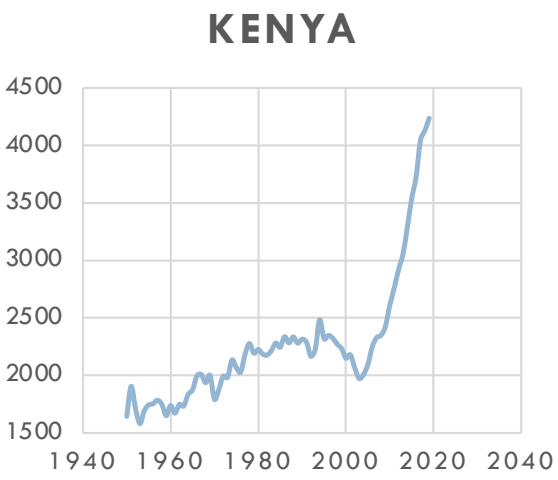
- **After WWII, colonial empires came apart and by the end of the 1960s there were a multitude of newly independent countries around the world**
- **Based on the Solow Growth Model how would we expect growth to look for newly independent countries in the Global South after the 1960s?**
  - We'd expect robust, very fast growth, why?
    - These were very capital-scarce countries

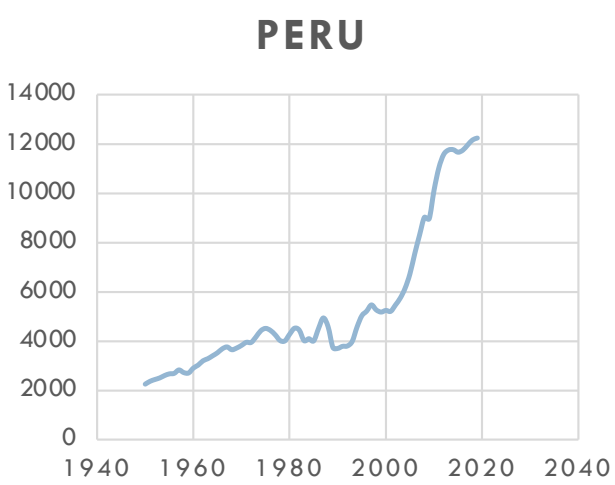
Growth in a Selection of Poor Countries 1950 – 2019

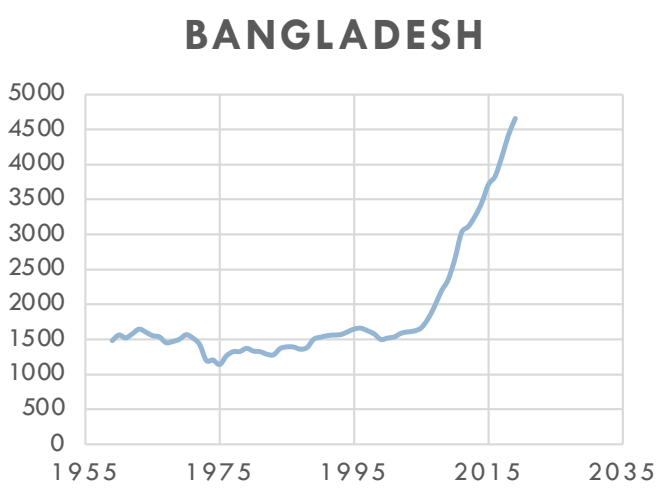








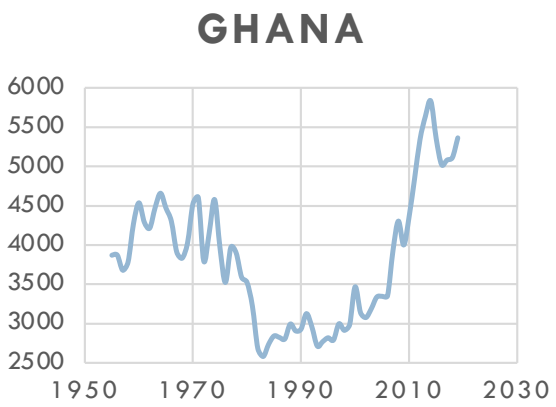


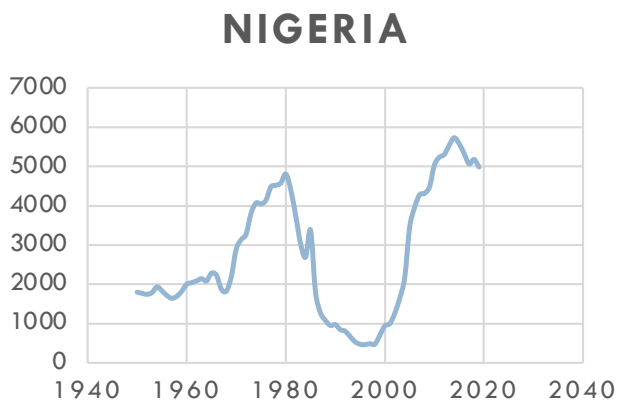


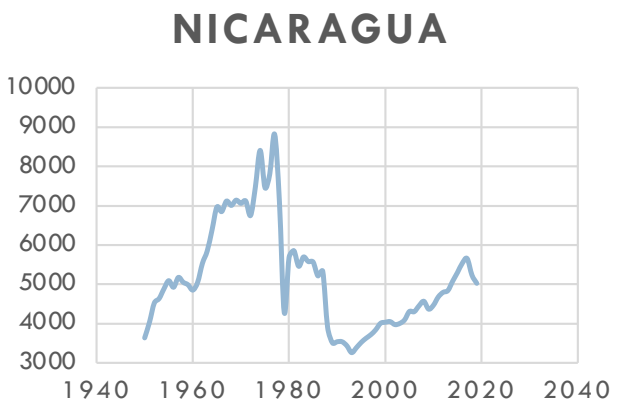
Source: Instructor's calculations. Data: Penn World Tables 10.0. All data adjusted for PPP.

Comparison to the Solow Model Predictions

- **How does this compare to what the Solow Model would have predicted?**
  - Ghana, Nigeria, and Nicaragua exhibit pretty serious fluctuations over time. Definitely no sustained growth in the pattern of the Solow model

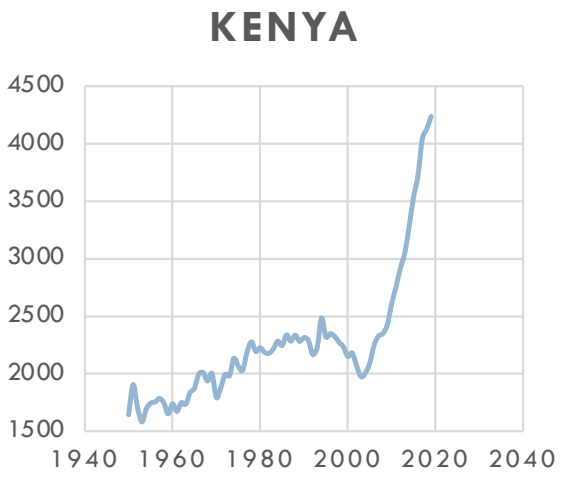


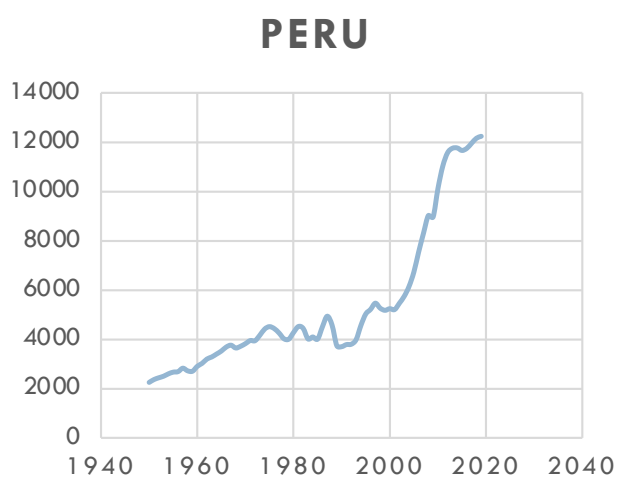


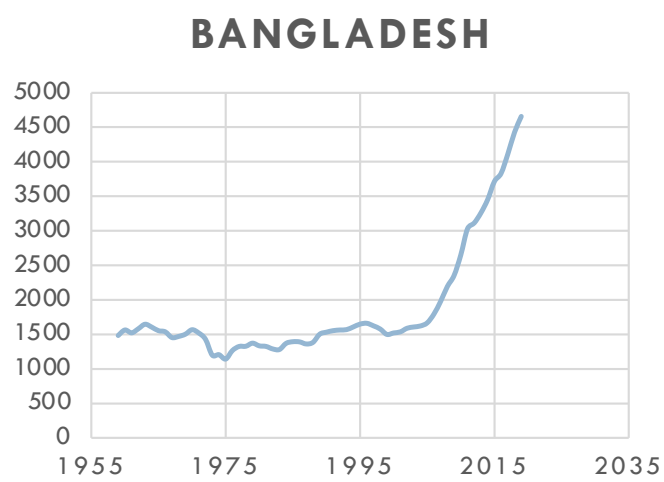


Comparison to the Solow Model Predictions

- **How does this compare to what the Solow Model would have predicted?**
  - Kenya, Peru, and Bangladesh show a prolonged period of very slow growth with relatively quick growth picking up around 2000. Again, very different from Solow







What is Going on?

- **Is the Solow Model "Incorrect"**
  - Not necessarily
  - Remember that Solow is trying to account for the forces driving **long-term** growth
  - Perhaps there are forces in the short term that would derail these long-term forces from working in the way that Solow predicts
  - What might be examples of these types of forces?
    - Natural resource booms
    - Policy decisions
    - Natural disasters, conflict, and social instability

Motivation for Another Model

- **So it would be nice to have a model that accounts for these forces and provides a structure for understanding how these forces affect growth and why**
- **This is the purpose of the Australian Model**
  - Developed in the 1950s to describe behavior of the Australian economy (at the time a "small" and "open" economy)
  - Adopted since as a nice framework for understanding economic instability and slow growth in poor countries

The Australian Model

- **Starting Definitions and Assumptions**
  1. **Poor economies are "small"**
     - **Definition:** Their supply of exports, nor their demand for imports affect world prices in any way
  2. **Poor economies are "open"**
     - **Definition:** Trade and capital floe across borders in quantities that are able to influence domestic prices and the country's money supply
  3. **Poor economies have two sectors**
     1. **The Tradable Sector, and**
     2. **The Non-Tradable Sector**

Tradables versus Non-Tradables

- **Definition of a Tradable Good or Service:**
  - Any good or service that one can sell abroad
  - Prices are determined by supply and demand on the world market. Why?
    - Competitors in the tradable sector come from all over the world
  - Example of a Tradable Good: Cars, oil, wood, etc.
  - Example of a Tradable Service: Call centers

Tradables versus Non-Tradables

- **Definition of a Non-Tradable Good:**
  - Any good that one can't sell abroad
  - Prices are determined by domestic supply and demand on the domestic market
  - Example of a Non-Tradable Good: Gravel (available everywhere and highly expensive to transport)
  - Example of a Non-Tradable Service: Haircuts

Definition: The Real Exchange Rate

- **The Australian Model uses the concept of the "Real Exchange Rate" RER**
  - **Definition:** The relative price of foreign goods in terms of domestic goods, expressed mathematically as

$$RER = \frac{P_t}{P_n} \qquad (1)$$

  - Where P_t is the price of tradables and P_n is the price of non-tradables in a country
    - In practice these are price indexes capturing the general price levels in both sectors

The RER is Important

- **Look at this equation closely,**

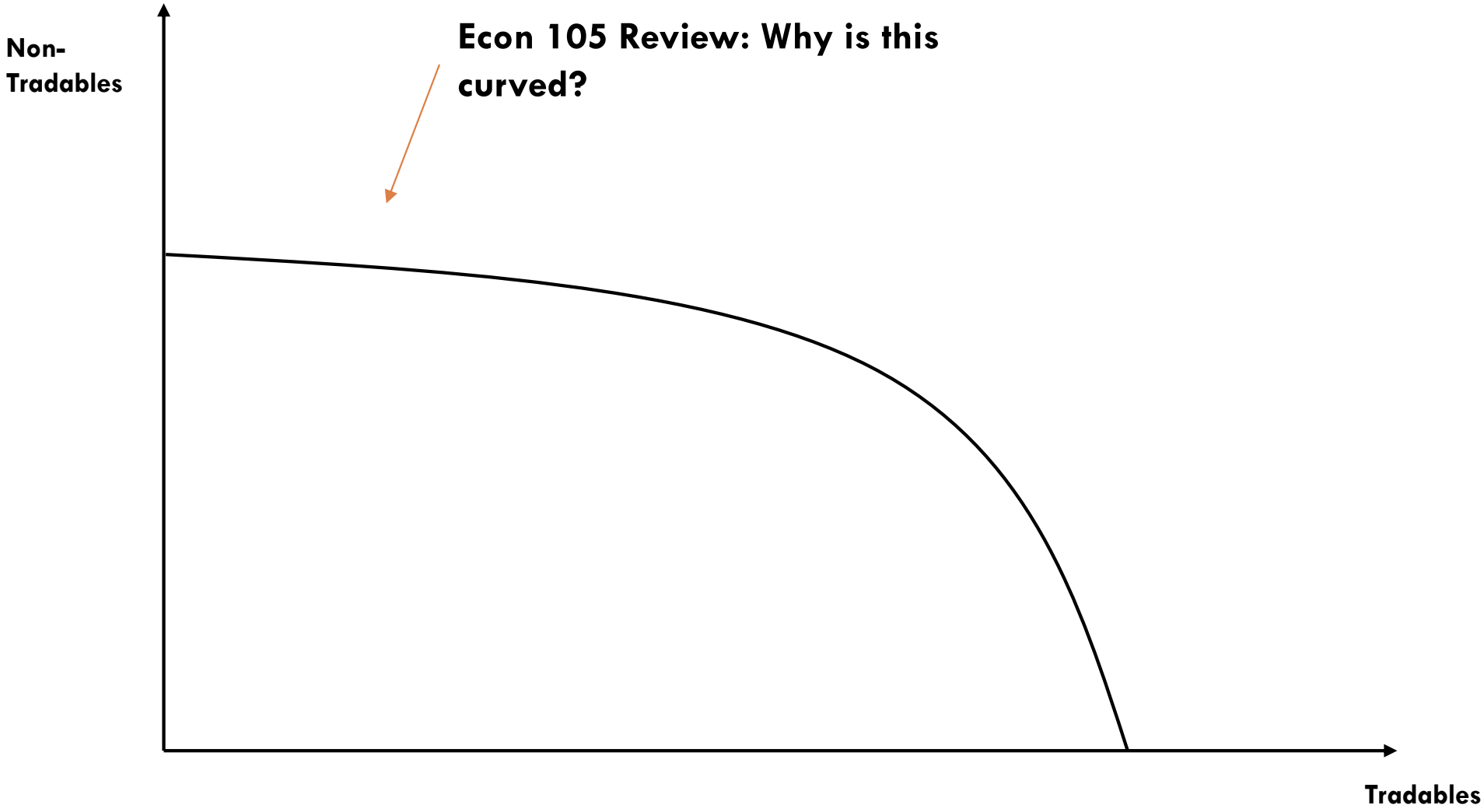
$$RER = \frac{P_t}{P_n} \qquad (1)$$

- **What happens when the price of tradables goes up and P_n stays constant in a country? What does it mean for the real exchange rate?**
  - It goes up!
  - What does this mean for the ability of someone in this country to consume tradables?
    - This is bad for their ability to consume tradables. It means tradables are relatively more expensive

Definitions of Internal Balance and External Balance

- Recall from ECON 105 the concept of the Production Possibilities Frontier (PPF)
- We are going to look at the PPF for a small and open economy with tradables on the x axis and non-tradables on the y axis

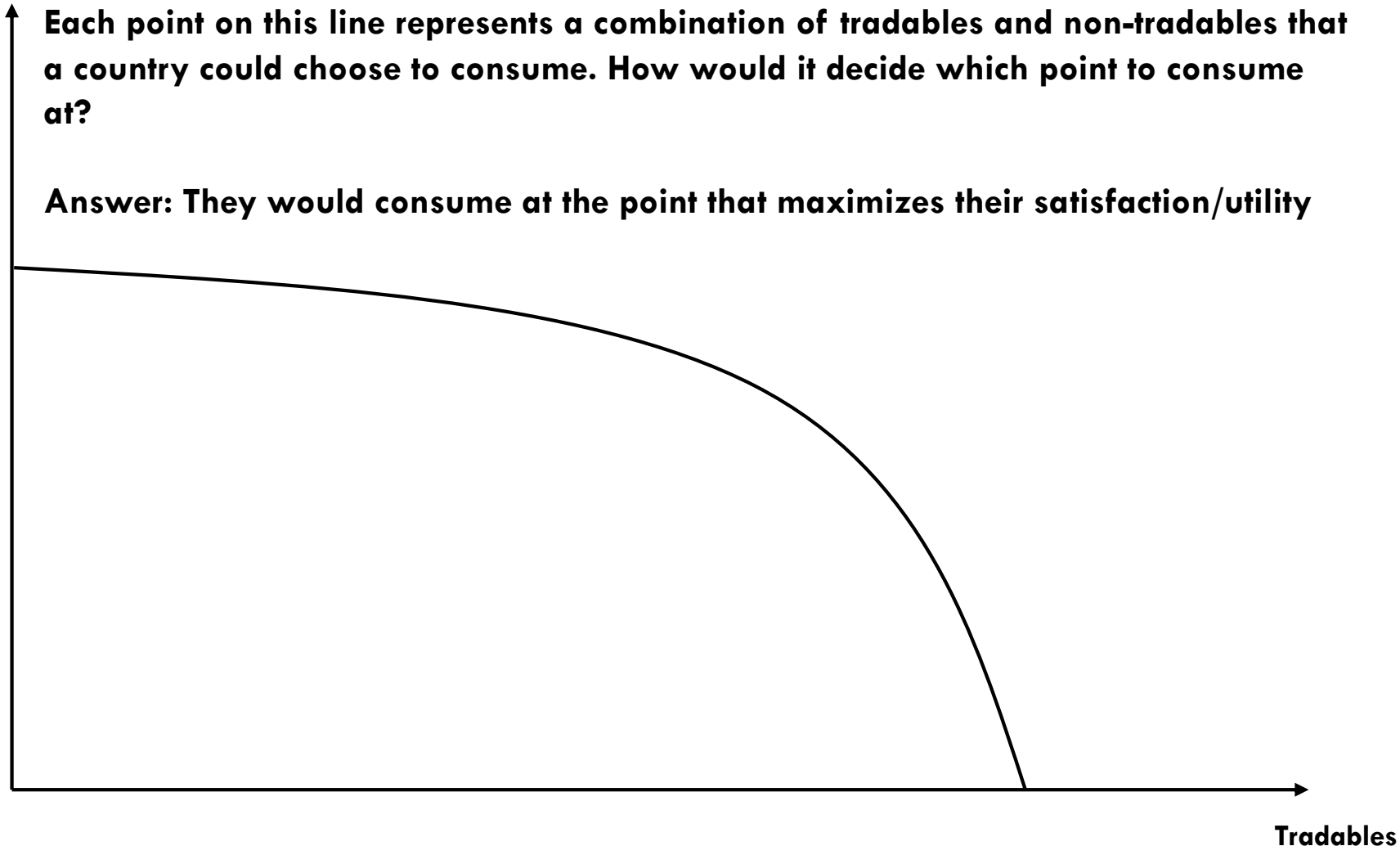
The Production Possibilities Frontier in Tradable, Non-Tradable Space



The Production Possibilities Frontier in Tradable, Non-Tradable Space

Each point on this line represents a combination of tradables and non-tradables that a country could choose to consume. How would it decide which point to consume at?

Answer: They would consume at the point that maximizes their satisfaction/utility



Modelling the Country's Utility

- Some students get exposed to this in ECON 105. Others don't. So we're going to cover this quickly
- We can model an individual or a country's satisfaction from consumption of goods (referred to as "utility" in economics) using a "utility function"
- Utility functions describe how consumption of some number of goods maps to some level of utility. Utility is a function of some quantity of different goods, x_1 and x_2, or $Utility = U(x_1, x_2)$

Modelling the Country's Utility

- **The utility function describes a person's or a country's collective preferences over the goods in the function**
- **A common functional form for $U(\cdot)$ is our friend the Cobb-Douglas Functional Form,**

$$U(x_1, x_2) = x_1^{\alpha} x_2^{1-\alpha} \; where \; \alpha \in (0,1) \qquad (2)$$

  - The Cobb-Douglas functional form has many properties that conform with how we think people structure their preferences in many situations. At this point, take my word for it. You'll go into much more depth with this in advanced microeconomics classes
  - How do we interpret α in this context?

Adapting $U(x_1, x_2)$ for the Australian Model

- So, in the Australian model, we have two types of goods, tradables and non-tradables, so we're going to make this country's aggregate utility a function of consumption of some amount of tradables t, and non-tradables n,

$$U(t, n) = t^{\alpha} n^{1-\alpha} \; where \; \alpha \in (0,1) \qquad (3)$$

- This is a multivariate function, and we need to analyze this in n and t space. How do we do this?

We Can Construct Indifference Curves

- **We can look at the curves this function makes in n and t space if we hold utility constant at various levels**
  - These are called indifference curves
- **So let's hold utility constant at some $\bar{U}$, and manipulate equation (3)**

$$\bar{U} = t^{\alpha} n^{1-\alpha} \tag{4}$$

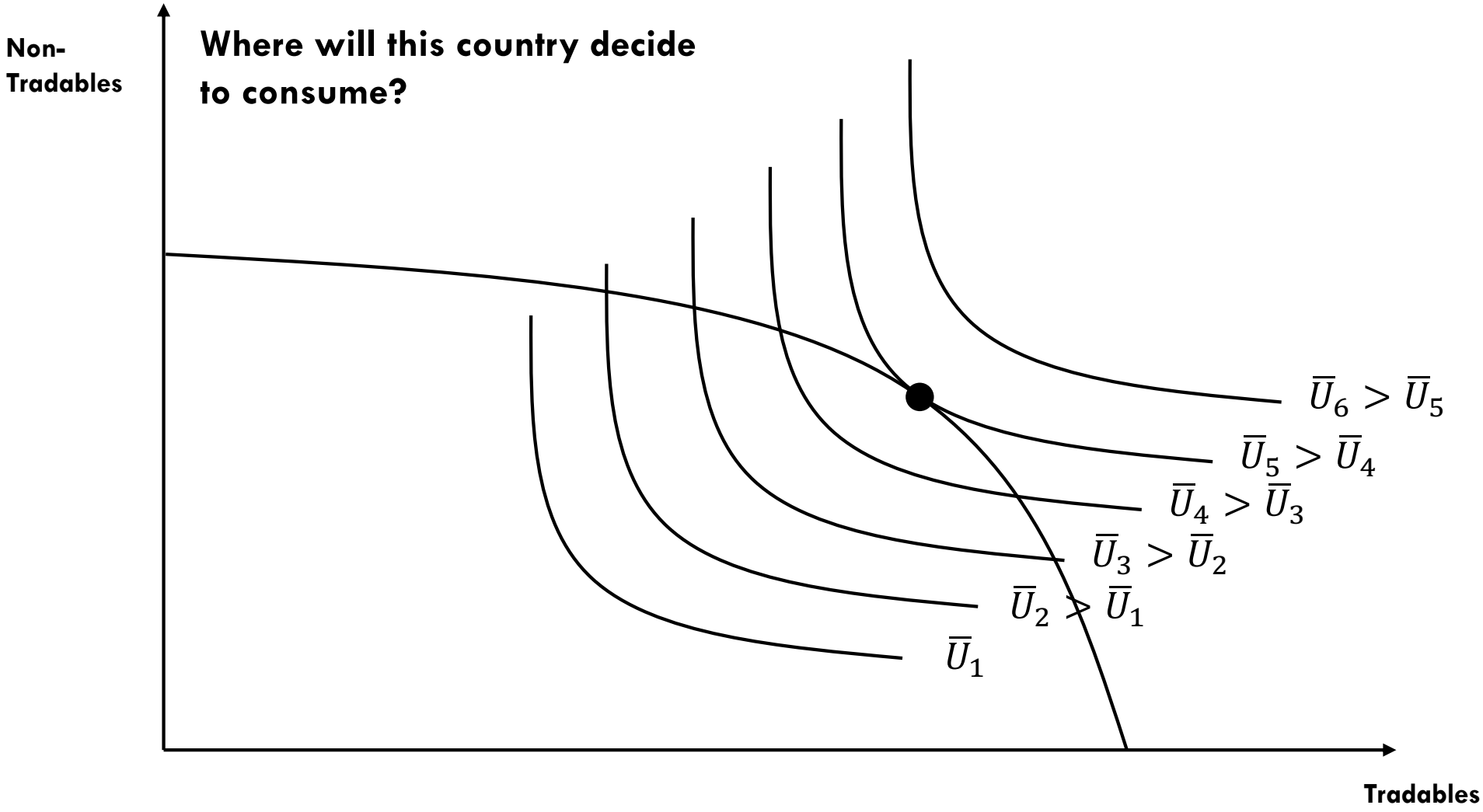
$$\Rightarrow \frac{\bar{U}}{t^{\alpha}} = n^{1-\alpha} \tag{5}$$

$$\Rightarrow \left(\frac{\bar{U}}{t^{\alpha}}\right)^{\frac{1}{1-\alpha}} = n \tag{6}$$

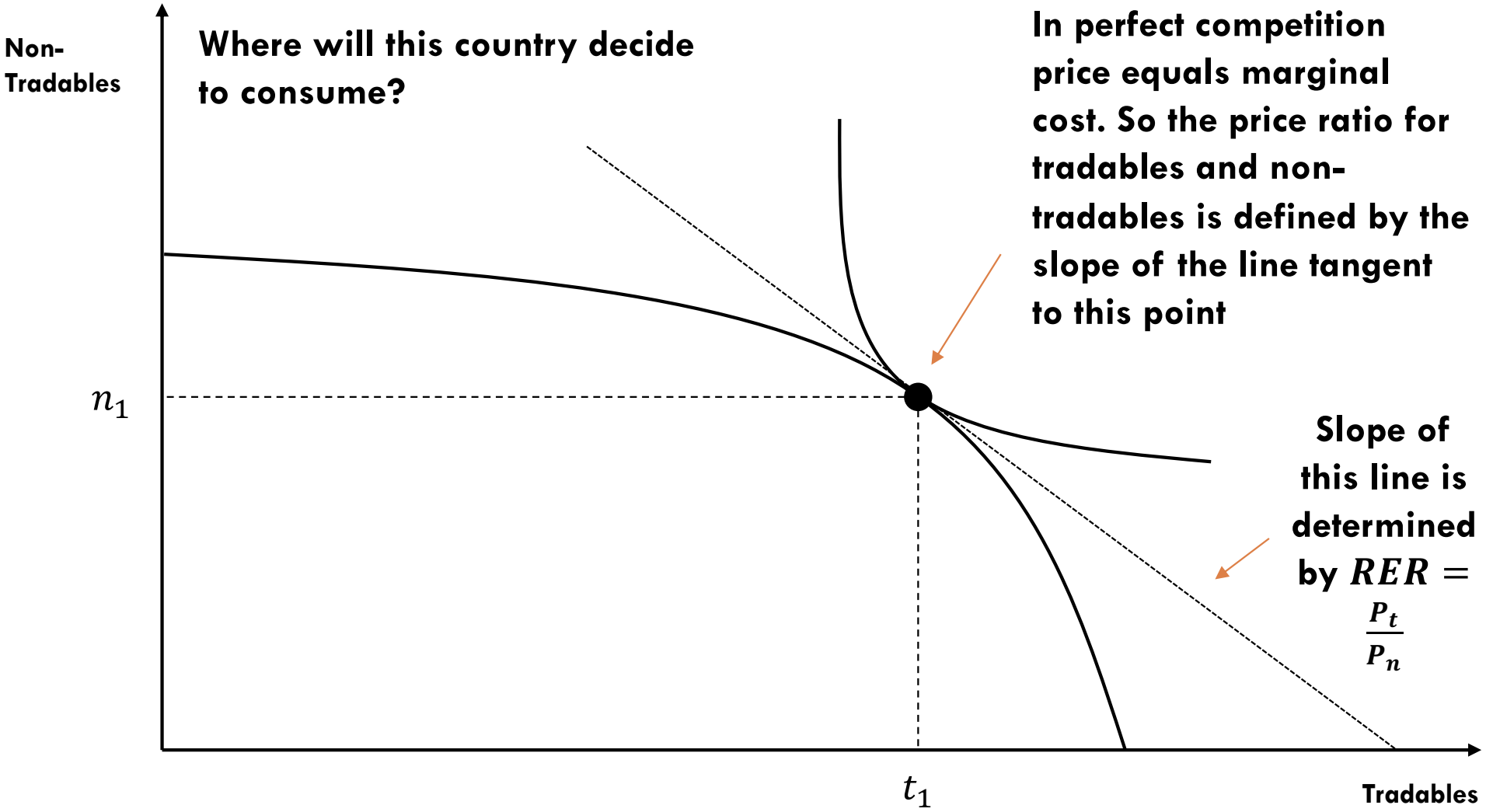
Constructing Indifference Curves

- Now, with any level of $\overline{U}$, you can see all the combinations of n and t that achieve that utility level
- You can now plot this in n and t space
- Using the Cobb-Douglas Functional Form, this produces a curve for each level of $\overline{U}$
- As $\overline{U}$ gets larger, the curves will move to the northeast in n and t space

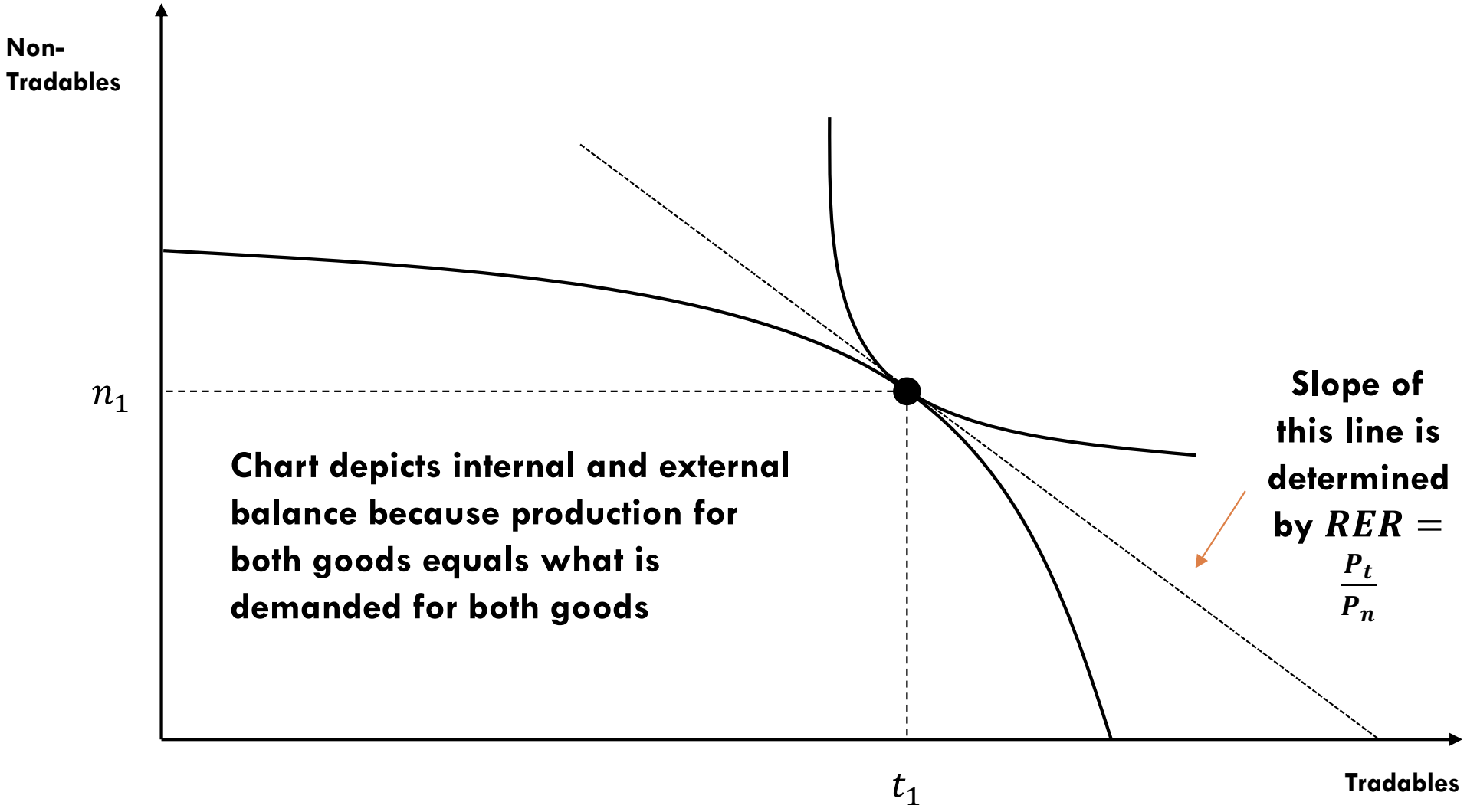
The Production Possibilities Frontier in Tradable, Non-Tradable Space



The Production Possibilities Frontier in Tradable, Non-Tradable Space



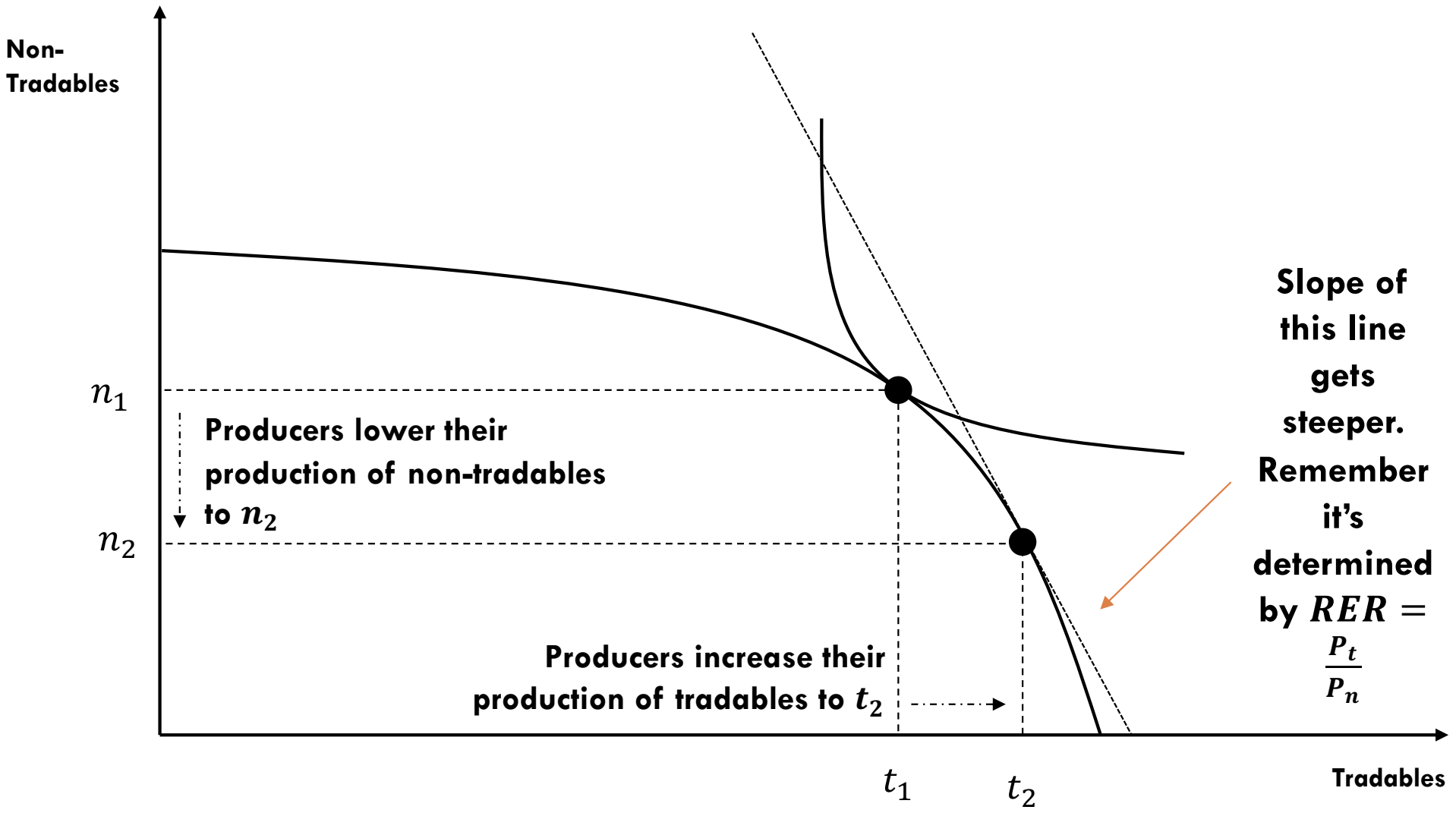
Internal and External Balance



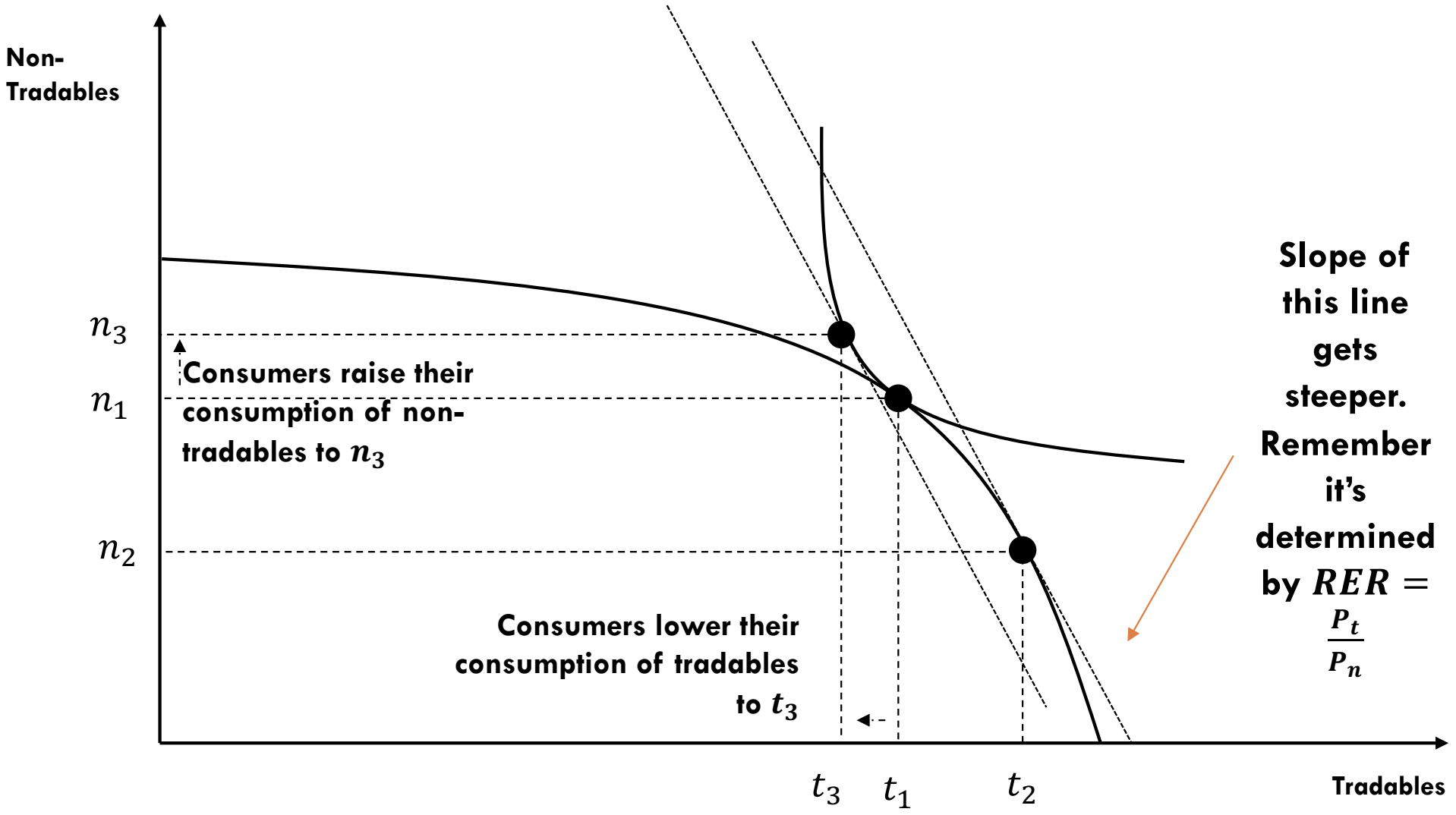
Internal and External Imbalance

- **Now suppose the price of tradables goes up. What happens to the RER line?**
  - It gets steeper
- **What do producers do if tradables become more expensive?**
  - They'll switch to producing more tradables
- **What will consumers do?**
  - They'll switch to consuming more non-tradable substitutes
- **Now production is not going to be "in balance" with consumption**

Internal and External Imbalance



Internal and External Imbalance



Internal and External Imbalance

- **So the country is in internal and external imbalance when what the country is producing in tradables and non-tradables isn't the same with what consumers are demanding**
  - If $t_2 > t_3$ the country is in "external surplus"
  - If $t_2 < t_3$ the country is in "external deficit"
  - If $n_2 > n_3$ the country is in "internal surplus"
  - If $n_2 < n_3$ the country is in "internal deficit"

Last Component: National Income Accounting

- **Recall from ECON 105:**

$$GDP = C + I + G + (X - M) \qquad (7)$$

Consumption — Investment — Government Spending — Exports — Imports

- **We are going to define a new concept called "Absorption", denoted A**
  - **Definition:** All gross *domestic* expenditure
- **So $A = C + I + G$**

Last Component: National Income Accounting

- **So note this allows the following statements,**

$$GDP = A + (X - M) \tag{8}$$

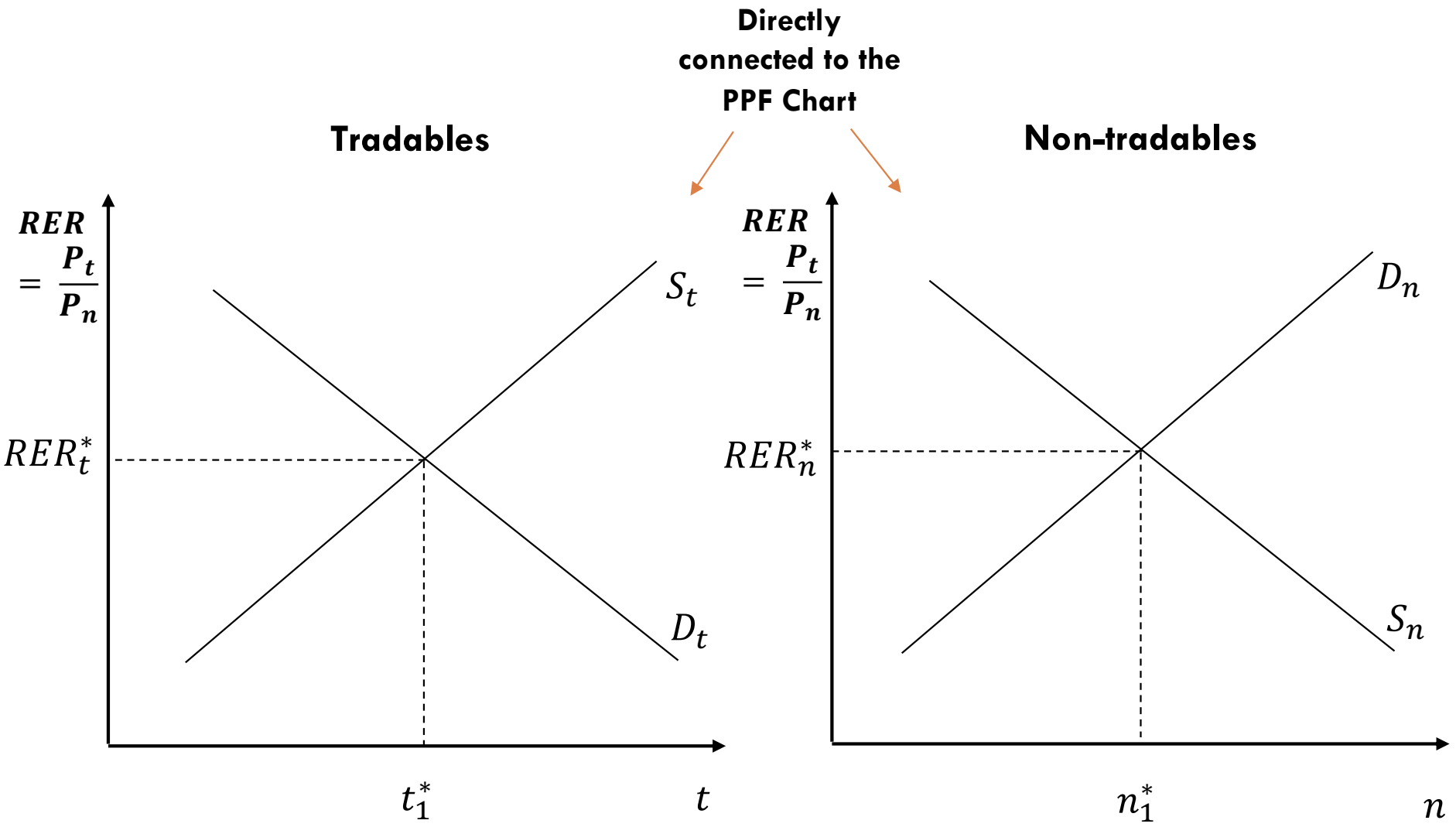
$$\Longrightarrow GDP - A = \underbrace{X - M}_{\text{Trade Balance}} \tag{9}$$

- **So if $A > GDP \Longrightarrow$ Negative Trade Balance**
- **So if $A < GDP \Longrightarrow$ Positive Trade Balance**
- **So if $A = GDP \Longrightarrow$ Equilibrium**

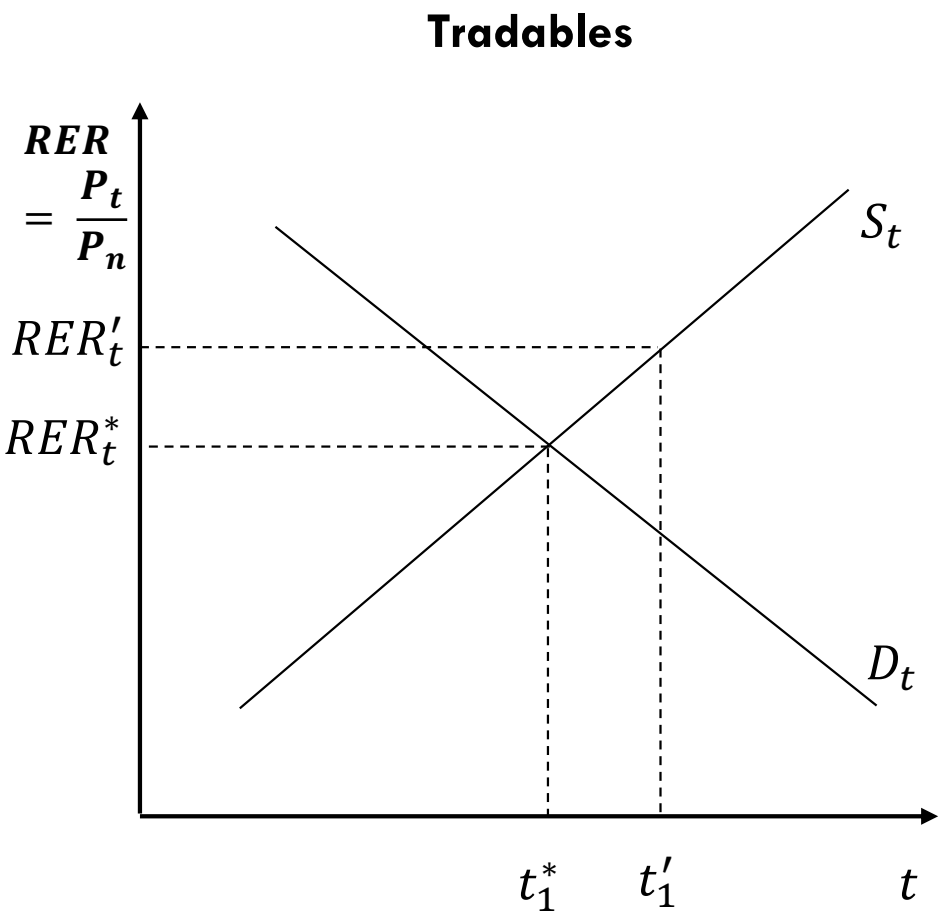
Supply and Demand in the Two Sectors

- Okay, that's a lot of definitions…
- Now let's consider the dynamics within the two sectors in the Australian Model (tradables and non-tradables)
- Instead of price on the y axis, we're going to use the RER

Supply and Demand in the Two Sectors

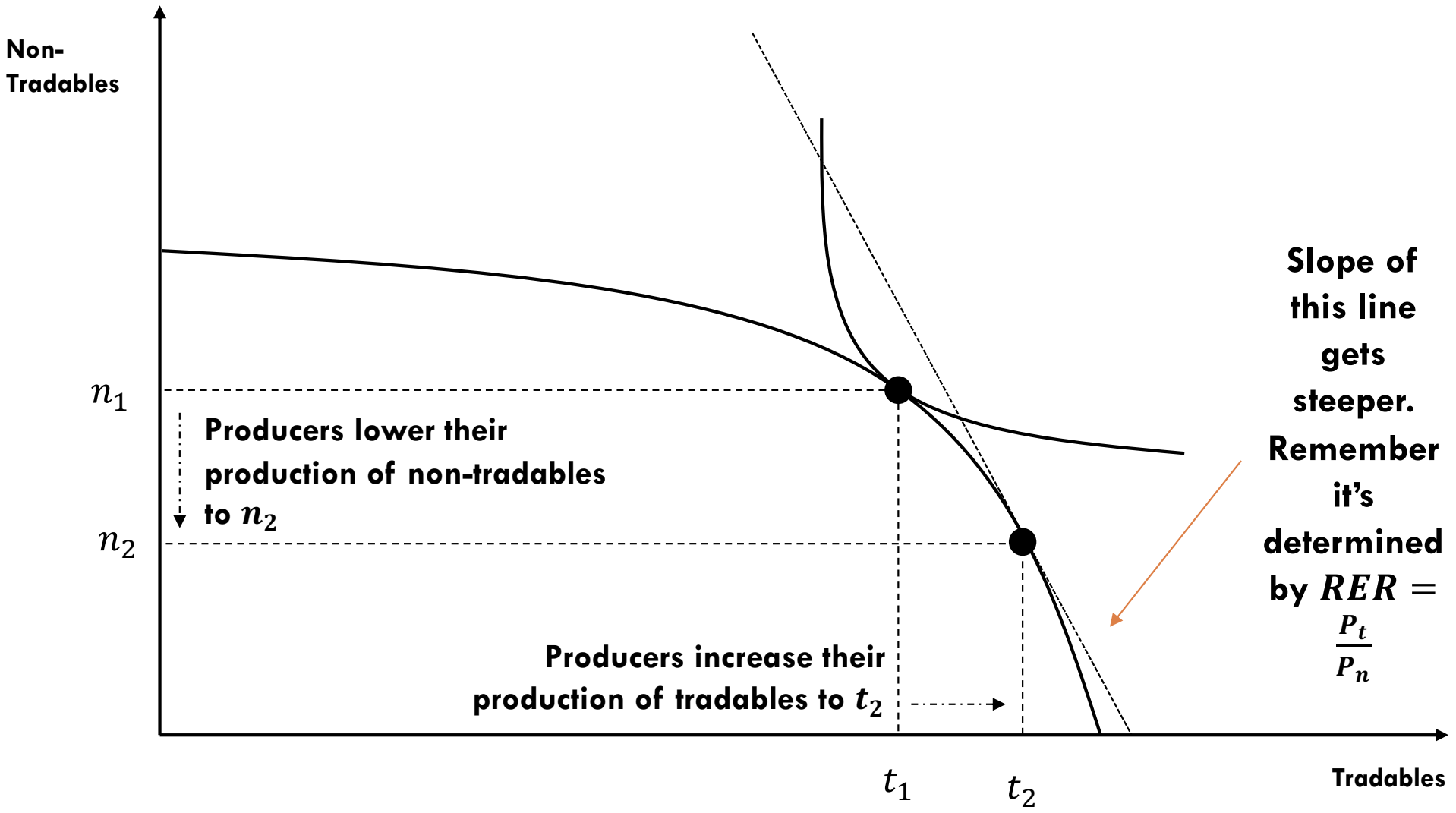


Consider the Tradables Sector



- **Supply equals demand at RER_t^*, t_t^***
- **Consider RER_t', t_t'**
- **What does this mean for internal and external balance?**
  - RER went up compared to its value in balance
  - Supply of t went up relative to what it was in balance

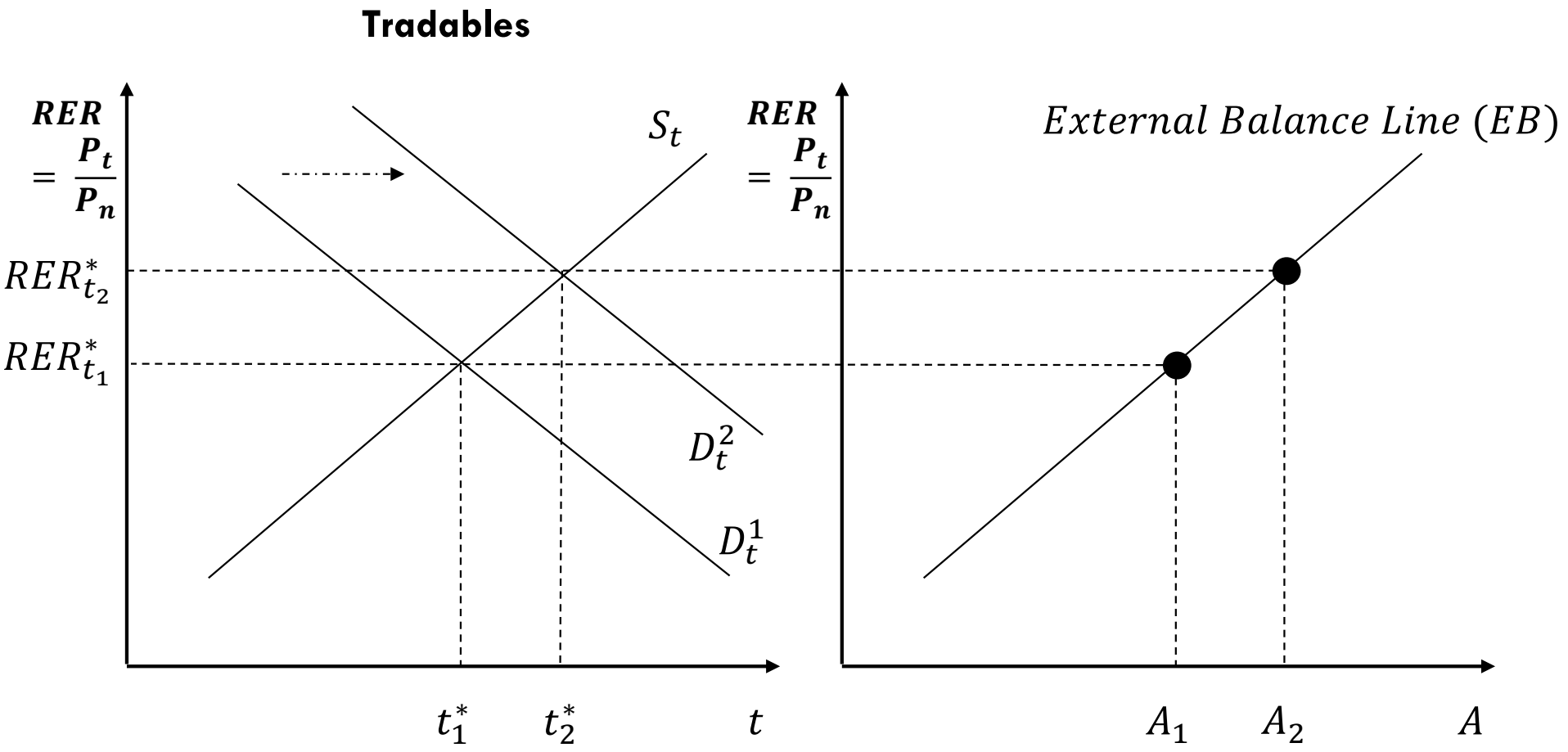
Describing this Situation



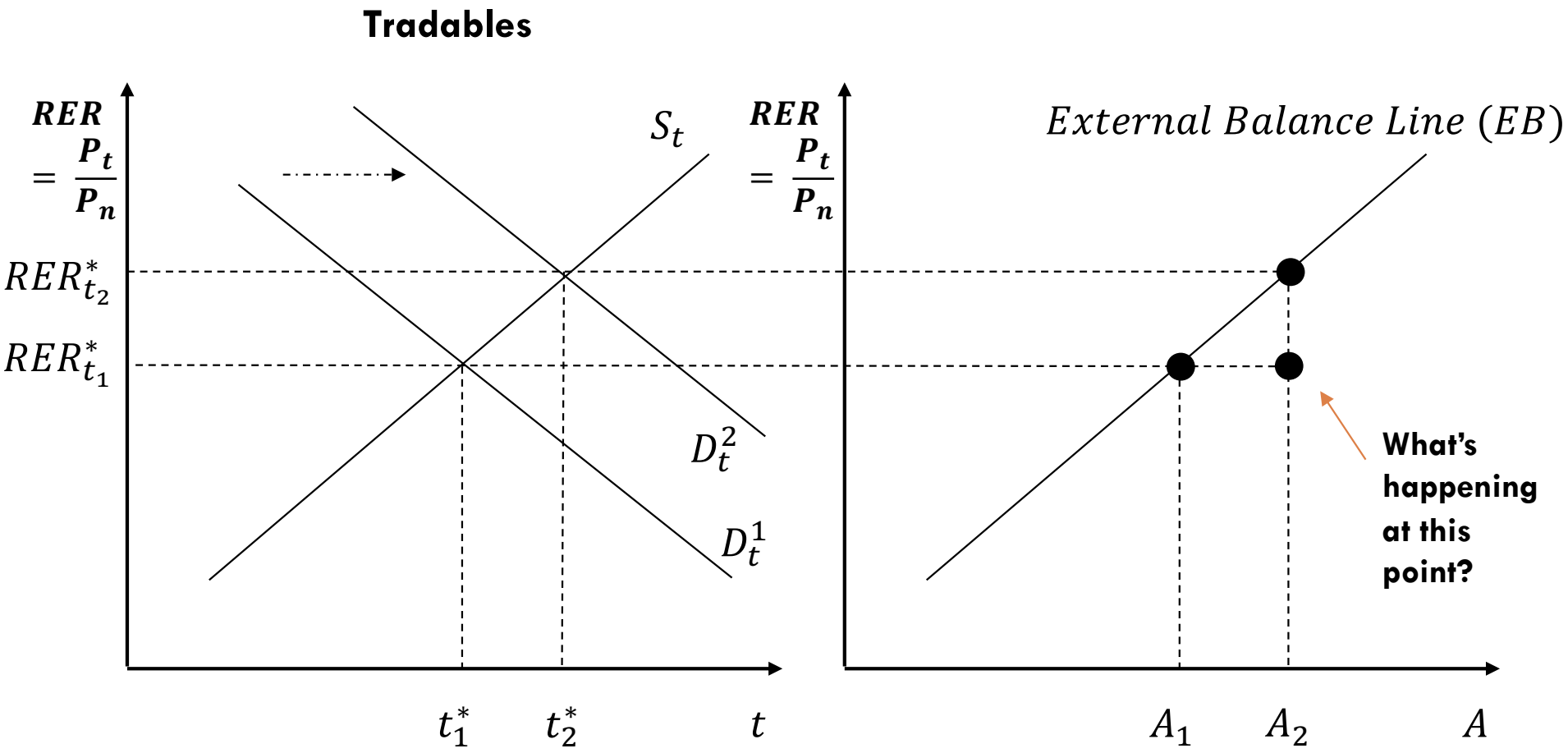
The Effects of Absorption

- **If Absorption goes up, how does that affect the demand curves here?**
  - It would push the demand curve out to the right in both charts
  - Why?
    - More income in people's pockets

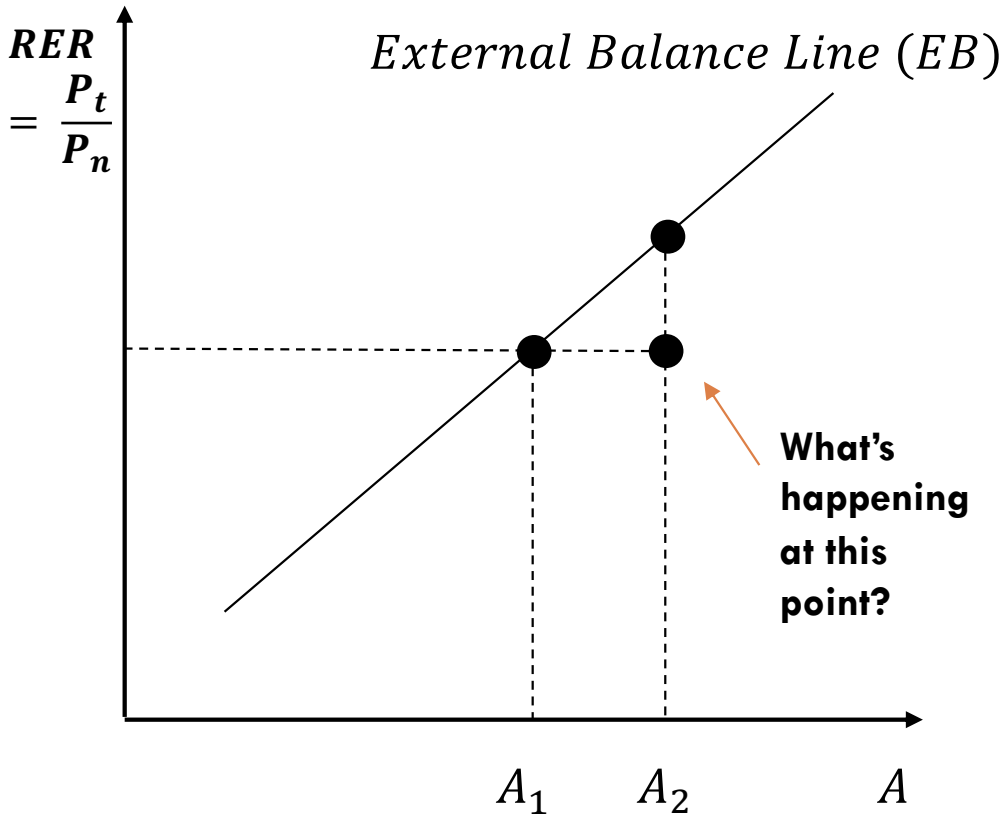
Illustration in the Tradables Market



If Prices are "Sticky" and RER doesn't Adjust

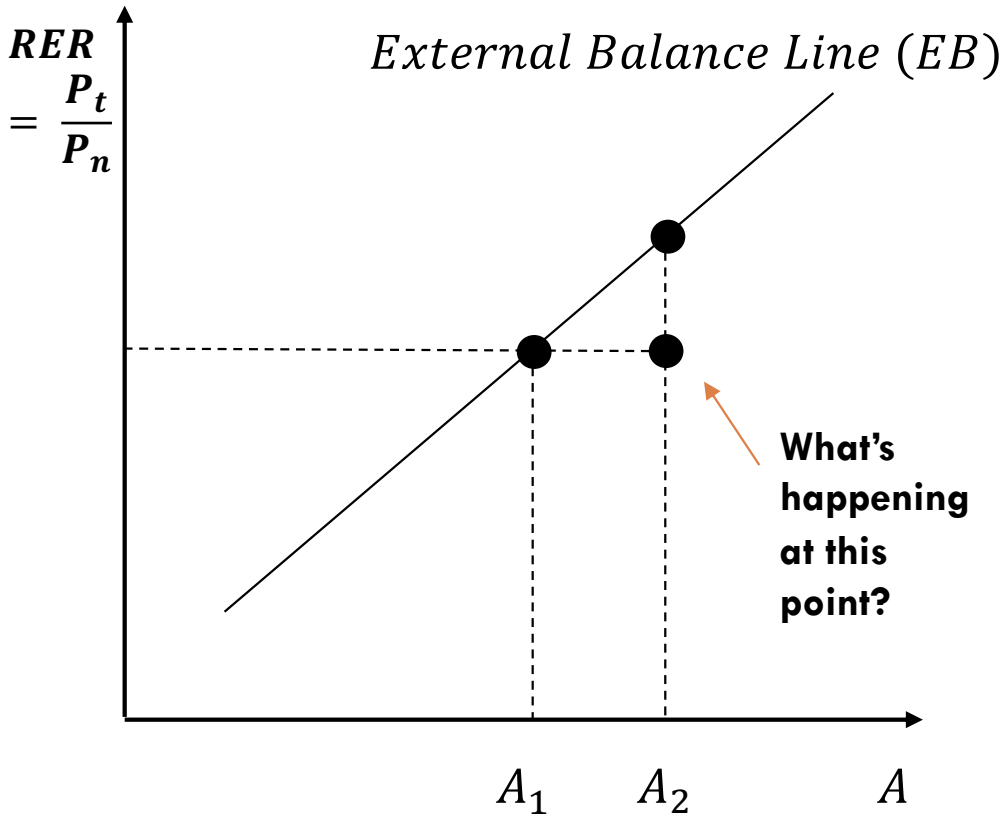


What if Prices Don't Adjust



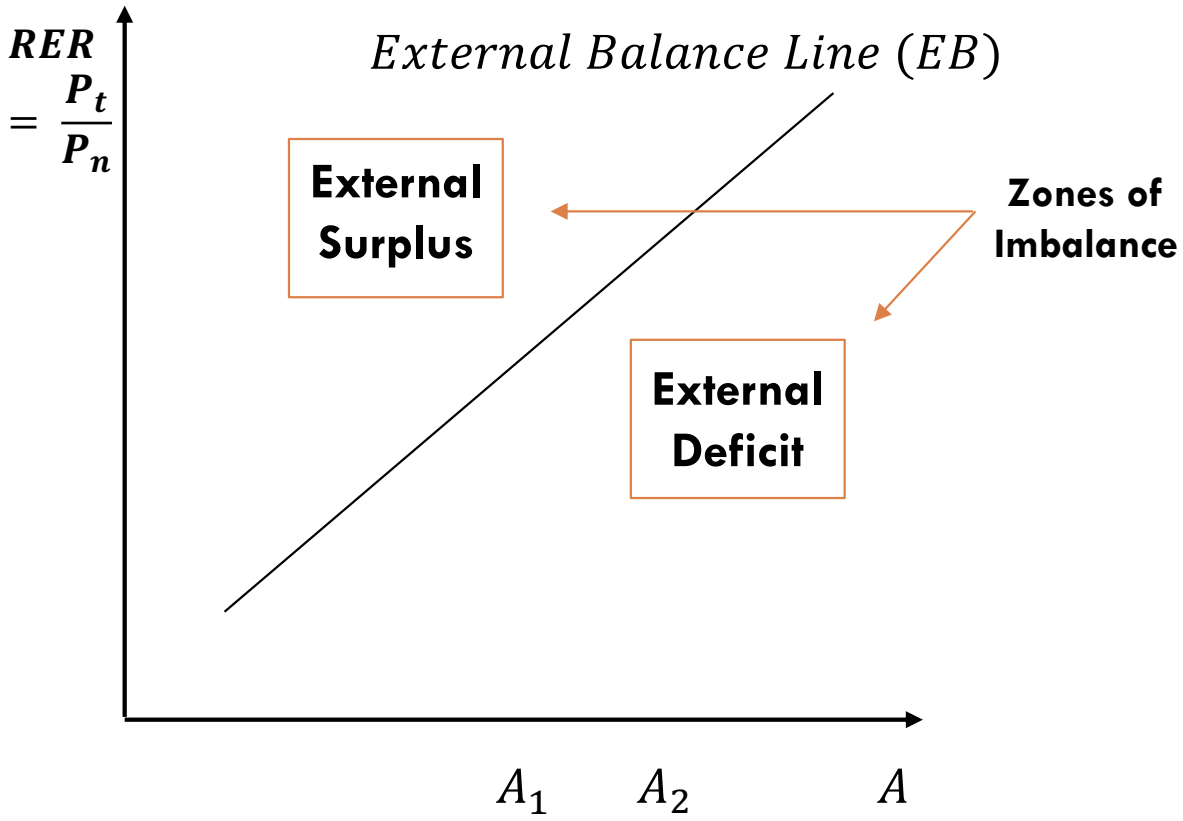
- **The economy is in external imbalance**
- **What kind of imbalance?**
  - Note: RER is below where it would be in balance
  - In other words, tradables are cheaper than they should be

What if Prices Don't Adjust



- **The economy is in external imbalance**
- **What kind of imbalance?**
  - This is describing a situation of internal surplus and external deficit

What if Prices Don't Adjust



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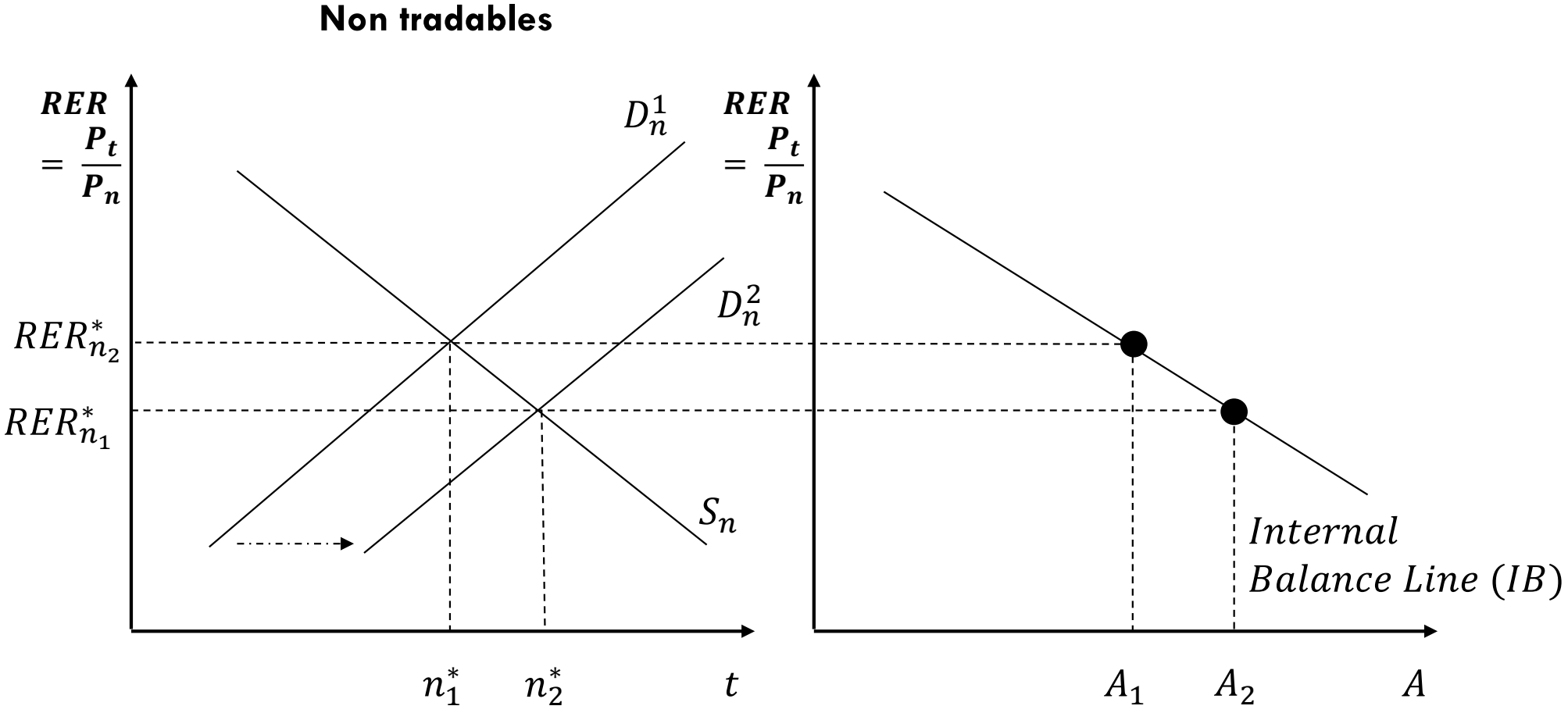
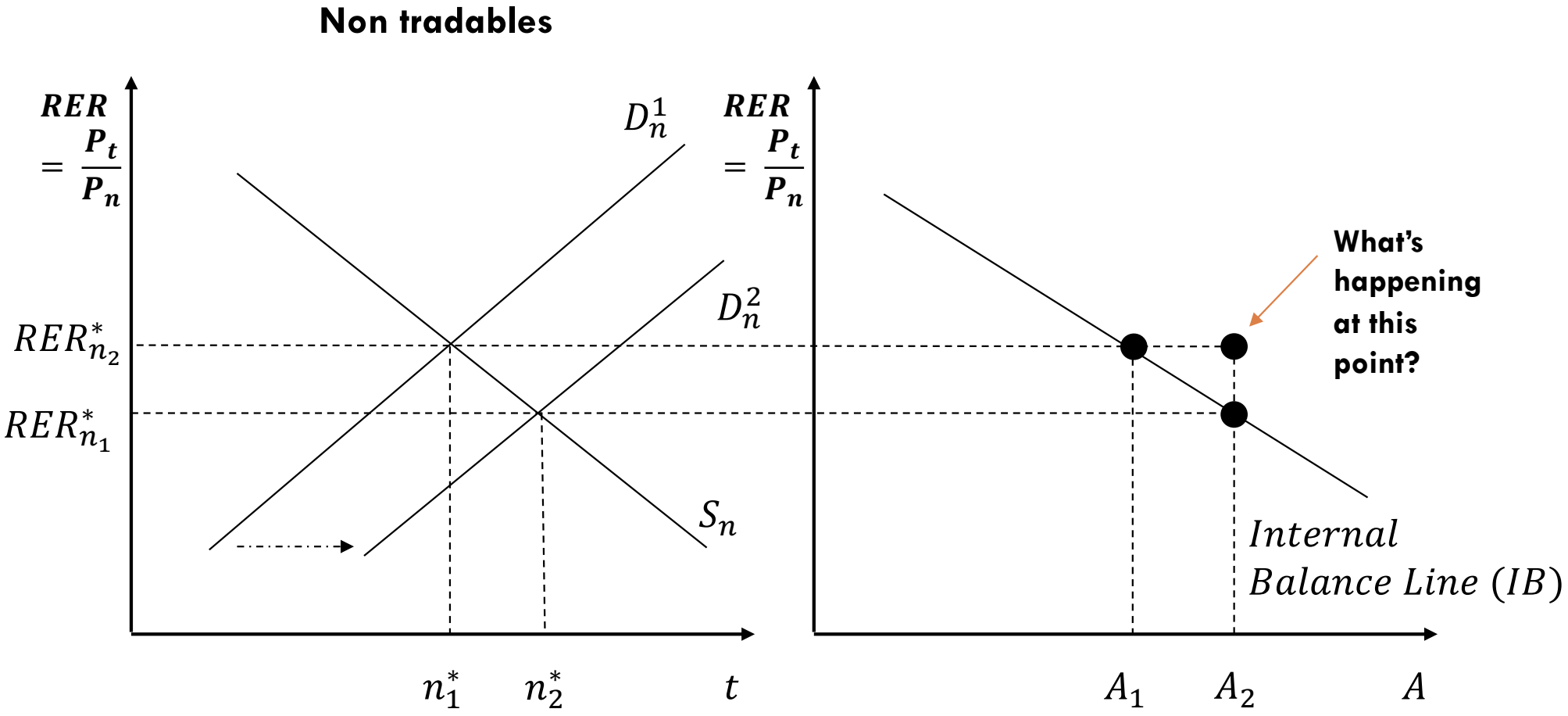
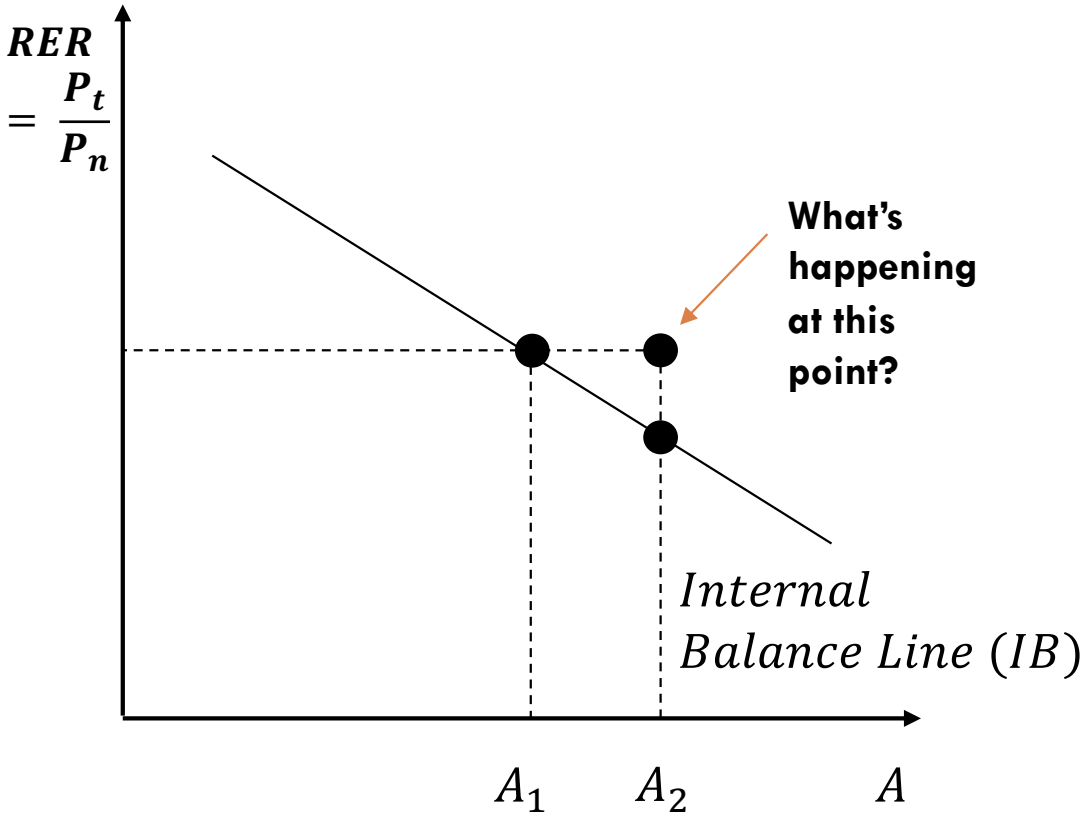
What About the Non-tradable Sector?



What if Prices are Sticky?

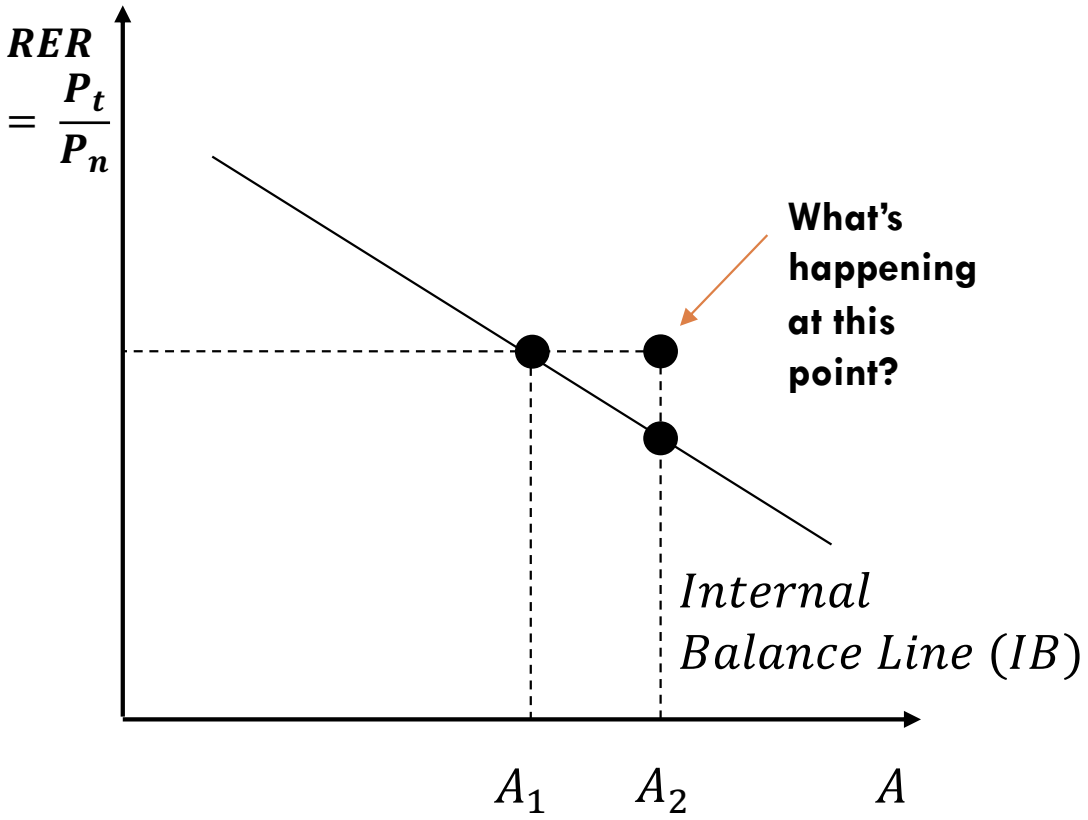


What if Prices Don't Adjust



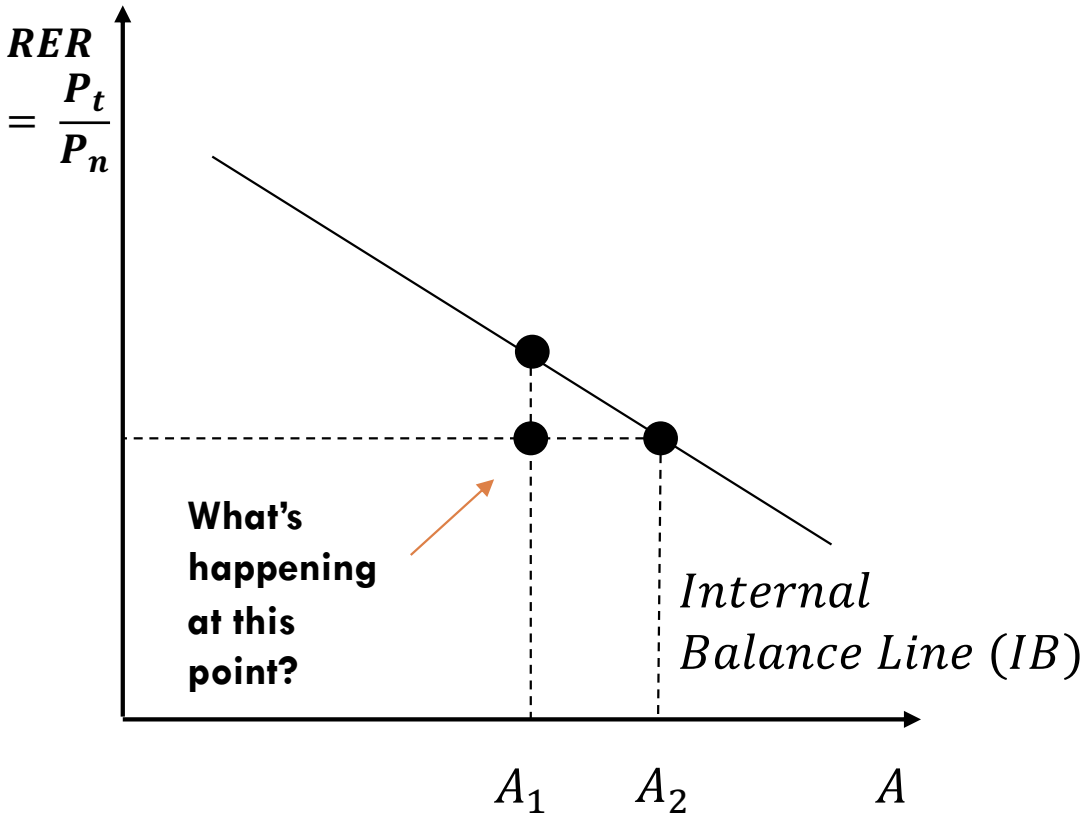
- **The economy is in internal imbalance**
  - The RER is above where it should be

What if Prices Don't Adjust



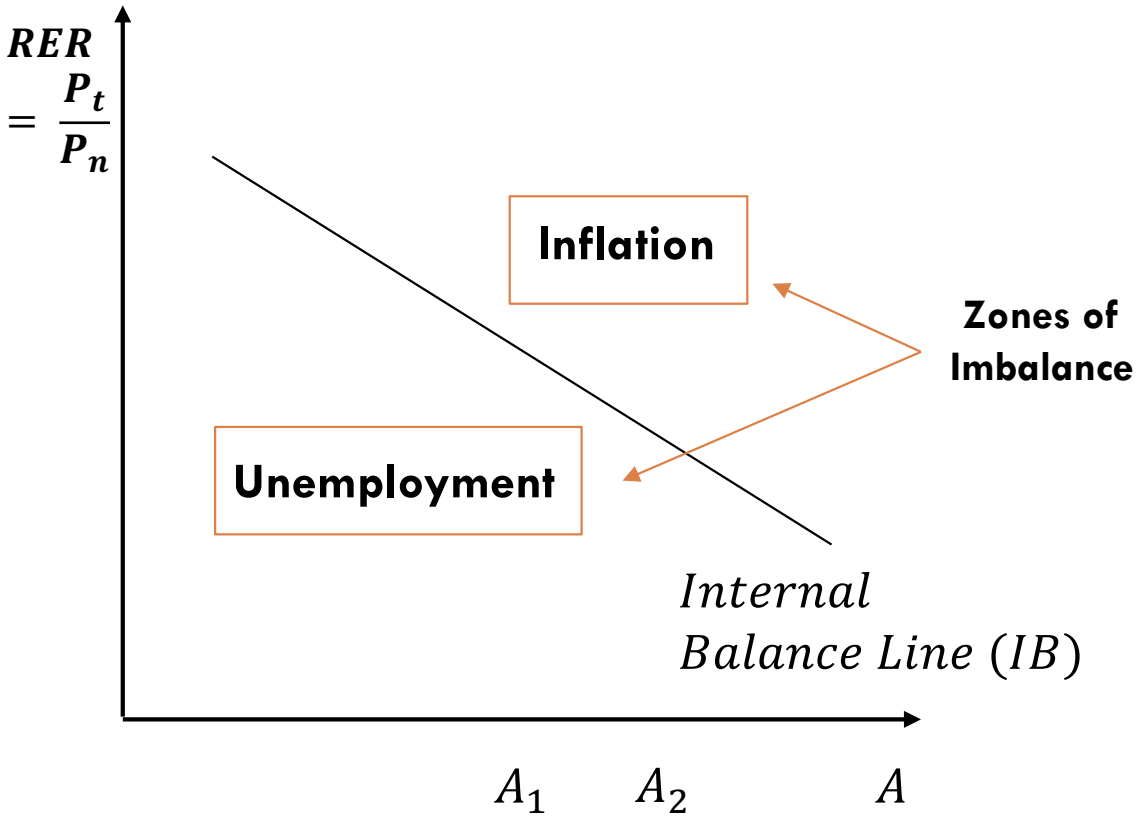
- **The economy is in internal imbalance**
  - Here demand for non-tradables exceeds supply
  - What will happen to domestic prices for non-tradables?
- **The Result: Inflation**

What if Prices Don't Adjust



- **The economy is again in internal imbalance**
  - Absorption is below where it should be
  - So people aren't consuming as much
  - **The result: Unemployment**

What if Prices Don't Adjust

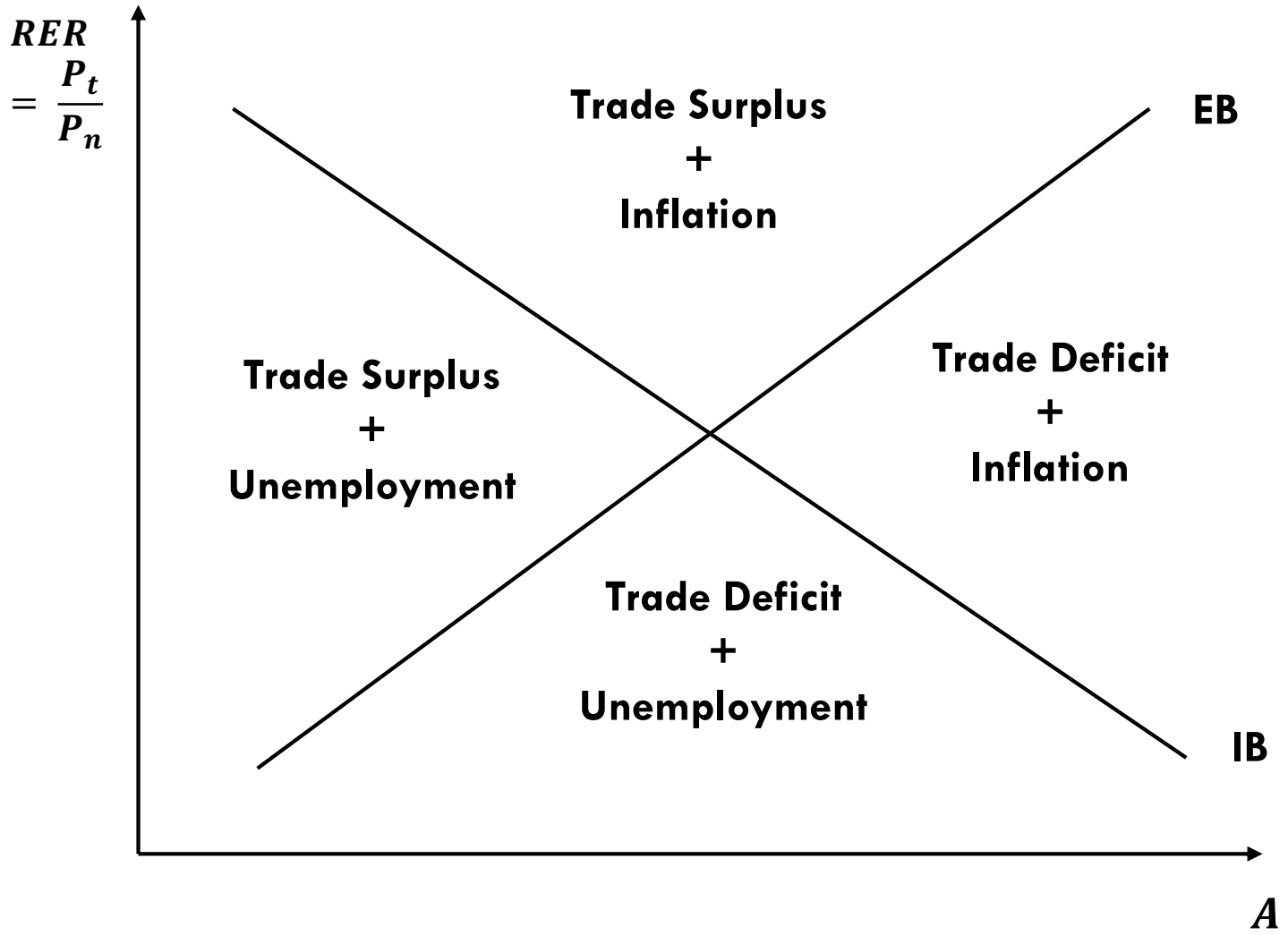


- **The economy is again in internal imbalance**
  - Absorption is below where it should be
  - So people aren't consuming as much
  - **The result: Unemployment**

So Many Charts…

- **So you may be thinking something like, "Yikes! This is a mess."**
- **There are a lot of charts and layers of analysis here**
- **Thankfully there is a way to reduce this all down into one chart for helpful analysis**
  - The Australian Model Phase Diagram

The Phase Diagram



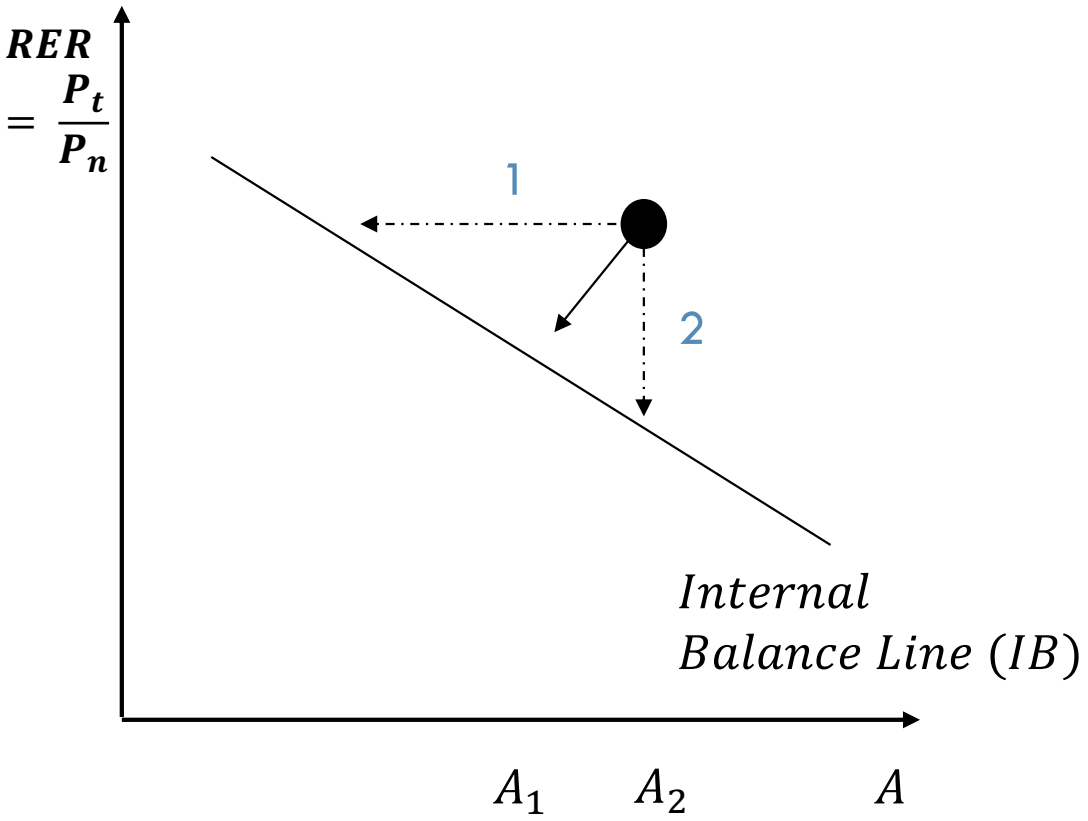
Implications for Growth

- **Inflation ⟹ Instability ⟹ Capital flight and Investment in Safe Price Stable Assets rather than productive projects**
  - Less capital
  - Less investment in technological innovation
- **Unemployment ⟹ Consumption and production are languishing**
  - Production capacity idle
  - Little incentive to invest in new technologies and capital formation
- **Trade Deficit ⟹ Currency leaving country ⟹ Decline in Money Supply ⟹ Interest Rates Go Up ⟹ Investment Declines**

Tendencies Toward Equilibrium

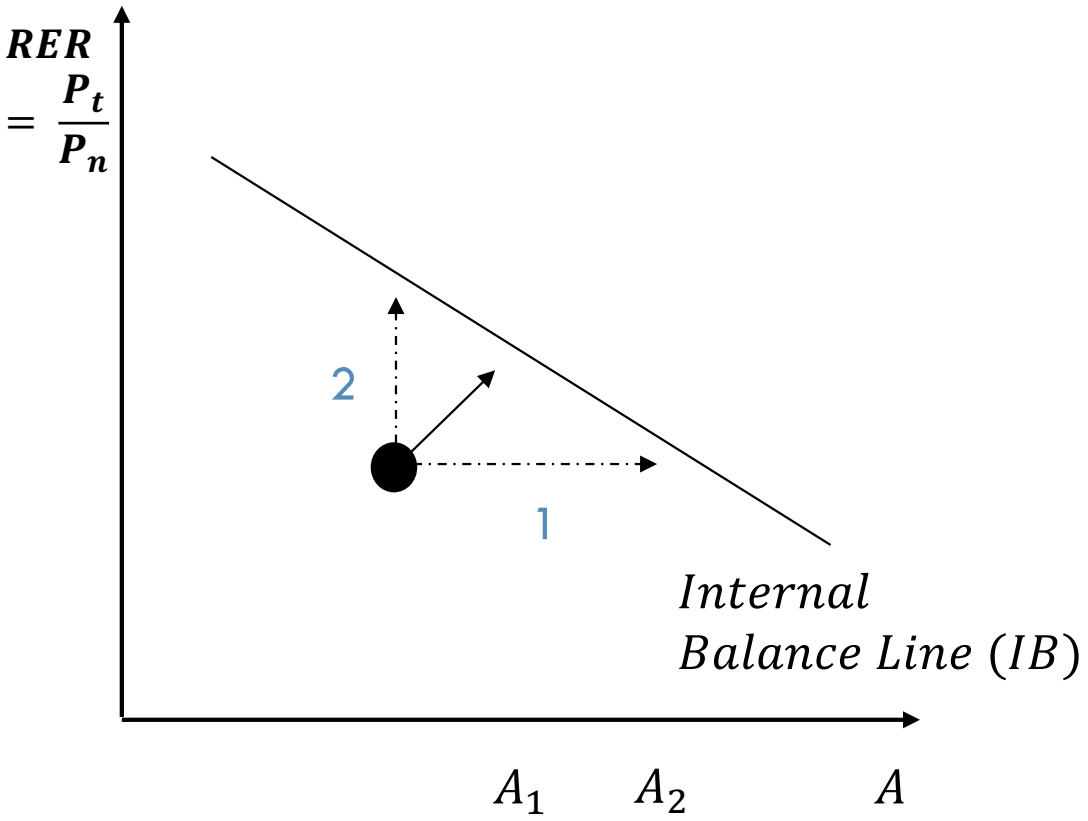
- If a country is off internal or external balance there will be naturally occurring forces that will bring you back to balance
- The next couple slides will discuss each of these

If Off Internal Balance



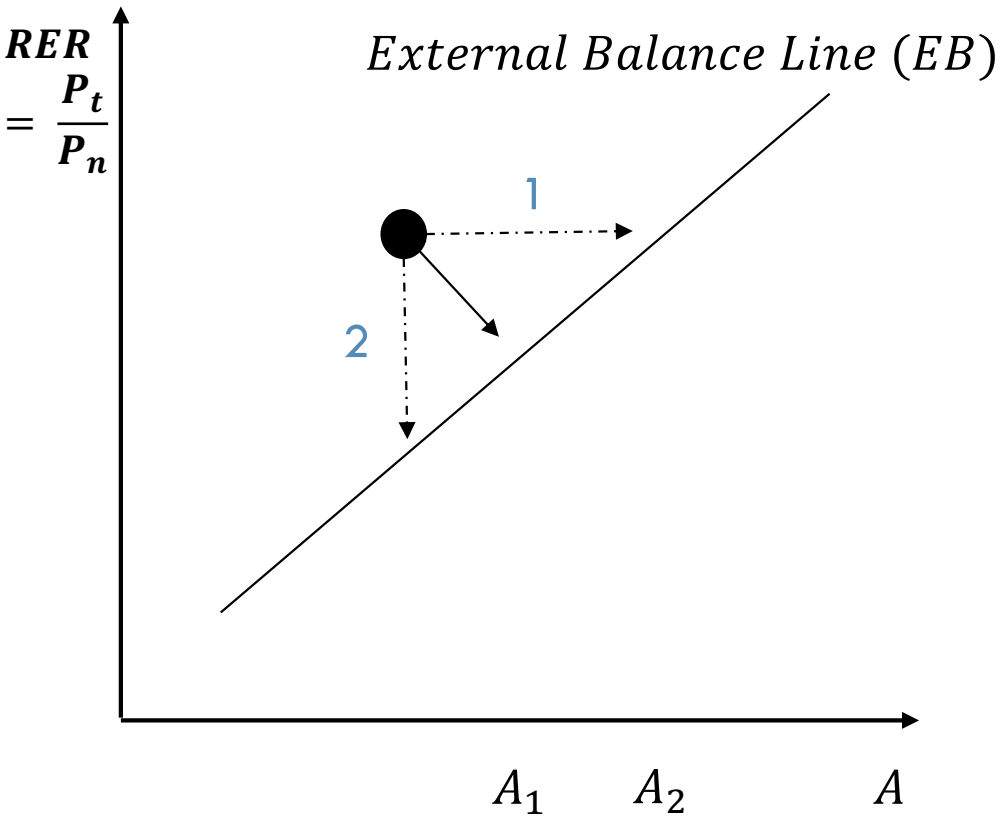
- **Eventually inflation causes prices to rise**
  1. The real value of A falls as P_n increases
  2. The RER declines as P_n increases

If Off Internal Balance



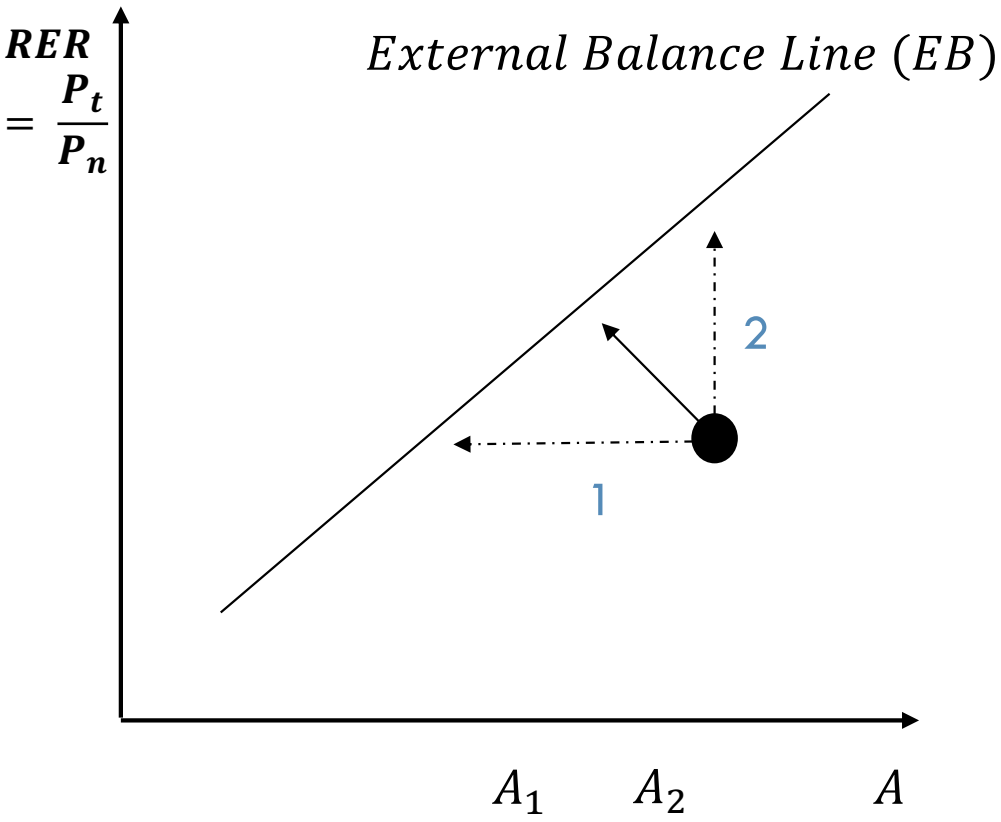
- **Eventually unemployment causes:**
  1. The real value of A increases as P_n declines
  2. The RER increases as P_n declines

If Off External Balance



- **In Trade surplus means**
  1. Money supply is increasing leads to decreasing interest rate, more investment and hence more absorption
  2. Inflow of foreign exchange leads to increase in demand for local currency, higher prices for non-tradables and a decrease in the RER

If Off External Balance



- **In Trade deficit means**
  1. Money supply is decreasing leads to increasing interest rate, less investment and hence less absorption
  2. Outflow of foreign exchange leads to decrease in demand for local currency, lower prices for non-tradables and an increase in the RER

So What's the Problem?

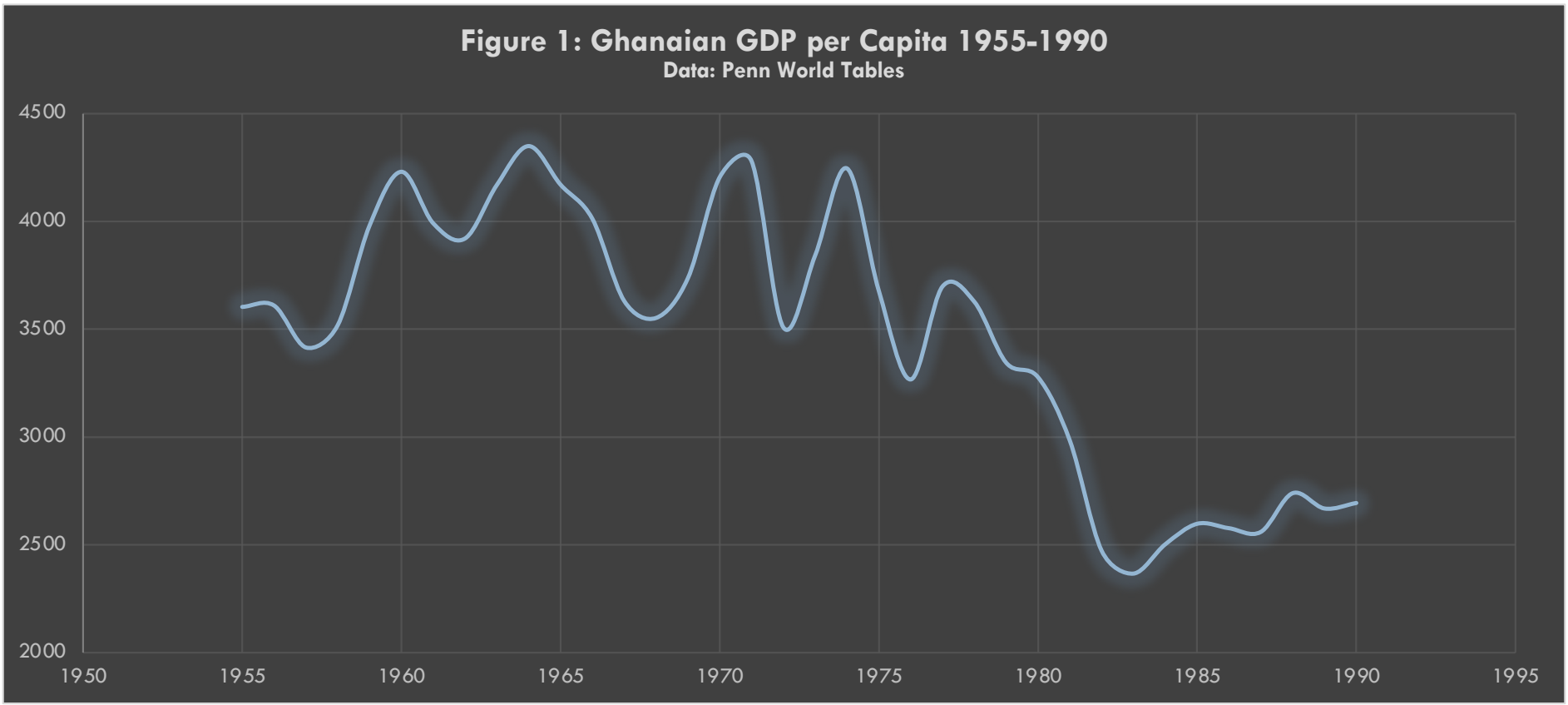
- Obvious question is why do we care about these zones of imbalance if the economy is just going to recover due to these naturally occurring forces?
- Answer: There are reasons why these naturally occurring forces might not actually happen or may take a very long time to happen, leaving the economy in a situation where it spends an extended (perhaps indefinite) period of time experiencing economic imbalance

Structural Rigidities

- **Why would prices not adjust?**
  - Politicians and/or oligopoly powers keep prices sticky
  - Contracts keep prices sticky
- **Why would absorption not adjust?**
  - Government unwilling to lower spending b/c of "political economy" interests
    - See Robert Bates (a Haverford alum) *Markets and States in Tropical Africa* if this interests you
  - Government increases spending over time to compensate for declining real value of absorption
  - Government not able to tax or able to borrow money

Application of the Model: Ghana and Import Substitution Industrialization (ISI)

- **Let's consider Ghana after it achieved independence from the UK**



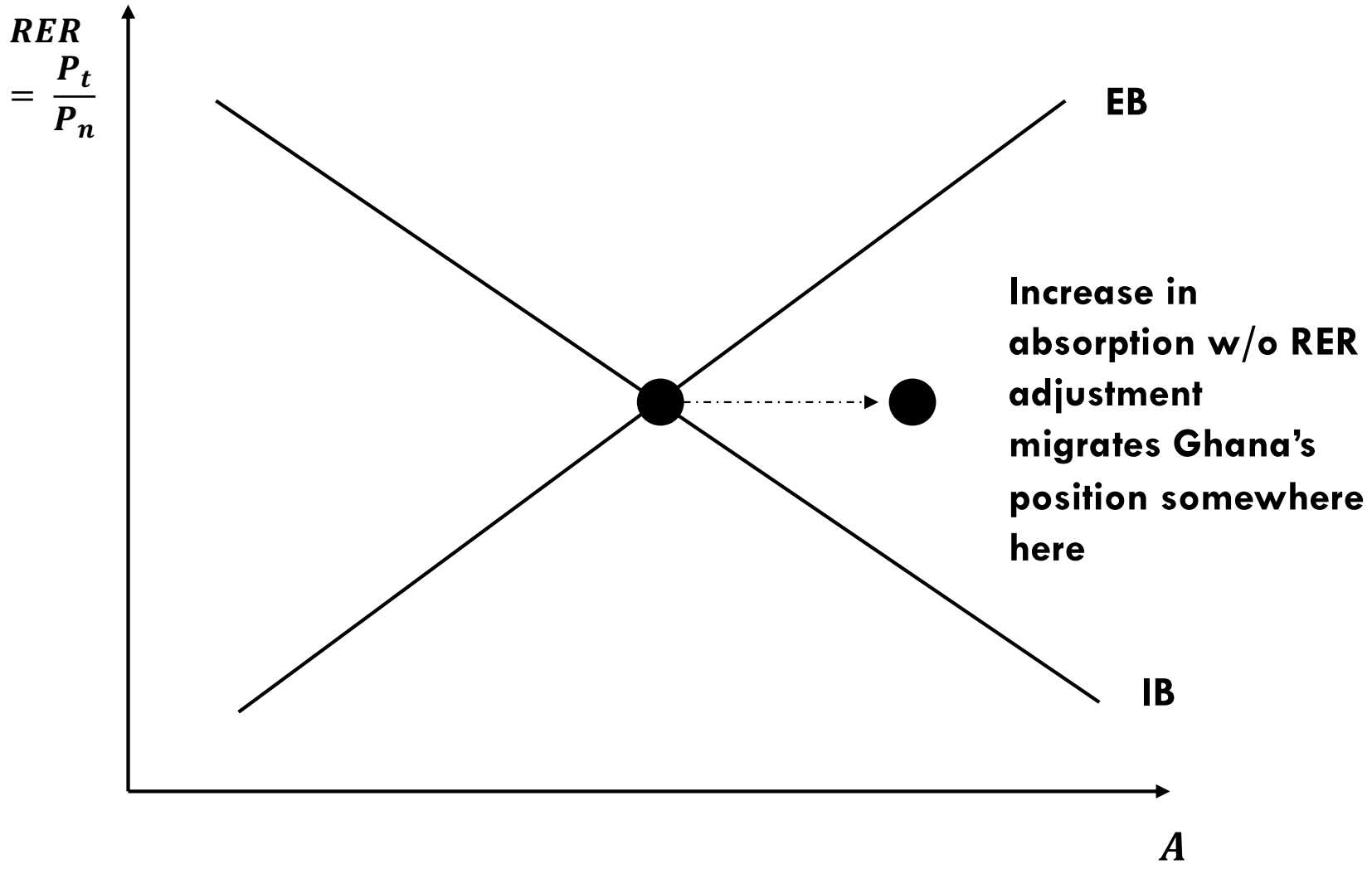
Policies After Independence: Import Substitution Industrialization (ISI)

- **Government borrows from domestic banks to finance large industrial projects**
- **Government is worried that foreign companies producing these same industrial products will still be able to sell them cheaper in Ghana**
  - Ghana establishes price controls and trade restrictions so that prices of foreign industrial products stay fixed in Ghana
- **Question for Groups: Use the Australian Model to make a prediction for how this will affect Ghana's economy in the short term (to start, assume these factories never become productive in any significant way)**

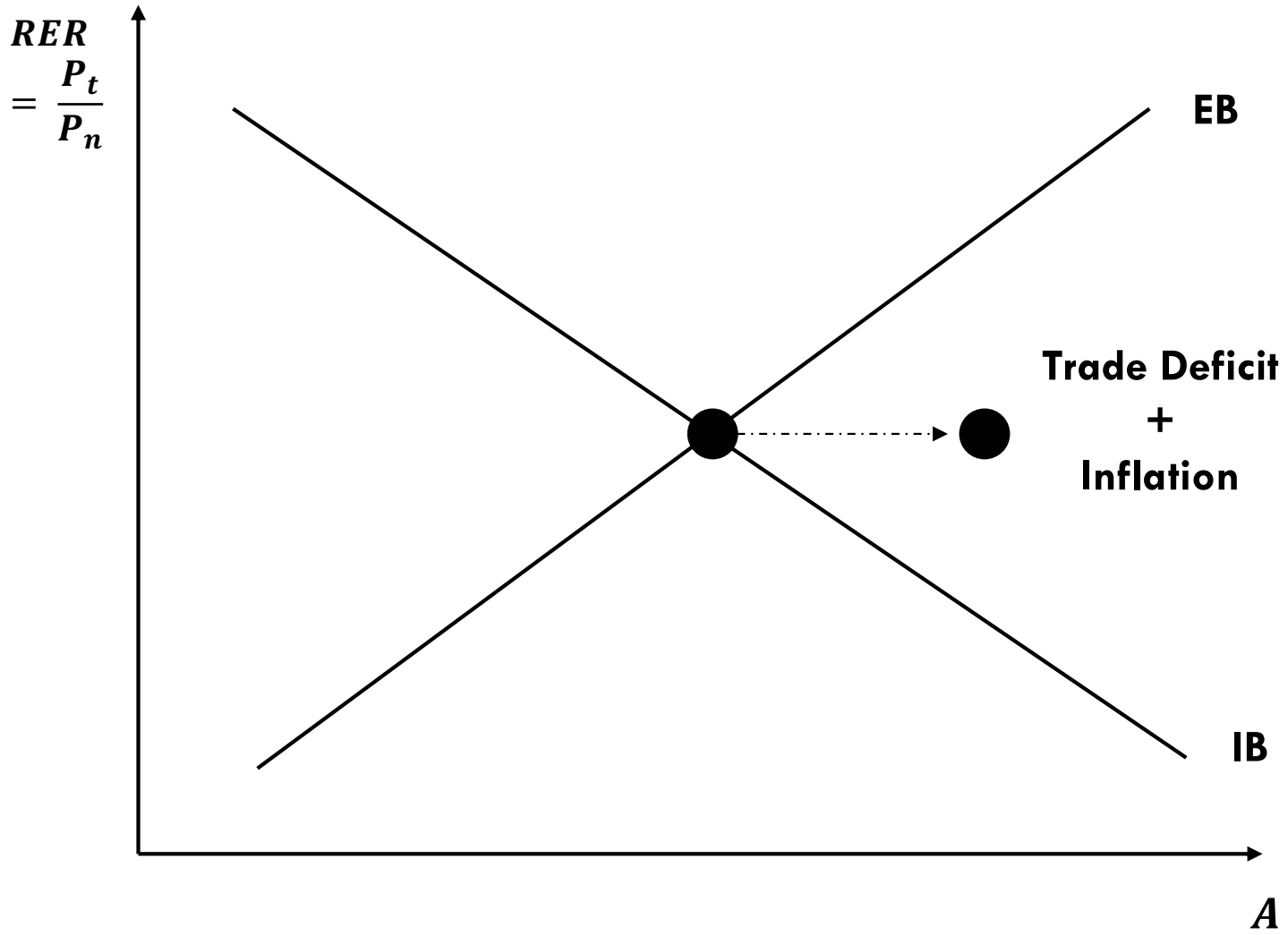
What Affect does this Have?

- **So Ghana is implementing a system where:**
  - The government is spending a ton of money to establish factories producing industrial products
    - What does this mean for absorption?
- **It is also fixing prices of foreign goods by law and other interventions so they cannot change**
  - What does this mean for the RER in Ghana?
- **So we have a situation where the RER is stuck, and the absorption is increasing**
- **Let's start the analysis assuming that prior to these actions Ghana was in IB and EB**
- **Let's assume these nascent industries are not productive for at least some period of time. What is happening?**

The Phase Diagram



The Phase Diagram



What is Happening in Private Industry at this New Point

- **We are seeing potentially very high inflation, and a large trade deficit**
- **Why is this bad for growth?**
  - **When economies become unstable like this, private industry will look for opportunities abroad to use their money or purchase non-productive assets with relatively stable prices**
  - This means capital used for productive purposes is decreasing
    - What does this mean in the context of the Solow Model?
      - Very bad: b/c capital accumulation can result in growth, AND investment can potentially drive technology growth
  - **Also, deficit means currency is leaving the country and the money supply is declining. This means higher interest rates and more downward pressure on investment**

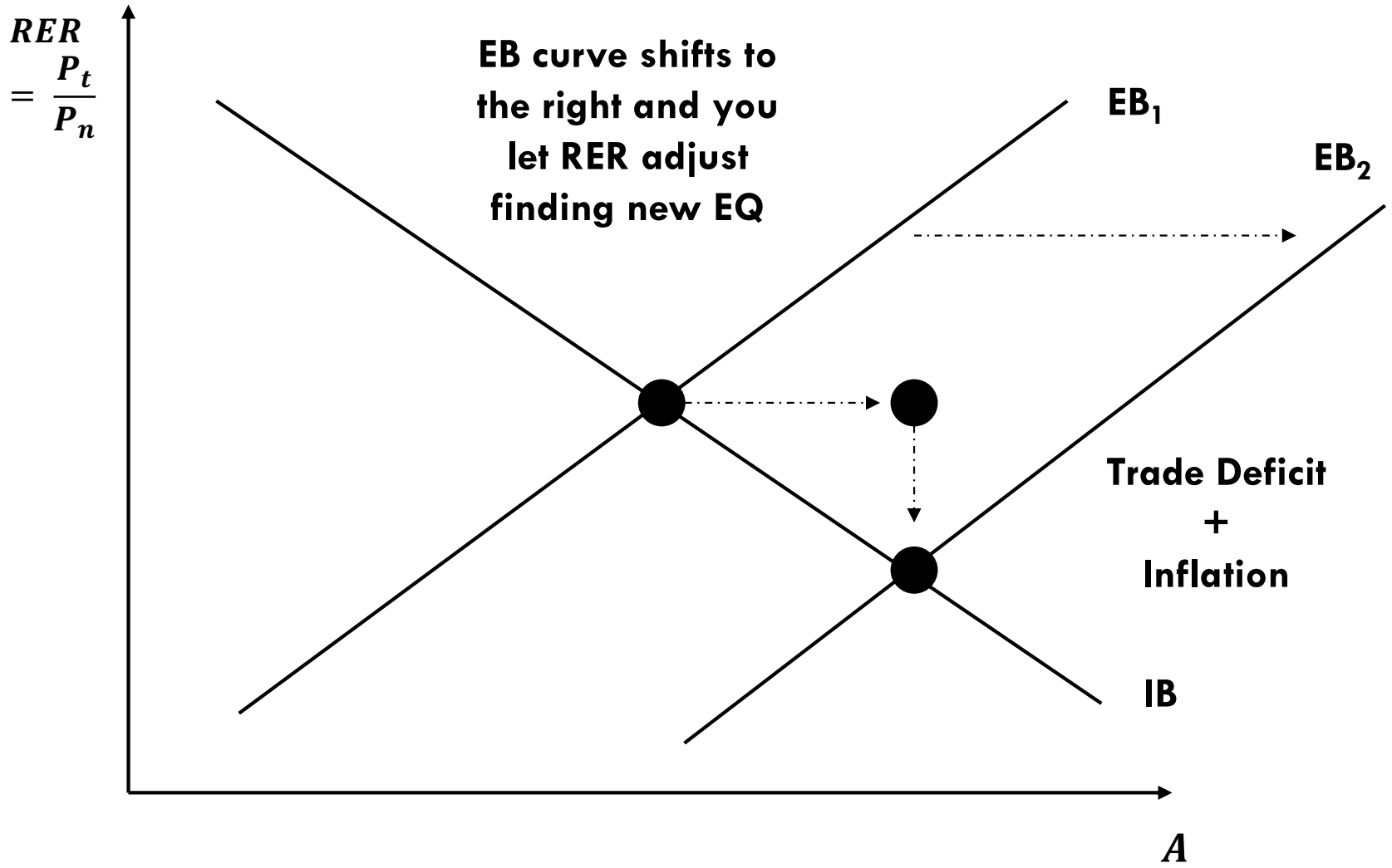
What's the Solution?

- **Ghana in this situation needs to get back to equilibrium on IB and EB**
- **Question: What could Ghana do to resolve inflation and the deficit? What are the costs of doing this?**
- **It could cut absorption**
  - Another word for this: "austerity"
  - But then it would lose its nascent industries
    - Employees lose their jobs
- **It could let the RER adjust**
  - This would at least get it back on IB and resolve the inflation
  - But then foreign firms outcompete its nascent industries and it loses them
  - Price of tradables will rise relative to non-tradables. People that consume a lot of tradables will be unhappy

Obtaining Equilibrium

- **Question for Groups: If these nascent industries eventually become competitive in the global marketplace, show using the Australian Model how Ghana could resolve the inflation and deficit**

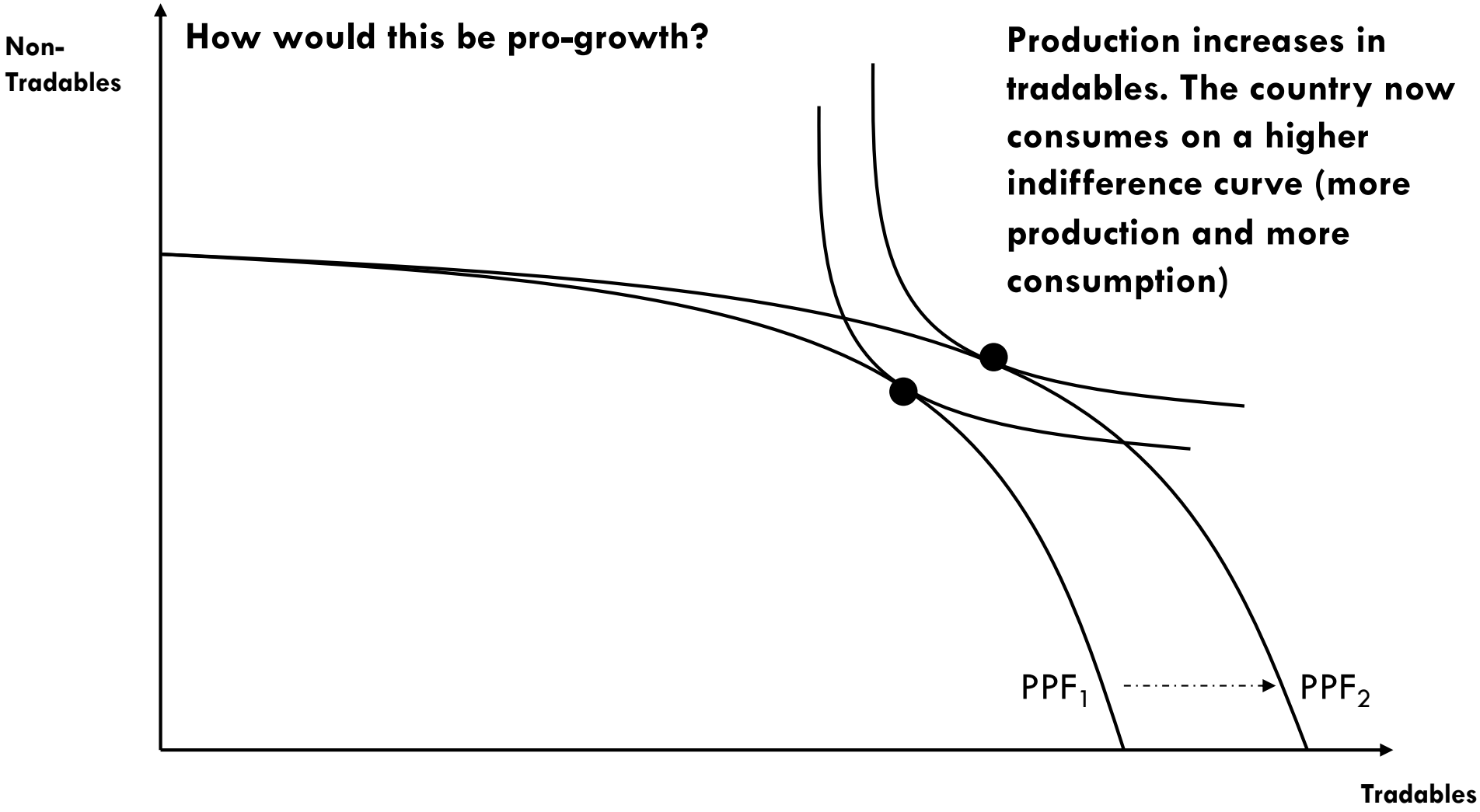
What Happens if these Industries Become Productive and Competitive?



Obtaining Equilibrium

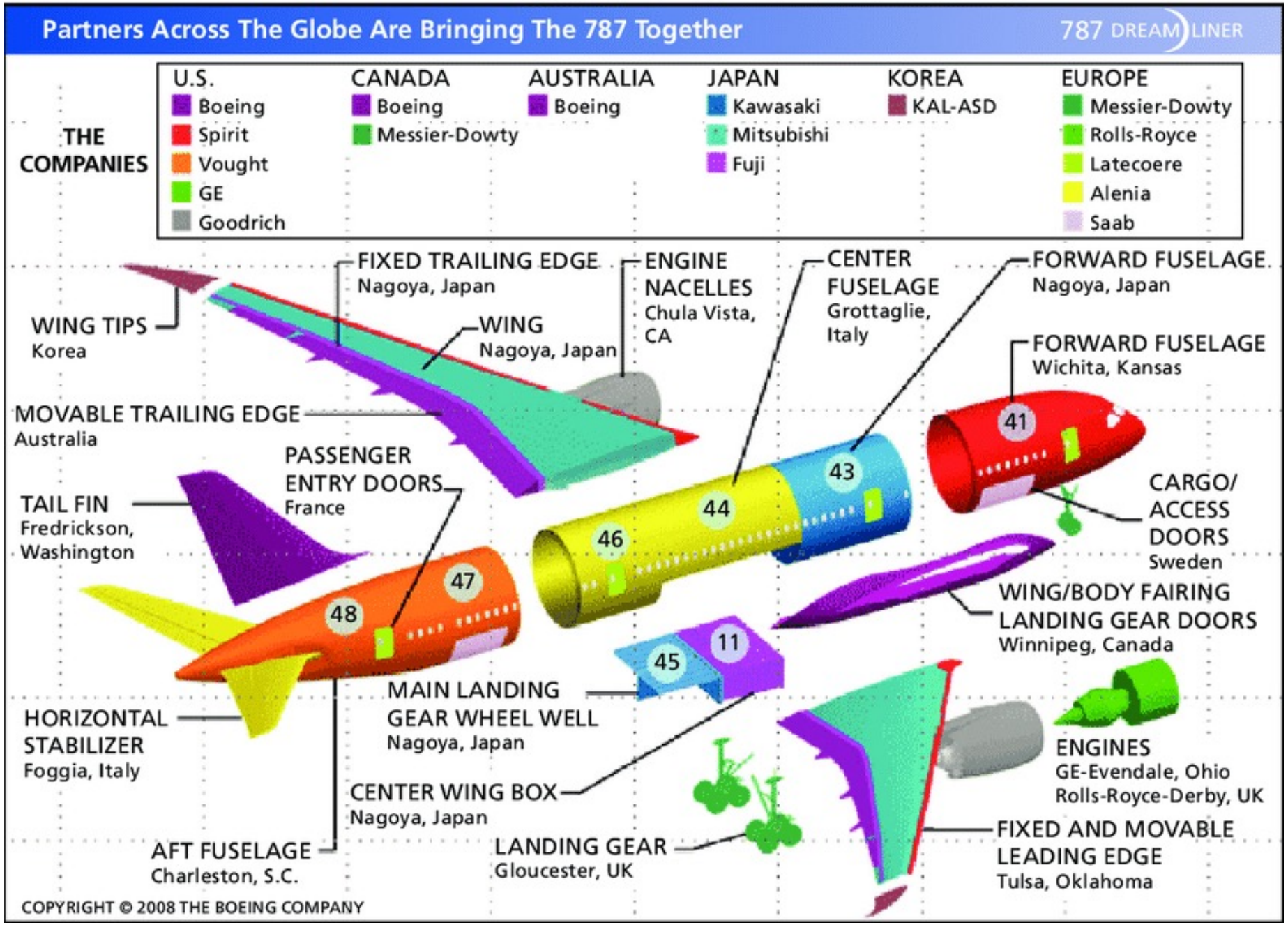
- Question for Groups: If these nascent industries eventually become competitive in the global marketplace, show using the Australian Model how Ghana could resolve the inflation and deficit
- How would this affect growth? Show this using the PPF.

Changes in the PPF



Going Back

- **What are some of the challenges to these nascent industries becoming competitive on the global market?**
  - How could they become competitive when insulated from competitive pressure?
  - Complex final goods often require supply chains from many other countries. Trade restrictions keeping prices high makes these inputs more expensive!


Partners Across The Globe Are Bringing The 787 Together
787 DREAMLINER
THE COMPANIES
U.S.
Boeing
Spirit
Vought
GE
Goodrich
CANADA
Boeing
Messier-Dowty
AUSTRALIA
Boeing
JAPAN
Kawasaki
Mitsubishi
Fuji
KOREA
KAL-ASD
EUROPE
Messier-Dowty
Rolls-Royce
Latecoere
Alenia
Saab
FIXED TRAILING EDGE
Nagoya, Japan
ENGINE NACELLES
Chula Vista, CA
CENTER FUSELAGE
Grottaglie, Italy
FORWARD FUSELAGE
Nagoya, Japan
WING TIPS
Korea
WING
Nagoya, Japan
FORWARD FUSELAGE
Wichita, Kansas
MOVABLE TRAILING EDGE
Australia
PASSENGER ENTRY DOORS
France
41
43
44
46
TAIL FIN
Fredrickson, Washington
CARGO/ ACCESS DOORS
Sweden
47
48
WING/BODY FAIRING
LANDING GEAR DOORS
Winnipeg, Canada
11
45
MAIN LANDING GEAR WHEEL WELL
Nagoya, Japan
HORIZONTAL STABILIZER
Foggia, Italy
ENGINES
GE-Evendale, Ohio
Rolls-Royce-Derby, UK
CENTER WING BOX
Nagoya, Japan
FIXED AND MOVABLE LEADING EDGE
Tulsa, Oklahoma
AFT FUSELAGE
Charleston, S.C.
LANDING GEAR
Gloucester, UK
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Going Back

- **What are some of the challenges to these nascent industries becoming competitive on the global market?**
  - How could they become competitive when insulated from competitive pressure?
  - Complex final goods often require supply chains from many other countries. Trade restrictions keeping prices high, results in retaliatory measures by these foreign countries making these inputs more expensive!
  - Low technical capacity in low-income countries. Tanzania only had two engineers after the independence period (Akyeampong, 2018)

- **Question for Groups: If Ghana wants to give the nascent industries more time to become competitive, what can it do?**
  - Continue to borrow and subsidize until creditors become worried
  - Cut other govt. services and direct resources to the nascent industries
  - Print money once all borrowing is exhausted
  - Tax large productive sectors of the economy. What is this in Ghana and many other poor countries?
    - Answer: Agriculture

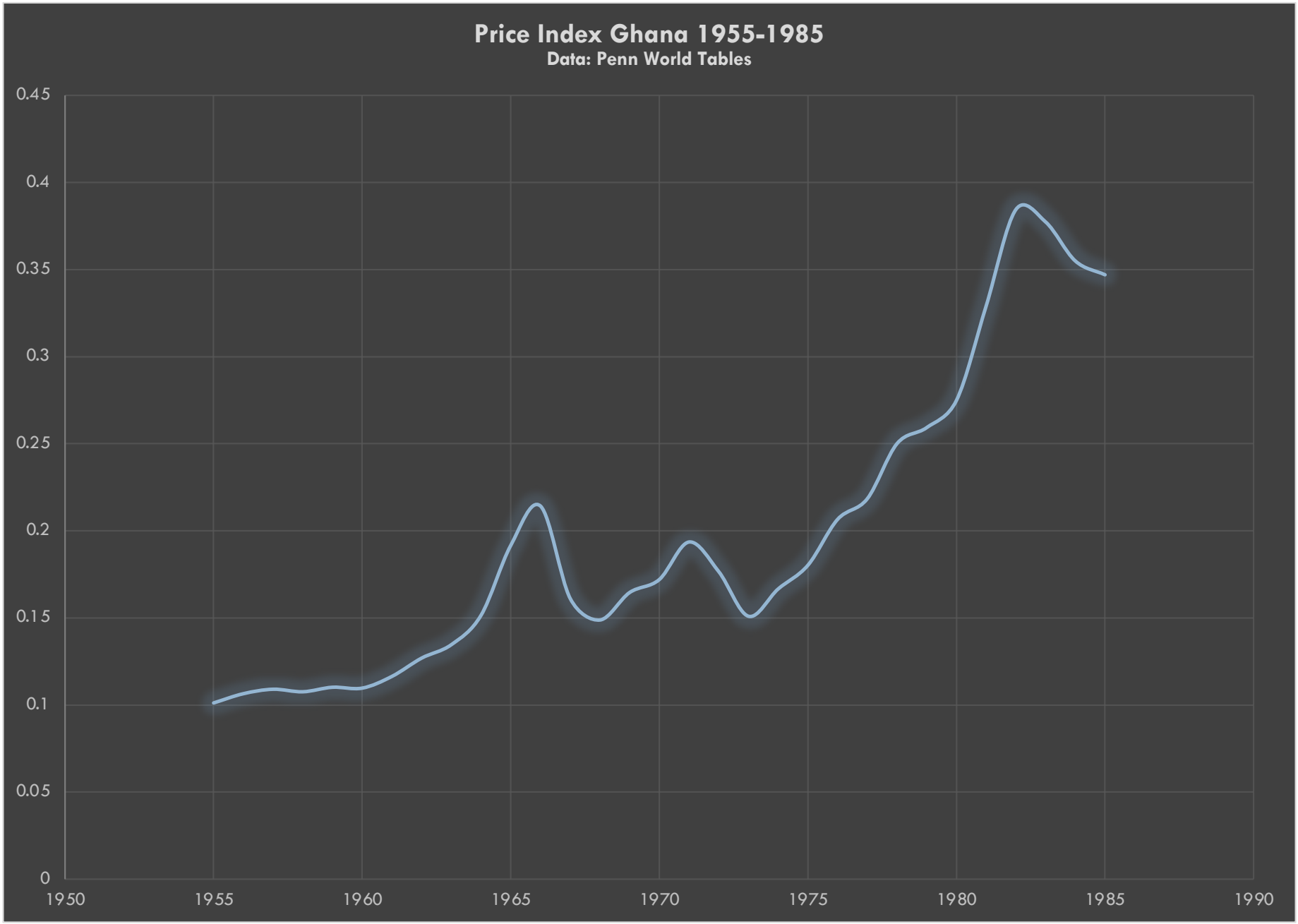
Prolonging the Situation

- **What are the effects of this if the industries never become competitive?**
  - **Continued borrowing**
    - $\Longrightarrow$ Higher interest rates and larger national debt. Borrowing for everything govt. wants to do becomes harder
  - **Shift resources from other govt. functions to the nascent industries**
    - $\Longrightarrow$ Decline in quality and coverage of healthcare, education system, infrastructure, etc. (think about what this means for TFP!)
  - **Print money**
    - $\Longrightarrow$ Worse inflation (more currency chasing the same amount of goods)
  - **Taxing Agriculture**
    - $\Longrightarrow$ Incentivizes transition to informal economy and erodes tax base over time. Further erodes trade balance (less agricultural exports). Can result in more inflation (if incentivizes less production and exacerbates scarcity)

Disclaimer: Not sure if Ghana itself ever actually pursued these options.

This Never Happens

- **Most nascent industries in Ghana never become competitive**
  - Completely insulated from competitive pressures their entire existence
- **Eventually Ghana runs out of options**
  - Can't borrow,
  - can't tax
  - so they can't spend any more on these nascent industries
- **Exports have collapsed and they are all out of foreign currency**
- **Investors have been worried about the stability of the country and investment has completely dried up**
  - Slow capital accumulation
  - Slow technological progress
  - GDP per capita collapses by almost 1/3 in early '80s as govt. can't prop up the economy any more


Price Index Ghana 1955-1985
Data: Penn World Tables
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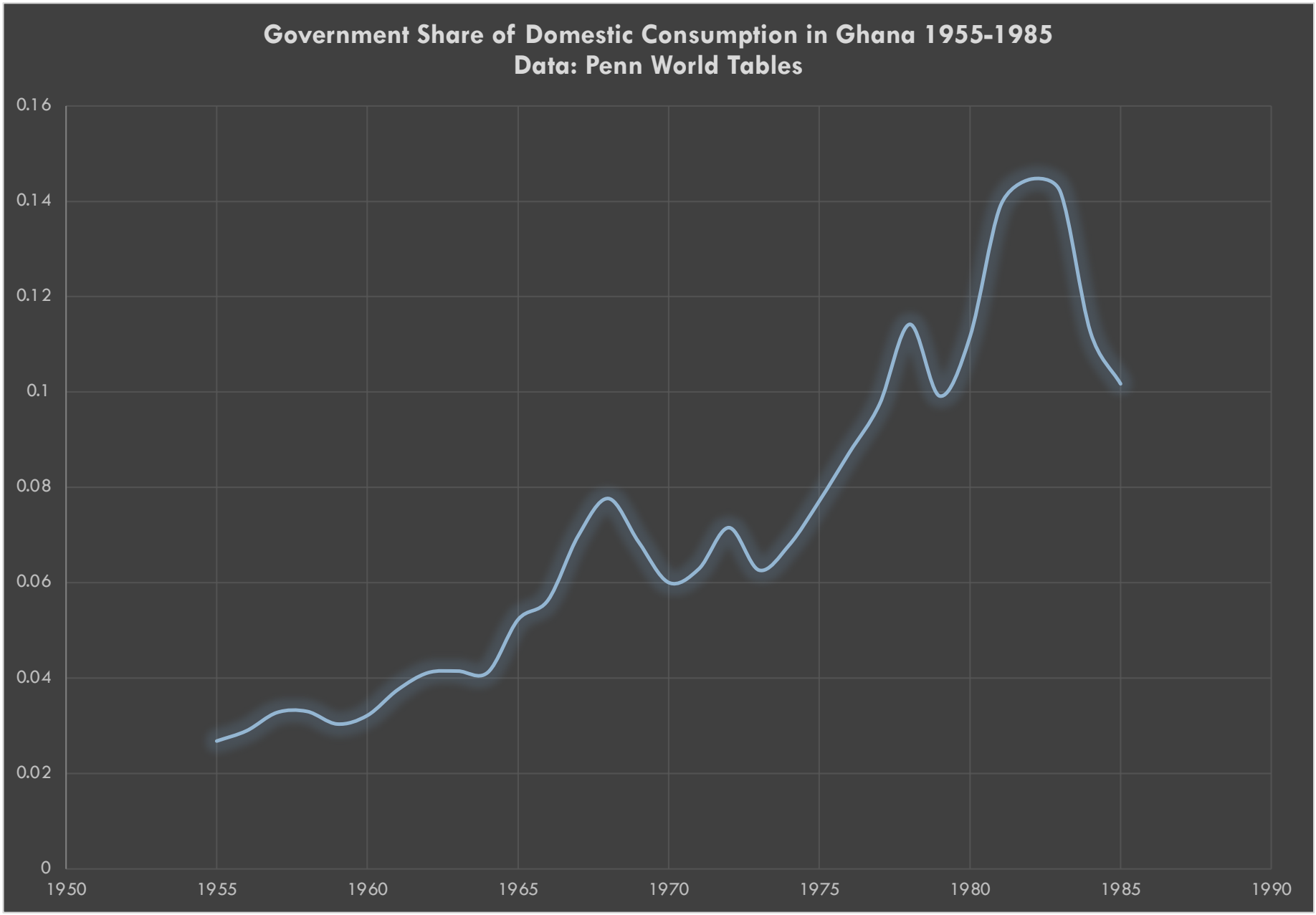
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1950
1955
1960
1965
1970
1975
1980
1985
1990


Government Share of Domestic Consumption in Ghana 1955-1985
Data: Penn World Tables
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0.14
0.12
0.1
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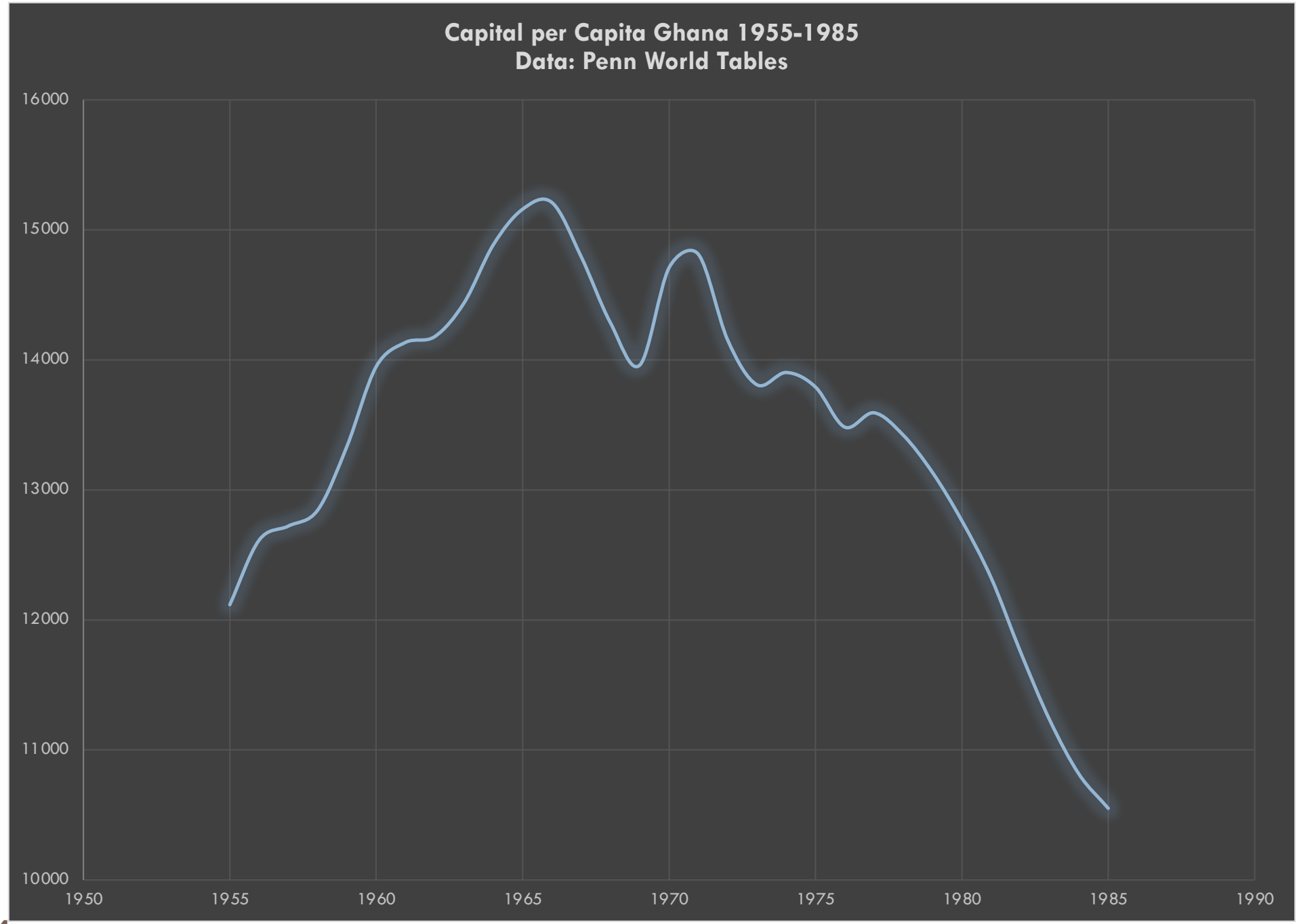
Capital per Capita Ghana 1955-1985
Data: Penn World Tables
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13000
12000
11000
10000
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1955
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1985
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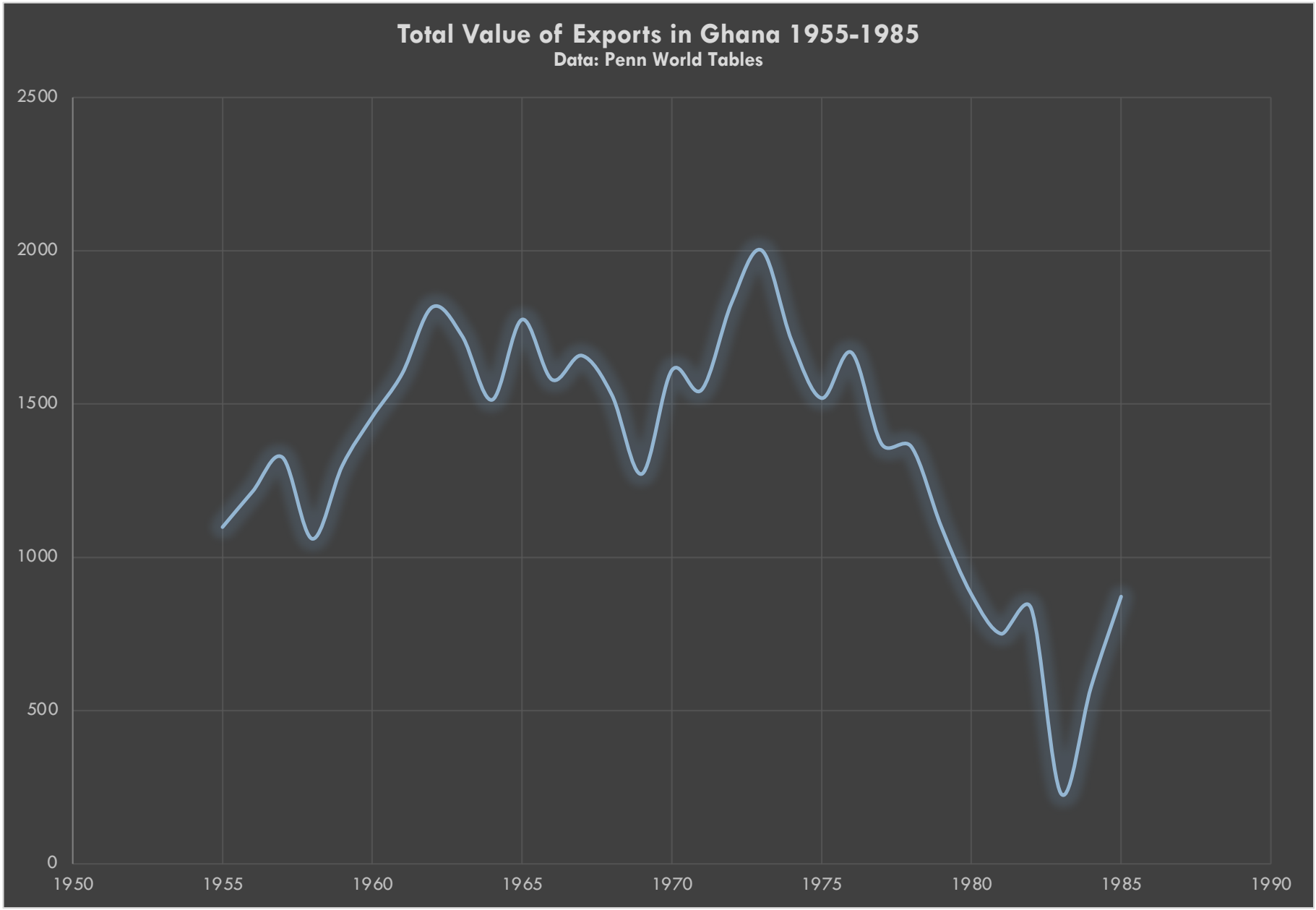
Total Value of Exports in Ghana 1955-1985
Data: Penn World Tables
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1500
1000
500
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1955
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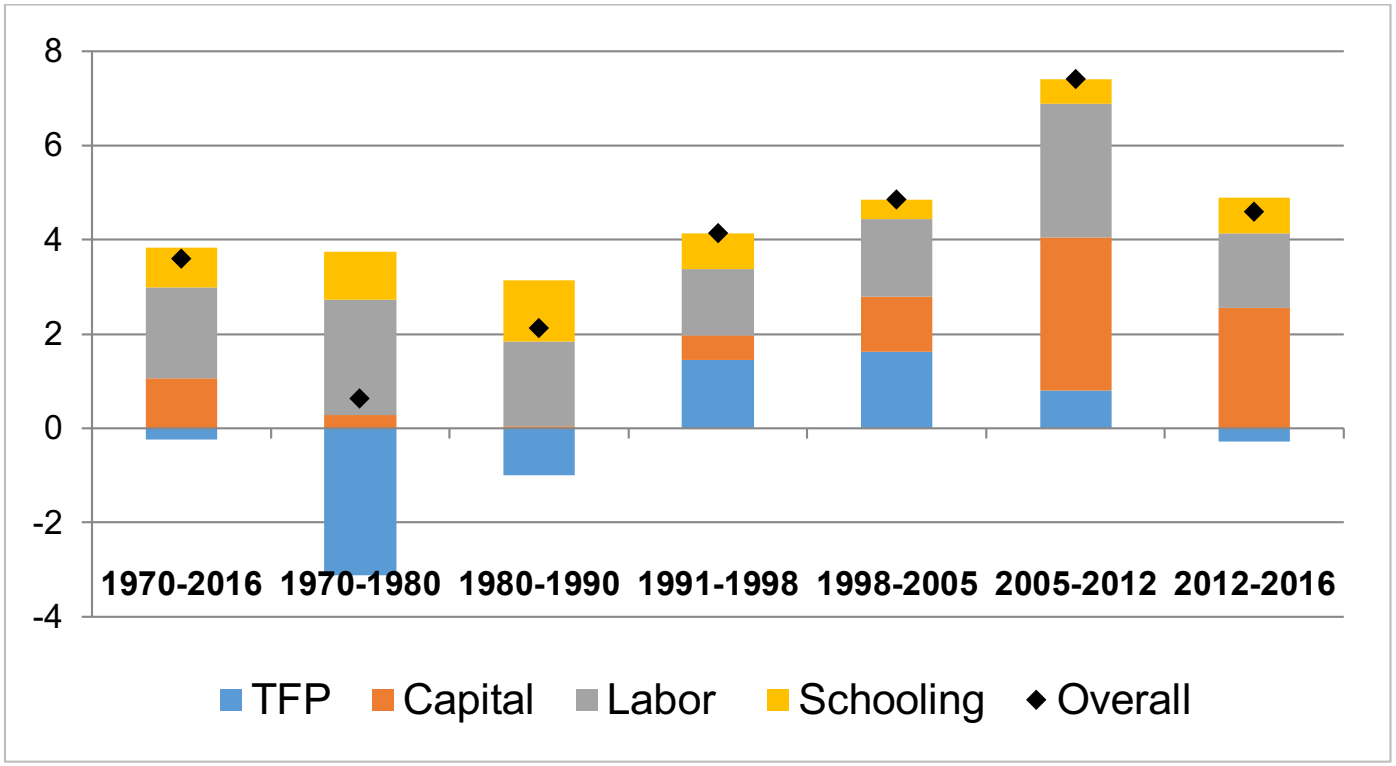
Ghana Growth Accounting 1970-2016



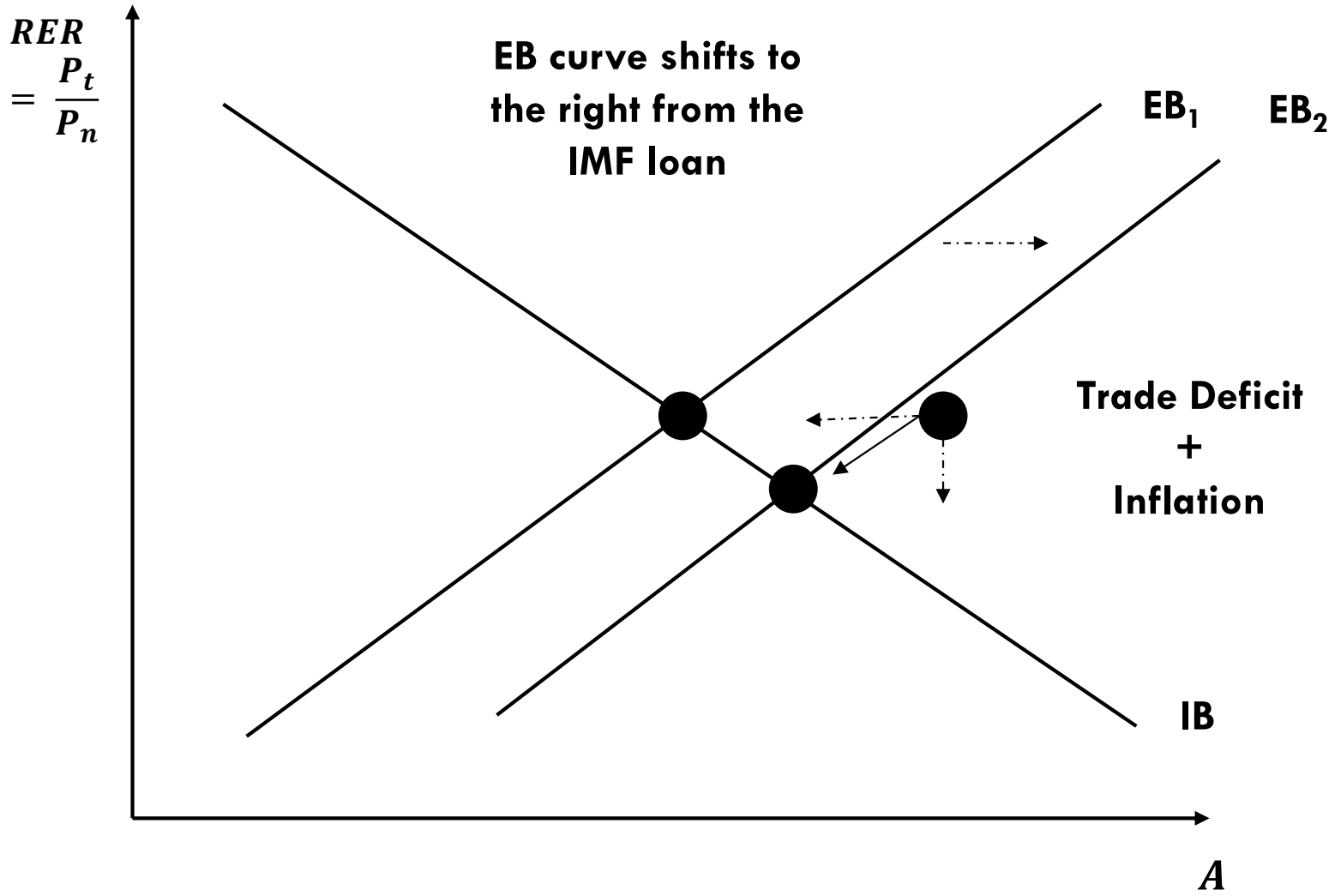
(World Bank, 2018)

I.

Ghana Requests a Loan from the International Monetary Fund (IMF) in 1983

- **IMF conditions loan to Ghana on, among other things, allowing the RER to adjust, and**
- **Austerity (cutting government spending)**
- **What is the effect of this? (Use the phase diagram)**
  - Hint: The aid package increases the **supply of tradables** (through increasing the ability to buy them)

What Happens if these Industries Become Productive and Competitive?



Conclusions from the Australian Model

- There are no other options. Without the emergence of those nascent industries, the country has to cut absorption and let the RER adjust
- The loan helps to lessen the trauma by shifting out the EB curve in the way it does

IMF Policy Intervention

- **Many countries pursued these types of policies after independence. Ghana was not the only one. Many sought loans from the IMF sometime in the 80s and 90s**
- **This type of intervention, stabilization loans conditioned on austerity and elimination of RER controls is called "structural adjustment"**
  - Hugely controversial set of policies
  - Why? (Next slide)

Controversy Around Structural Adjustment (Simplified)

- **Cuts in absorption were highly traumatic**
  - Nascent industries employed a lot of people and many many people lost their jobs and healthcare
- **For a period of time, non-industrial tradables become very expensive as the RER adjusts**
  - Some governments were using other price controls to keep non-industrial consumer tradables to keep standards of living high and letting the RER adjust eliminated these
- **IMF using its leverage to dictate domestic policies reminiscent many of colonial relationships**

More Controversy

- **So what's the conclusion of ISI policies? Are they bad?**
  - Depends who you ask. As depicted by the Australian Model here, they can definitely negatively affect growth if those nascent industries never become competitive
  - To be fair, many scholars argue that ISI isn't the problem and point to unfair attributes of the international system and actions by the rich countries in response to ISI as the real problem

More Controversy

References

Akyeampong, Emmanuel, 2018. "African socialism; or, the search for an indigenous model of economic development?", *Economic History of Developing Regions* 33(1): 69-87.

World Bank, 2018. *Ghana - Priorities for Ending Poverty and Boosting Shared Prosperity (English)*. Washington, D.C. : World Bank Group. http://documents.worldbank.org/curated/en/175681543268250421/Ghana-Priorities-for-Ending-Poverty-and-Boosting-Shared-Prosperity