

# *Paper 4:* TRADE & DEVELOPMENT

SUMMARY NOTES

*Luca F. Righetti (lfr29)*

*University of Cambridge | Economics: Part II A (2018/19)*

## Table of Contents

<b>Basics .....</b>	<b>4</b>
Patterns of Trade.....	4
Key Terms.....	4
<b>Ricardian Model (Discrete) .....</b>	<b>4</b>
Set Up.....	4
Autarky.....	5
Free Trade .....	5
<b>Ricardian Model (Continuous).....</b>	<b>6</b>
Set Up.....	6
Free Trade .....	6
Comparative Statics .....	7
Extensions of the Model.....	8
<b>Gravity Equation.....</b>	<b>8</b>
<b>Rising Wage Inequality .....</b>	<b>9</b>
Introduction .....	9
Factors .....	9
Conclusion.....	10
<b>Ricardo-Viner Specific Factors Model .....</b>	<b>11</b>
Set Up.....	11
Autarky.....	11
Free Trade .....	11
Offshoring.....	12
<b>Heckscher-Ohlin Model: Substitutes .....</b>	<b>13</b>
Set Up.....	13
Autarky.....	13
Free Trade .....	13
Empirical Application.....	14
<b>Heckscher-Ohlin Model: Leontief .....</b>	<b>16</b>
Set Up.....	16
Autarky.....	16
Free Trade .....	16
<b>Immigration.....</b>	<b>17</b>
Theory.....	17

Evidence .....	17
<b><i>Outsourcing</i></b> .....	<b>18</b>
Basic Model of Wages (Feenstra-Hanson Theory) .....	18
Basic Model of Production.....	19
<b><i>Multi-nationals</i></b> .....	<b>20</b>
Basics.....	20
Facts .....	20
Head's Model.....	20
Brainard Model.....	21
Principles of Taxation.....	21
<b><i>Tariffs</i></b> .....	<b>22</b>
Stylized Facts.....	22
Small Open Economy (PPF-IC) .....	22
Large Open Economy (SS-DD) .....	23
Broda, Limao, Weinstein (2008) Model of Optimum Tariffs .....	23
<b><i>Trade Policy</i></b> .....	<b>24</b>
Bagwell and Staiger Model of Reciprocity.....	24
McLaren (2013) Model of Stabilization .....	25
Grossman and Helpman (1994) Model of Interest Groups.....	26
Empirical Evidence.....	26
<b><i>Development Accounting</i></b> .....	<b>28</b>
**Caselli (2005): Accounting for Cross-Country Income Differences.....	28
Further Discussion.....	29
<b><i>Geography</i></b> .....	<b>30</b>
**Dell, Jones, & Olken [DJO] (2012): Temp. shocks and econ. growth .....	30
**Acemoglu, Johnson, & Robinson [AJR] (2012): Reversal of Fortune .....	31
Further Discussion.....	32
<b><i>Institutions</i></b> .....	<b>32</b>
**AJR (2001): The Colonial Origins of Comparative Development.....	32
**Pappaioanou & Michalopoulos [PM] (2014): National Institutions and Subnational Development in Africa.....	33
Further Discussion.....	35
<b><i>History</i></b> .....	<b>35</b>
**Nunn (2008): The Long Term Effects of Africa's Slave Trades .....	35

**Dell (2010): The Persistent Effect of Peru's Mining Mita .....	37
Further Discussion.....	38
<b>Culture .....</b>	<b>38</b>
**Tabellini (2010): Culture and Institutions.....	38
Further Discussion.....	40
<b>Political Economy.....</b>	<b>42</b>
**Miguel, E. (2004). Tribe or nation? .....	42
Further Discussion: Public Goods .....	43
Further Discussion: Modelling Voting .....	44
<b>Human Capital .....</b>	<b>47</b>
< Nutrition >.....	47
< Health > .....	48
< Education > .....	49
**Banerjee et al (2007): Remedyng Education .....	49
**Jensen (2010): Perceived Returns To Education and Demand for Schooling .....	50
Further Discussion.....	51
<b>Foreign Aid .....</b>	<b>51</b>
Brief History of Development Policy .....	51
Is Aid good? – Perspectives.....	52
Is Aid good? – Evidence.....	52

# Basics

## Patterns of Trade

*What are the key drivers of trade?*

- Transportation infrastructure and distance matter. Trade is concentrated among high-income countries (but middle income are rising over past 20y). Low or zero import tariffs facilitate more.

*What types of trade are there?*

- Some commodities trade in one direction (US cereal, Mexico beer, China clothing). Other in two (US-EU chemicals, US-EU machinery)

*How does trade grow?*

- An exporter can expand in a key commodity (EU cars); import markets grows richer (China), a country expands competency (Chinese computer), production is fundamentally reorganized (global value chains)

## Key Terms

- Domestic value added in gross exports:** Difference between gross output at basic prices and intermediate consumption at purchasers' prices (a % share of value)
- Import content of exports:** Share of imported inputs in the overall exports of a country and of its exported goods and services used as imported inputs to produce other countries' exports. Reflects the extent to which a country is a user/producer of foreign inputs
- Terms of Trade:**  $\frac{P_X}{P_M}$ , the higher the better

# Ricardian Model (Discrete)

## Set Up

### Key Assumptions

- There are two countries with labour endowments ( $L^S = 390$ ;  $L^N = 130$ ) producing two goods
- There is full employment (i.e.  $L^i = L_c^i + L_F^i$ )
- Technology is CRS (i.e.  $f_A^i = a_A^i L_A^i$ ) and differs between countries:
 

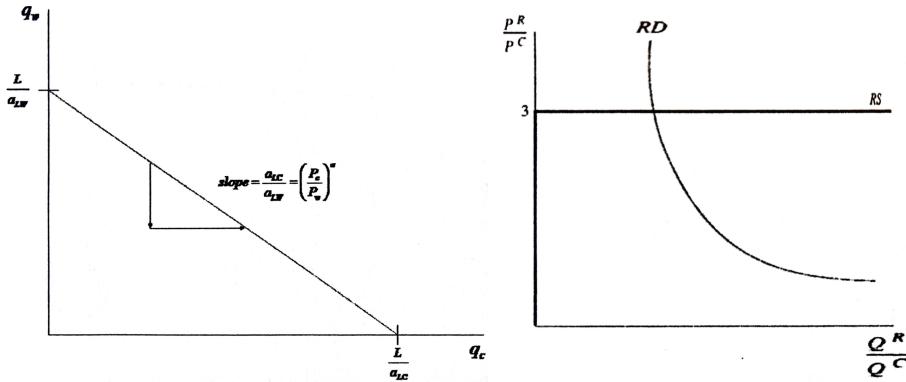
	US	Nig
$a_R$	1.5	1.0
$a_C$	1.5	0.33
- Preferences are given by CD utility function  $U = (C^R)^\alpha (C^C)^{1-\alpha}$  that is identical across countries. Thus consumers spend a fixed share of Income on each good. In this specific case we say  $\alpha = 0.5$ .

### Comparative Advantage

- The country with the lowest opportunity cost of producing a good has a comparative advantage in that good (i.e. A in C iff  $\frac{a_C^A}{a_R^A} > \frac{a_C^B}{a_R^B}$ ). By definition, a country must have a comparative advantage, even if it has an absolute advantage in nothing.
- Absolute advantage has no importance for the pattern of trade, but is important for the international distribution of income.

## Autarky

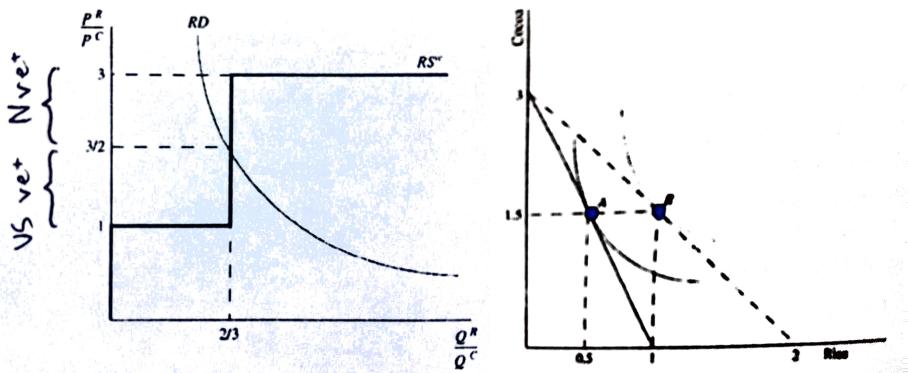
- From full employment we know  $L = a_C q_C + a_W q_W$  and thus PPF is given by  $q_R = \frac{L}{a_R} - \frac{a_C}{a_R} q_C$
- Under autarky production occurs at the tangency of PPF and IC. Production = consumption
- We can derive the relative supply curve of  $R$  in  $N$  by noting the following behavior: Worker produces rice if  $\frac{P^R}{P^C} > 3$ , cocoa if  $\frac{P^R}{P^C} < 3$ , and is indifferent if  $\frac{P^R}{P^C} = 3$
- We can derive the relative demand curve of  $R$  in  $N$  via CD. Maximize utility given the budget constraint to solve for relative demand.



## Free Trade

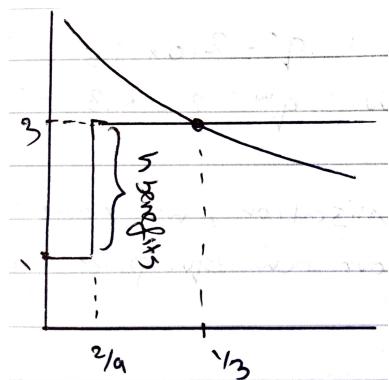
### *Internal Equilibrium*

- We can derive the relative world supply curve of  $R$  by noting the following behavior: Both produce cocoa if  $\frac{P^R}{P^C} < 1$ , US-rice and N-cocoa if  $1 < \frac{P^R}{P^C} < 3$ , and both price if  $\frac{P^R}{P^C} > 3$ .
  - $RS\left(\frac{P^R}{P^C}\right) = \frac{2}{3}$  making the initial assumption that US, N specialize
  - $RD\left(\frac{P^R}{P^C}\right) \equiv \frac{C^R}{C^C} = \frac{0.5I/p^R}{0.5I/p^C} = \frac{p^C}{p^R}$
  - So internal equ. @  $\frac{P^R}{P^C} = \frac{3}{2}$ . If this lies on vertical portion of RS our assumption is justified
- We use this new price line to obtain new PPFs, which reveal the new equilibrium pattern of trade



### Boundary Equilibrium

- Suppose that internal equ.  $\frac{p^R}{p^C}$  doesn't lie on vertical part of RS (i.e. can't completely specialize)
- Instead we will have partial specialization and we use boundary solution for  $\frac{p^R}{p^C}$  to find  $\frac{Q^R}{Q^C}$ . In such cases all the ToT gains go to just a single country since the price ratio only changes for one



### Welfare Analysis

- With an interior equilibrium, both countries strictly gain from trade (i.e. improved terms of trade) because each country fully specializes in the good in which it has a comparative advantage.
  - IRL example:* Nigeria has an approximately 80% autarky ratio in cereals which was forced by policies of Pres (national security, avoid price fluctuations)
- International distribution of welfare will depend on ToT and thus absolute advantage. GDP capacity matters (i.e.  $a_A^i L_A$ ) since bigger countries can't specialize as much and hence don't gain as much.

## Ricardian Model (Continuous)

### Set Up

#### Key Assumptions

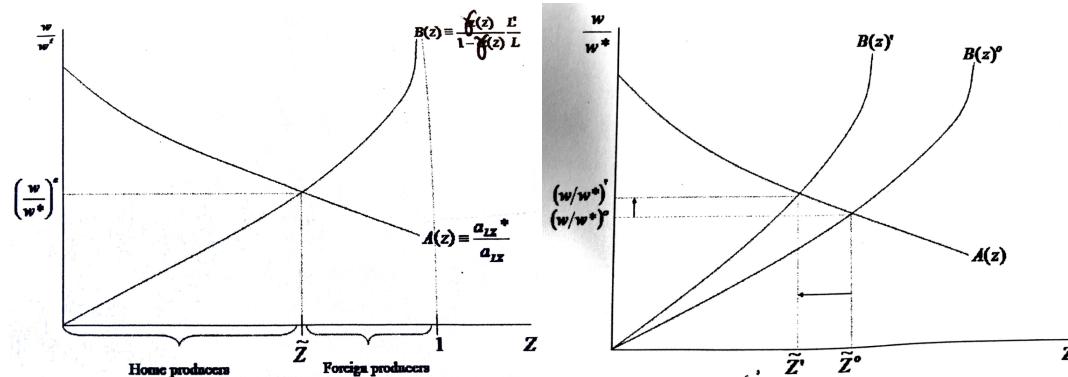
- There are two countries producing  $Z$  goods indexed from 0 to 1 according to  $A(z) = \frac{a_z^*}{a_z}$  [i.e. the bigger the number the relatively better Home is at making  $z$ ] with CRTS throughout
- Both countries have identical, homothetic preferences that are given by CD so that a constant expenditure share is spent on the  $z^{\text{th}}$  good
- We assume that there must be balanced trade (i.e. value of  $M^i$  = value of  $X^i$ ). By definition the share of income below  $\tilde{z}$  is  $\gamma(\tilde{z}) = \int_0^{\tilde{z}} b(z) dz$  and above  $1 - \gamma(\tilde{z})$ . Moreover,  $Y = wL$  and  $Y^* = w^*L^*$

### Free Trade

#### Solving For Equilibrium

- Goods are produced at Home as long as  $p_z \leq p_z^*$  hence  $wa_z \leq w^*a_z^*$  hence  $\frac{w}{w^*} \leq A(z)$ . We note that for a given relative wage there must be some cutoff good  $\tilde{z}$ .

- From the balanced trade condition we know that  $[1 - \gamma(\tilde{z})]wL = \gamma(\tilde{z})w^*L^*$ , which rearranges to  $\left(\frac{w}{w^*}\right)^e = \frac{\gamma(\tilde{z})}{1-\gamma(\tilde{z})} \frac{L^*}{L} = B(\tilde{z})$
- Plotting  $A(z)$  and  $B(z)$  on the same graph allows us to solve for  $\tilde{z}$  and  $\frac{w}{w^*}$ :



### Analyzing Welfare Effects

- Suppose there is 'Relative Size Increase in Foreign' (see below).
- Because preferences are identical in the two countries, the relative wage tells us about the welfare of a person in home relative to foreign.  $\uparrow \frac{w}{w^*}$  implies increase in Home welfare relative to Foreign.
- To analyze absolute welfare, we compare real wages before and after any given event. Without CPI we look at each class of good individually:
  - $z'$ : produced at home pre and post:  $\frac{w}{P_{z'}}$  remains fixed. Home rw is unchanged for this set!
  - $z''$ : produced at home pre and foreign post:  $\frac{w}{P_{z''}} = \frac{w}{w^* a_{z''}^*} = \frac{w/w^*}{a_{z''}^*} > \frac{1}{a_{z''}^*}$  (since else home would still produce these goods itself). Home rw improves for this set!
  - $z'''$ : produced at foreign pre and post:  $\frac{w}{P_{z'''}} = \frac{w}{w^* a_{z'''}^*} = \frac{w/w^*}{a_{z'''}^*}$  and we know  $w/w^*$  increases. Home rw improves for this set!
  - Real income of workers in home has increased because (1) home moves into production of more productive goods and (2) foreign imports are cheaper.

## Comparative Statics

### Relative Size Increase in Foreign

- Algebra:*  $\uparrow \frac{L^*}{L}$ ; shifts up  $B(\quad)$ ;  $\uparrow \frac{w}{w^*}$  and  $\downarrow \tilde{z}$  (but somewhat crowded out)
- Intuition:*  $\uparrow L^*$  creates excess foreign labour supply and home labour demand. Hence  $\uparrow w$ , which increases relative unit labour costs, losing comparative advantage in marginal industries
- Welfare Effect:* Unambiguous rise in home's real income and fall in foreign. But decline in share  $\gamma$

### Technological Progress in Foreign

#### Uniform technical progress in Foreign

- Algebra:*  $\downarrow a^*(z) \forall z$ ; shifts down  $A(\quad)$ ;  $\downarrow \frac{w}{w^*}$  and  $\downarrow \tilde{z}$  (but somewhat crowded out)
- Intuition:* Loss of comparative advantage implies loss of some home industries and hence trade deficit ( $\downarrow \tilde{z}$ ). Resulting decline in  $w$  serves to restore trade balance and somewhat offsets  $\tilde{z}$  in doing so.
- Welfare Effect:* Home's ToT improve for any two commodities. Domestic and foreign real incomes increase.

### Transfer of least cost technology

- $\downarrow |a(z) - a^*(z)| \forall z$ ; flattens  $A(\cdot)$  curve
- *Intuition:* Reduced discrepancies in  $a$
- *Welfare Effect:* Benefits innovation low-income, may reduce real income in rich

### **Demand Shift to low-z**

- *Algebra:* shifts up  $B(\cdot)$ ;  $\uparrow \frac{w}{w^*}$  and  $\downarrow \tilde{z}$  (but somewhat crowded out)
- *Intuition:* Domestic labour is allocated to a narrower range of commodities that are consumed with higher density while foreign labour is spread more thinly across a larger range
- *Welfare Effect:* Absolute cannot be identified as tastes themselves may have changed. But relative Domestic incomes and wellbeing rises compared to foreign.

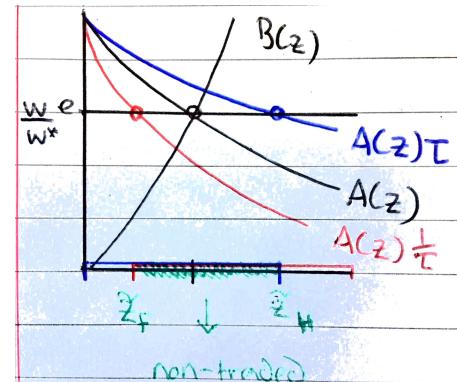
### **Unilateral Transfers**

- *Algebra:* none
- *Intuition:* Receiver spends the transfer exactly as the foreigners would have
- *Welfare Effect:* Recurring trade deficit equal to the transfer but no change in ToT.

### Extensions of the Model

#### **Transportation Costs**

- Suppose need to ship  $\tau$  units for 1 to arrive where  $\tau > 1$
- Home:  $p_z \leq p_z^* \Rightarrow p_z \leq p_z^*\tau$  so  $\frac{w}{w^*} \leq A(z)\tau$
- Foreign:  $p_z^* \leq p_z \Rightarrow p_z^* \leq p_z\tau$  so  $\frac{1}{\tau}A(z) \leq \frac{w}{w^*}$
- We now have non-traded goods:



#### **Non-Tradable/Service Goods**

- Let  $k$  be the fraction of income spent on traded goods for both countries:  $k = \int_0^1 b(z) dz < 1$
- $\gamma(z)$  has max  $\gamma(1) = k$  so new balanced trade condition:  $[1 - \gamma(\tilde{z}) - (1 - k)]wL = \gamma(\tilde{z})w^*L^*$ 
  - Rearranging we get new  $\left(\frac{w}{w^*}\right)^e = \frac{\gamma(\tilde{z})L^*}{k - \gamma(\tilde{z})L} = B(\tilde{z})$
- Now transfers do have an effect!

# Gravity Equation

- $F_{ij} = c \frac{m_i m_j}{(d_{ij})^2} \Rightarrow T_{ij} = A \frac{Y_i^a Y_j^b}{(d_{ij})^c} \Rightarrow \ln T = \ln A + a \ln Y_i + b \ln Y_j - c \ln d_{ij} + \epsilon_{ij}$ 
  - Where  $T$  stands for trade flow,  $D$  stands for the distance (geographic and cultural),  $Y$  stands for the economic dimensions, and  $A$  is a constant.
- This is a famous empirical relationship, not a theoretical one.

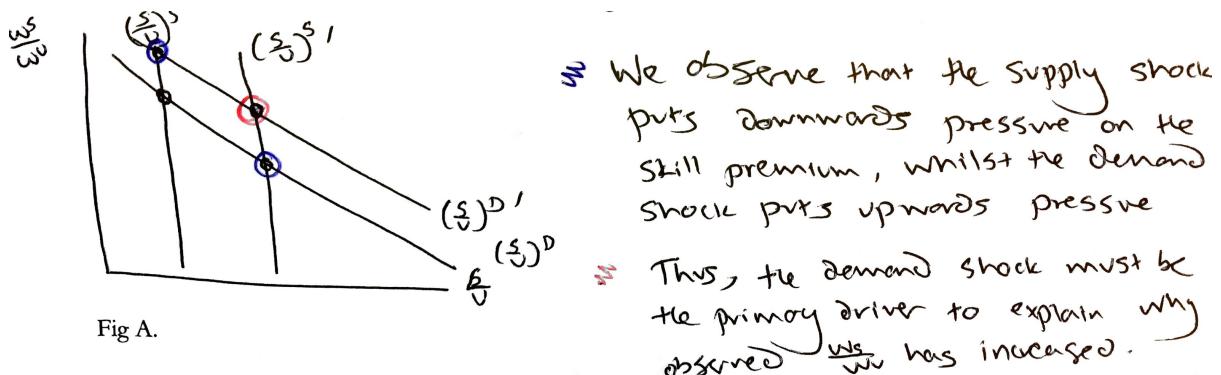
### Eaton and Kortum (2002)

- $\hat{c}_{1966} = 0.75$ : a 1% increase in distance is associated with a 0.75% decline in trade
- $\hat{c}_{2006} = 1.52$ : a 1% increase in distance is associated with a 1.52% decline in trade
  - Trade has become more sensitive to distance even as technology and transportation costs have fallen! Why? Regional agreements (e.g. EU) and domestic policy barriers.

## Rising Wage Inequality

### Introduction

- Global inequality is driven by a rise in the educational premium: Gap between college and high-school households in the US has risen from \$30,000 to \$58,000 between 1979-2012
- Even though educated workforce increased from about 10.6% to 30% between 1960-2005 (i.e. there was a rightward shift of the supply curve of highly skilled workers).
- Hence wage inequality must be demand driven. There are three reasons why but relying on a purely mono-causal framework is very limiting.



### Factors

#### *Skill biased technological change*

##### Argument For

- Innovations in IT have increased the demand for high skilled workers (complement PCs) whilst automation has decreased the demand for low skilled workers (substitutes to machines)
- IT's 'winner-takes-all' characteristics explains why the Western median wages have stagnated despite rises in labour productivity and evermore profits go to the owners of capital.

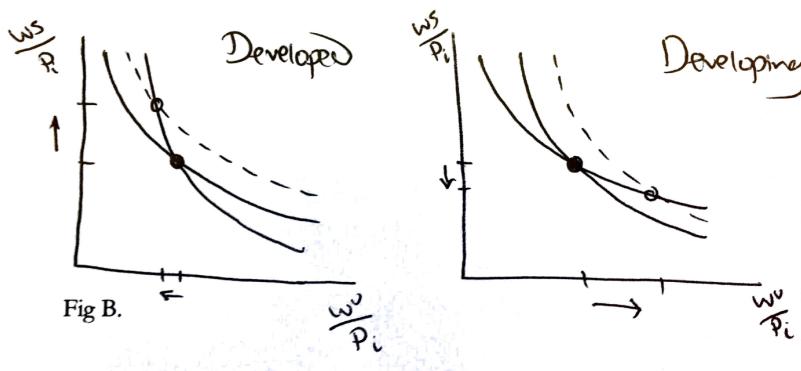
##### Argument Against

- Autor, Levy & Murnane: Technological change largely doesn't affect the lowest-skilled (cannot be replaced by computers) but middle classes yet is blue collar workers who saw decline in wages
- Universal effect of information technology cannot explain changes in inequality amongst different countries as well as timing inconsistencies

### *Expansion of international trade*

#### Argument For

- Heckscher-Ohlin Model (HO) states that countries export the goods which are intensive in the factor which they have an abundance, which in turn puts upwards pressure on those factors' wages.
  - Developed: Implies an increase in relative high-skilled wages
  - Developing: Implies an increase in high-skilled wages



- Correctly predicts the rising inequality in the West (mantra that Free Trade is good for the elite but not the working classes)

#### Argument Against

- If correct we would expect to see a reduction in inequality in the developing world. But the share of income owned by the top-decile in China has risen from 18% to 28% between 1987-2004.

### *Liberal institutional changes in labour markets*

#### Argument For

- David Card: De-unionization's weakening of low-skill worker's bargaining power and the fall in real minimum wage in the 1980s explains rising inequality in the West.
  - Countries with stronger labour laws have experienced less a rise in inequality: US's Gini coefficient has risen from 37.5 to 41.0 between 1986-2013, Canada's only from 31.5 to 34.0.

#### Argument Against

- If real minimum wages then we would expect to observe a decline in inequality in the UK and US between 1990-2005 when they picked up. In fact we observe just the opposite.
- Autor, Katz & Kearney: Minimum wages cannot be responsible for all since most of the increase in inequality arose from those in the top of the distribution, which would be unaffected.
- Cannot explain the rise in inequality in developing country where liberalization was much less pronounced.

## Conclusion

Technological change, international trade, and labour institutions are all interlinked:

- Brown: Competitive pressures unleashed by open trade is a major drive behind the decline in union power, with multinational companies threatening to off-shore jobs.
- Trade competition can incentives firms to adopt new skill-biased technologies.

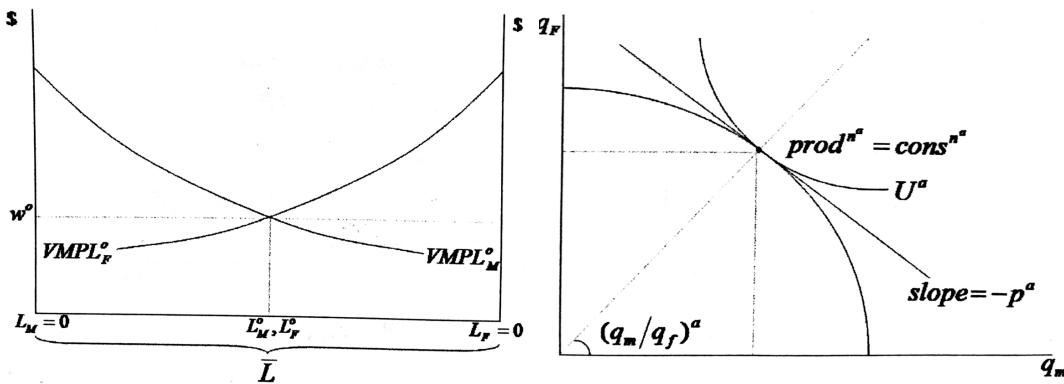
# Ricardo-Viner Specific Factors Model

## Set Up

- There is one mobile factor, Labour ( $L$ ), for which we assume full employment (i.e.  $L_M + L_F = \bar{L}$ )
- There are two goods and two specific factors: Manufactures ( $M$ ), which requires Capital ( $K$ ), and Food ( $F$ ), which requires Land ( $T$ ).
- Technologies are DRTS (not CRTS!) and identical across countries. Preferences are homothetic.
- Define  $F$  as the numeraire good so  $P_F = 1$  and  $P_M = \frac{P_M}{P_F}$
- We assume competitive wages so  $w = P_M MPL_M$  and  $w = P_F MPL_F$

## Autarky

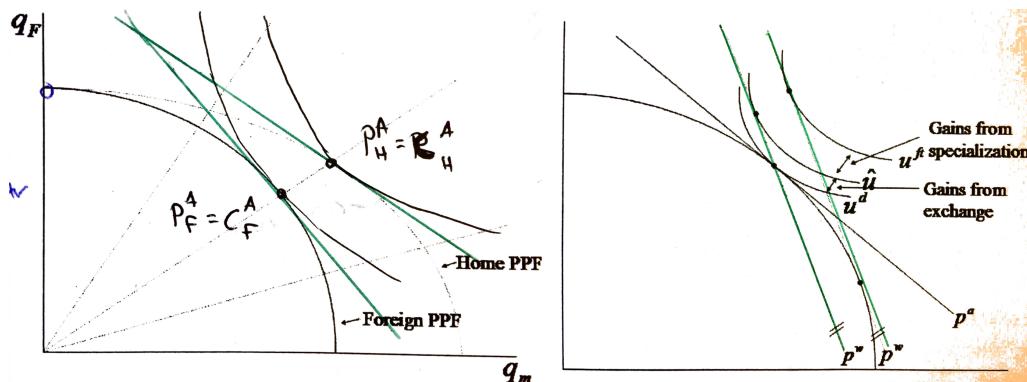
- We note that equilibrium implies  $P_F MPL_F = P_M MPL_M$  so  $\frac{P_M}{P_F} = -\frac{MPL_F}{MPL_M}$
- This is equivalent to the price ratio = slope of PPF



## Free Trade

### Finding Equilibrium

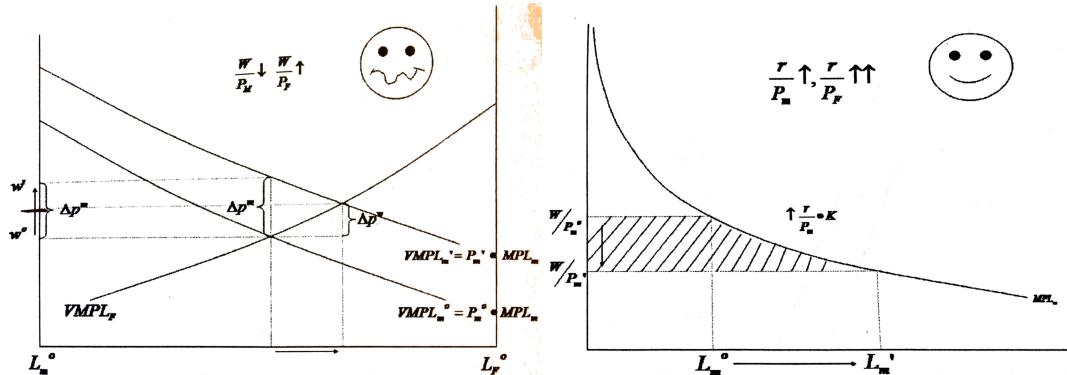
- Let us suppose that home has a larger Capital endowment  $K^* > K$ . Hence  $p^a < p^w < p^{*a}$



### Welfare Analysis

- There are definite aggregate gains since we are on a higher IC. We can decompose this into gains from specialization and gains from exchange. But welfare effect is ambiguous...

- Labour RW rise for food but fall for manufacturing Need to know exact utility function!
- Some labour moves from food to manufacturing. Capitalists gain and land owners lose
- Fixed factor that was relatively abundant under autarky (but scarce globally) will experience an increase in its return in the short run. Mobile factor gains depend critically on the utility function.



## Offshoring

- Outsourcing: The process whereby corporations procure inputs from several countries and allocate the tasks of production across several countries in order to minimize costs
- Offshoring: When a firm hires workers abroad for a task that used to be done domestically

### Theory

- Suppose we have two sectors: multinational ( $M$ ) and non-multinational ( $N$ ). Each has sector-specific capital but also requires labour, which can move freely between.
- What happens when we introduce offshoring (i.e. foreign labour)?
  - Substitute:  $M$  domestic employment shrinks and lowers wages of Home
  - Complement:  $M$  domestic employment expands relatively and raises wages of Home

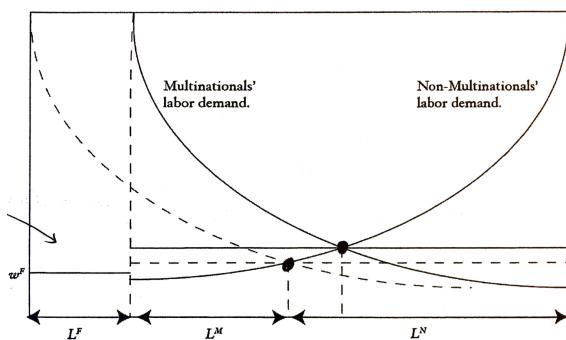


Figure 11.7: Offshoring When Foreign Labor Substitutes for Domestic Labor.

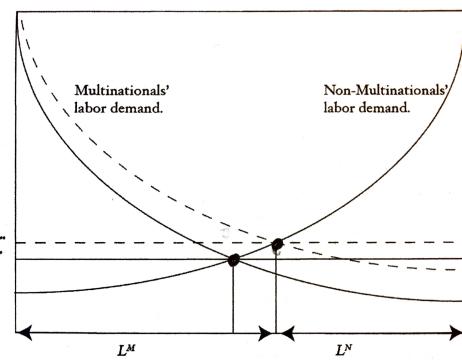


Figure 11.8: Offshoring When Foreign Labor Complements Domestic Labor.

### Evidence

- **Slaughter:** US period up to 2000 saw parent and affiliate employment positively correlated, hence complements. Period after saw negative correlation, hence substitutes.
- **Harrison and McMillan:** Looked at subset of affiliates in low income countries and distinguished that whilst high wage foreign workers are complements to US, low wage are substitutes

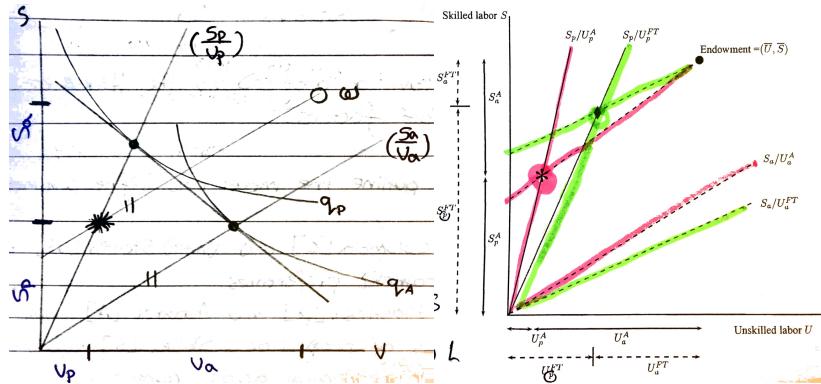
# Heckscher-Ohlin Model: Substitutes

## Set Up

- 2 goods: Plastics ( $P$ ) and Apparel ( $A$ ) with 2 perfectly mobile factors of production: Skilled ( $S$ ) and unskilled ( $U$ ) labour.
- CRTS technology identical across countries:  $q_P = S_P^\gamma U_P^{1-\gamma}$  and  $q_A = S_A^\alpha U_A^{1-\alpha}$  where  $P$  is more skill intensive (i.e.  $0 < \alpha < \gamma < 1$ )
- Perfect competition and CRTS implies that every industry must have ZPC in equilibrium
- 2 countries: Colombia ( $C$ ) and United States ( $US$ ) with identical homothetic preferences but differing endowments.  $C$  has a relative abundance of  $U$  (i.e.  $\frac{U^C}{S^C} > \frac{U^{US}}{S^{US}}$ )

## Autarky

- Given technology and endowments we can derive a country's unit revenue isoquant for  $P$  and  $A$
- A country's unit isocost line  $S_i = \frac{1}{w_S} - \left(\frac{w_U}{w_S}\right) U_i$  is tangent to both these curves to satisfy ZPC
- A country's factor intensities rays  $\frac{S_i}{U_i}$  go from the origin that go through these tangency points.
- Equilibrium is the intersection of the factor intensity rays, where endowment is the alternative origin
  - If  $\omega$  isn't between rays (within the cone of diversification) there is unemployment and we are in disequilibrium (i.e. [un]skilled workers are too expensive hence  $S/U$  share is too high[low])
- We thus see the sectoral decomposition of  $U$  and  $S$



## Free Trade

### Finding Equilibrium

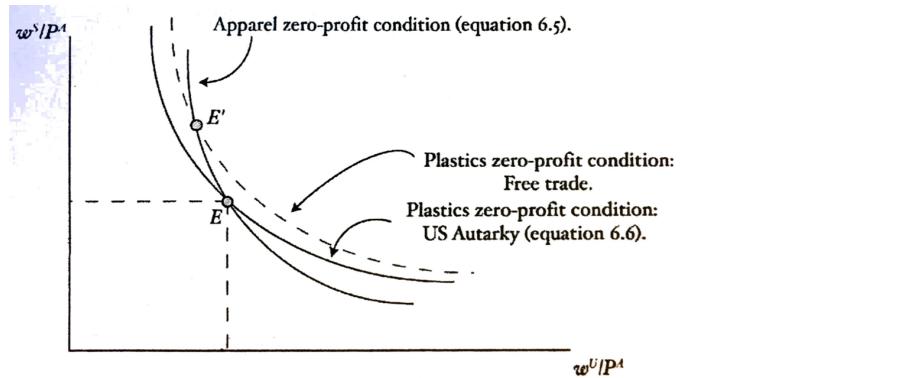
$\Delta$  output prices (isoquant)  $>$   $\Delta$  wages (isocost)  $>$   $\Delta$  technique (intensity ray)  $>$   $\Delta$  output (equilibrium)

- Trade causes a convergence/change in relative output prices (i.e.  $C$  sees a fall in  $\frac{p_P}{p_A}$  by having access to cheaper  $US P$  and global demand for  $A$ )
- Thus we have a movement of the unit-revenue isoquants (i.e.  $C$  sees  $q_A$  shift in since need to produce less  $A$  to earn \$1 and thus hire less labour generally)
- In order to maintain ZPC this thus causes wages to change (i.e.  $C$  sees steeper isocost  $\frac{w_U}{w_S}$ )

- Thus firms reoptimize their techniques (i.e.  $C$  sees steeper intensity rays  $\frac{S_i}{U_i}$ ). This gives new equ.
- Heckscher Ohlen Theorem:** Each country exports the good that is intensive in the factor in which it is relatively abundant and imports the other. Implies an expansion of the sector that experiences a rise in their output price and a contraction in the other.
  - e.g.  $C$  sees a fall in  $\frac{p_P}{p_A}$  and thus  $\downarrow q_P$  and  $\uparrow q_A$  as labour reallocates (opposite for US)

### Welfare Analysis

- Total income should increase in both countries due to specialization but distributional effects...
- Factor Price Equalization Theorem:** Free trade will cause the factor prices in each country to equalize (i.e. a perfect substitute for international mobility of factors)
- Stolper-Samuelson Theorem:** A decrease in the relative price of a good will reduce the return to the factor that is used intensively in the production of this good and increase the return to the other
  - e.g.  $C$  sees a fall in  $\frac{p_P}{p_A}$  and thus  $\downarrow w_S$  and  $\uparrow w_U$  (opposite for US)
- We can use ZPC to identify effect on RW:
  - ZPC:  $p_A = w_U U_A + w_S S_A$  and  $p_P = w_U U_P + w_S S_P$ . Note
  - Thus:  $1 = \frac{w_U U_A}{p_A} + \frac{w_S S_A}{p_A}$  and  $\frac{p_P}{p_A} = \frac{w_U U_P}{p_C} + \frac{w_S S_P}{p_C}$
  - Thus:  $\frac{w_S}{p_A} = -\frac{w_U U_A}{p_A S_A} + 1$  and  $\frac{w_S}{p_A} = -\frac{w_U U_P}{p_A S_P} + \frac{p_P}{p_A} 1$  where  $\frac{p_P}{p_A}$  is what changes under FT
    - Since for  $C \downarrow \frac{p_P}{p_A}$  we see a shift down in  $P$ -ZPC and thus lower[higher]  $\frac{w_S}{p_A} \left[ \frac{w_U}{p_A} \right]$
    - Since for US  $\uparrow \frac{p_P}{p_A}$  we see a shift up in  $P$ -ZPC and thus higher[lower]  $\frac{w_S}{p_A} \left[ \frac{w_U}{p_A} \right]$
    - That is, we see a rise in US skills premium and fall in Colombia.



### HO Implications

- To summarize, for  $C$  we expect...
  - A fall in relative prices  $\frac{p_P}{p_A}$  and shift in production to  $A$  (i.e. increase in  $\frac{S_A}{S}$  and  $\frac{U_A}{U}$ )
  - A decrease in the wage premium  $\frac{w^U}{w^S}$  and more unskilled intensive production  $\left( \frac{S_i}{U_i} \forall i \right)$  as firms move away from expensive S

### Empirical Application

#### Lawrence and Slaughter (1993)

- Test HO-implications with US data for 1979-89:
  - SS-theorem: Rise in skills premium: true

- Drop in the relative employment of skilled labour in each industry: false
- Decline in the price of the U-intensive good: false
- Decline in wage inequality in developing countries: false

### ***Attanasio, Goldberg, and Pavcnik (2004)***

- Uses micro-level data and varying degree of trade liberalization across industries in Colombia 1984-1998 to test relationship between wage inequality and trade liberalization via HO-model
- Concludes that trade only affected wage inequality indirectly and instead that there is evidence for Skills-biased technological change

#### HO-model does not directly work...

- *SS theorem:* C should observe  $\downarrow \frac{w_S}{w_U}$ : Authors find the exact opposite!
  - But... Authors note that trade liberalization was concentrated in U-intensive sectors, thus it is consistent to expect economy wide  $\downarrow w_U$  (i.e.  $\uparrow \frac{w_S}{w_U}$ ) as they are no longer protected
- *Extended SS theorem:* Rising skill premium suggests C firms should substitute away from S and thus its share of industry employment should decline: But share increases substantially in each industry!
- *HO theorem:* C should reallocate from sectors with big tariff (i.e. price) reductions to those with small: regress industry employment shares on tariffs gives small coeff (0.01) that is statistically insignificant

#### ... but trade can still have an indirect effect on wage inequality

- Instead better explained by skill-biased technological change. To the extent that tech is an endogenous response to foreign competition (Wood's "defensive innovation"), trade still matters
- Also, inequality rose because of changes in industry wide wages (TU power falls under FT) and due to shift towards informal sector (which is empirically linked to tariffs)

### ***Autor, Dorn and Hanson (2013)***

#### Headline

- Difference-in-difference model with find that rising US imports from China causes higher manufacturing unemployment and reduce wages between 1990-2007.

#### Methodology

- Assume US consists of 722 small commuting zones whose borders are closed to labour migration
- Issue that US imports from China are endogenous due to demand factors. Thus instruments US imports from China via other high-income countries' imports from China (only supply shock).
- Run regression  $\Delta L_{it}^m = \gamma_t + \beta_1 \Delta IPW_{uit} + \mathbf{X}'_{it} \beta_2 + e_{it}$  where  $L_{it}^m$  is change in manufacturing employment,  $\mathbf{X}'_{it}$  is a vector of controls, and  $\Delta IPW_{uit}$  the instrument for Chinese imports

#### Results

- A \$1,000 increase in a CS's IPW reduces manufacturing employment by 0.75%-points.
- Rising exposure to Chinese imports explains 44% of US manufacturing decline 1990-2007
- Robustness: Does not predict 1970-90 manufacturing decline (i.e. pre-China liberalization)

#### Criticism

- If product market demand in the foreign countries is correlated with product market demand in the US (i.e. IV exogenous condition fails) then estimates will overestimate the true effect
- Other literature has focused on US construction boom 2000-08, which attracted many manufacturing workers to move cross-CZ and is claimed to have mattered much more.

# Heckscher-Ohlin Model: Leontief

## Set Up

- Very similar analysis and conclusions as above, so we will only highlight the novel
- Same assumptions as above only now  $q_i = \min[\alpha S_P, \beta U_P]$ . Thus we have straight lines.

## Autarky

- Relative supply does not depend on  $\frac{p_A}{p_P}$ , only on full employment. Our relative supply curve is vertical
- Rybczynski Theorem: At constant prices, an increase in one factor endowment will increase by a greater proportion the output of the good that is intensive in that factor and reduce the other
  - Because prices are constant, optimal input usage ratios are fixed so we “add up” factor endowments to show that  $\Delta q_A > 0 > \Delta q_P$

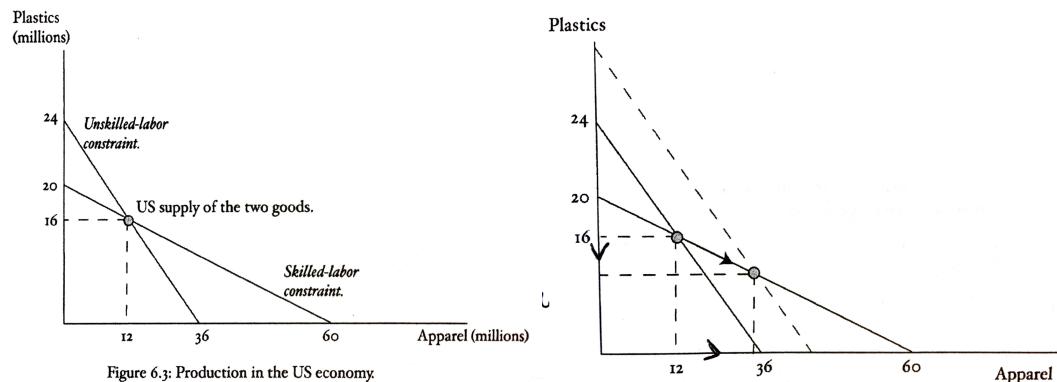
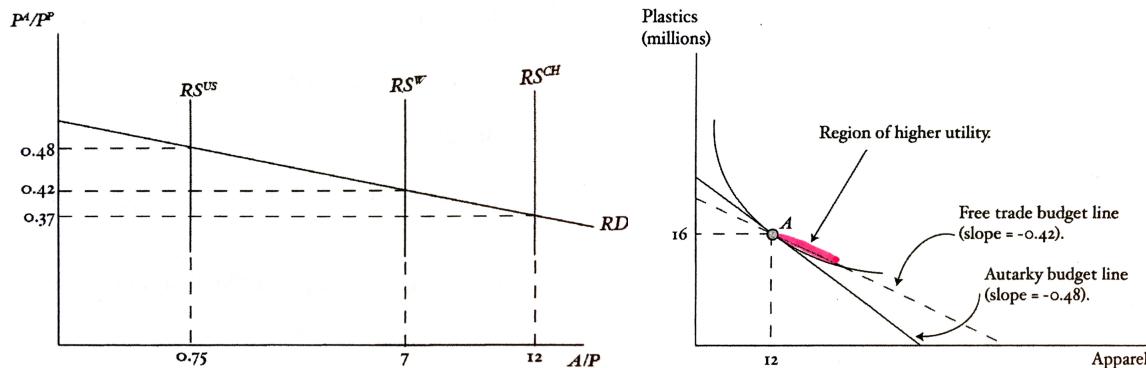


Figure 6.3: Production in the US economy.

## Free Trade

### Finding Equilibrium

- Putting together worldwide RS and RD gives free trade equilibrium
- Representative consumer can consume a bundle on a higher IC when prices are given by FT



### Welfare Analysis.

- Stolper-Samuelson Theorem, Heckscher Ohlin Theorem, and Factor Price Equalization Theorem

# Immigration

- Walmsley and Winters: A 3% increase in labour migration would result in half the gains associated with complete trade liberalization
- Removing barriers to migration between OECD and rest would boost world output 92-172%

## Theory

### **Immigration Under the Specific Factors Model**

- Workers will move until  $MPL = MPL^*$  and so real wages are equalized.
- Effect differs depending on if foreign labour substitutes or complements native-born workers

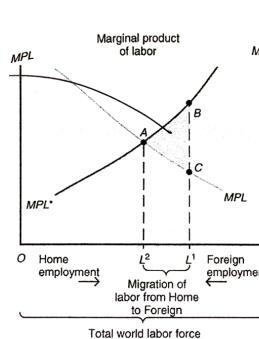


Figure 12.1: Immigration, Assuming Foreign Labor Substitutes for Domestic Labor.

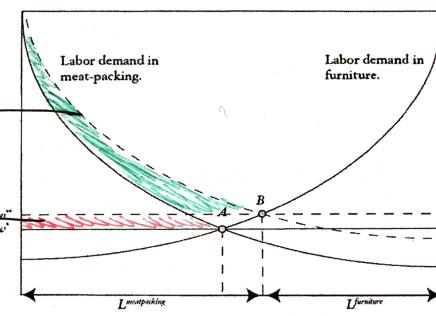


Figure 12.2: Immigration, Assuming Foreign Labor Complements Domestic Labor.

### **Heckscher-Ohlin Model**

- Unit revenue isoquants only shift in response to relative price changes, so if we assume small open economies so there is no effect on K and L ratios
- Output of labor-intensive good increases. An increase in the amount of a factor found in an economy can be absorbed by changing the outputs of the industries, without any change in factor prices.

## Evidence

### **Card (1990): Mariel Boatlift**

- Uses natural experiment of 125,000 Cubans fleeing to Miami, representing a 7% increase in the local labour force in five months: "geographical clustering"
- Using a difference-in-difference equation find that there was no wage depression relative to other cities. Either labour is mobile across location or that it is in-between substitutes and complements

### **Borjas (2003): National Labour-Market Approach**

- Card local-labour market approach since Miami residents facing competition can move elsewhere
- Ignores the strong currents that tend to equalize economic conditions across cities. Spatial correlations conceal around 2/3 of the national impact of immigration on wages
- Divides workers in 32 education-experience groups and makes use of the fact that education-composition of immigration varies across time.
- 10% increase in labour supply of a category lowers wages in that category by 4%

### **Ottaviano & Peri (2008): Elasticity of Substitution Approach**

- Borjas assumes foreign and US-born workers are perfect substitutes within the same education-experience-gender group and also that there are no cross-effects.

- Immigrants tend to choose a different set of occupations because they are a selected group or because they have some culture-specific attributes (e.g. language)
- (1) estimate elasticities of substitution between different types of workers and (2) uses these to calculate changes in the wages of foreign-born and US-born workers due to immigration
- Finds that immigration has little impact on average wages of US born but additional immigration has a negative effect on the wages of previous immigrants.
  - Average wage of US born workers experience a significant increase (+1.8%) as a consequence of immigration 1990-2004. Foreign complements US!
  - Borjas estimated that 1980-2000 immigration lowered the average wage by 3.2%

# Outsourcing

## Basic Model of Wages (Feenstra-Hanson Theory)

### Assumptions

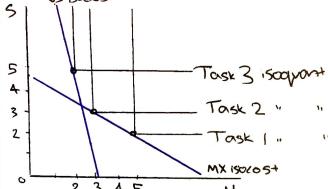
- Assume inputs require  $U, S$  labour and capital, which applies uniformly across all activities
- Assume foreign wages are less than home ( $W_i^* < W_i$ ) and relative wage of  $U$  is lower ( $\frac{w_L^*}{w_L} < \frac{w_S^*}{w_S}$ )
- Assume least skill-intensive tasks in Home are more skill-intensive than Foreign

### Analysis

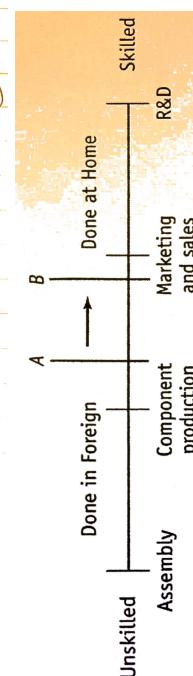
- In the “value chain of production” there is a cutoff point A where home firms send most unskilled-labour intensive activities abroad
- Lower trade costs create incentive to shift activity from Home to Foreign
  - Home relative demand curve shifts out (BUT absolute demand to decreases)
  - Foreign relative demand curve shifts out since new activities are more skill-intensive
- Both countries experience an increase in the relative wage of skilled

» Example «

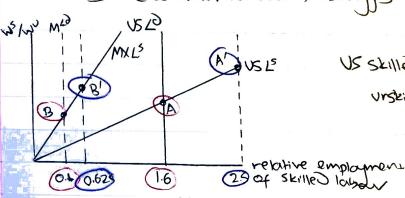
Two countries: US and Mexico. No migration between  
One product: radio. Three parts: component assembly (5U)  
exterior assembly (3U)  
testing (2U)



- US ratio of skilled: unskilled labour vs. Mexico is 3:1.
- This is the only difference
- $\frac{w_U^*}{w_U} < \frac{w_M^*}{w_M}$
- Task 3 done in US, 2,1 in Mx



Now suppose for external reasons Task 2 needs to be done in US (communication, tariffs etc.)



$$\begin{aligned} \text{US skilled lab required: } & 3 + 5 = 8 \\ \text{unskilled: } & 3 + 2 = 5 \\ \therefore \frac{8}{5} & = 1.6 \end{aligned}$$

Likewise Mx = 0.625

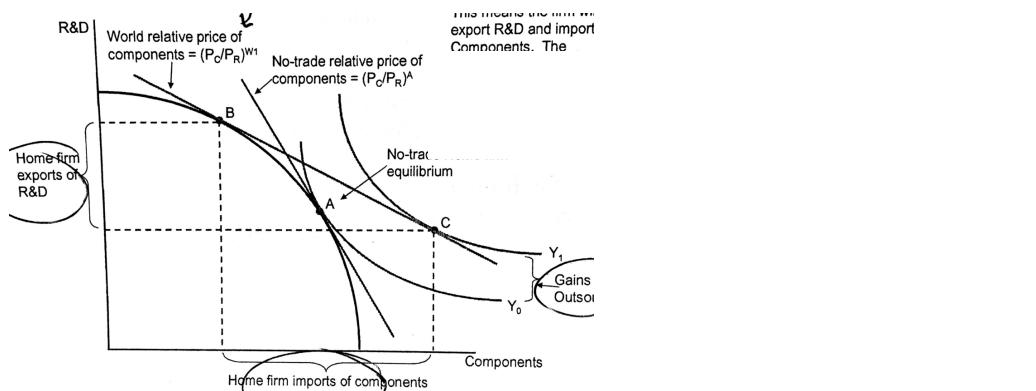
We see that offshoring Task 2 (○ → ○) causes a rise in  $w_U^*$

## Basic Model of Production

- Assume: Inputs include  $U, S$  labour, which is free to move between activities, and capital, whose cost is equal across activities. There are two activities: components ( $U$  intensive) and R&D ( $S$  intensive)
  - In this example Home is  $S$  abundant and Foreign  $U$  abundant. Thus the relative price of components is cheaper than Home's no-trade relative price
- Autarky: Optimal point  $A$  is given by the tangency of the isoquant to PPF. The slope of the isoquant reflects the marginal costs of production (i.e. price) of the two activities.

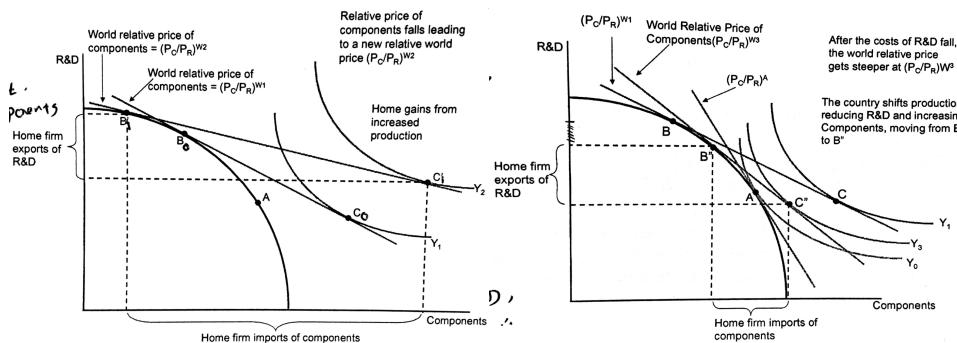
### Outsourcing

- Quantity of the final good is no longer constrained by Home PPF (can move from  $Y_0$  to  $Y_1$ )
- Relative price that the Home firm has available through outsourcing is given by  $\left(\frac{P_C}{P_R}\right)^W$
- The isoquant is tangent PPF at new point B (home firm undertakes more R&D and less component) and to the IC at new point C (new max amount of the good  $Y_1$ ).
  - More productive  $>$  cost of production falls  $>$  price of product falls
  - If  $\left(\frac{P_C}{P_R}\right)^W \neq \left(\frac{P_C}{P_R}\right)^A$  there are always gains from outsourcing



### Changing Labour Productivities

- Foreign-Component technology improvement would cause a fall in the relative price of component production  $\left(\frac{P_C}{P_R}\right)^{W2} < \left(\frac{P_C}{P_R}\right)^{W1}$ . Improvement in the ToT of Home and  $Y_2 > Y_1$
- Foreign-R&D technology improvement would cause a fall in the relative price of component production  $\left(\frac{P_C}{P_R}\right)^{W3} > \left(\frac{P_C}{P_R}\right)^{W1}$ . Deterioration in the ToT of Home and  $Y_3 < Y_1$
- Samuelson (2004): Outsourcing might allow other countries to gain a comparative advantage in our activities. Dixit and Grossman (2005): But still better than autarky!



# Multi-nationals

## Basics

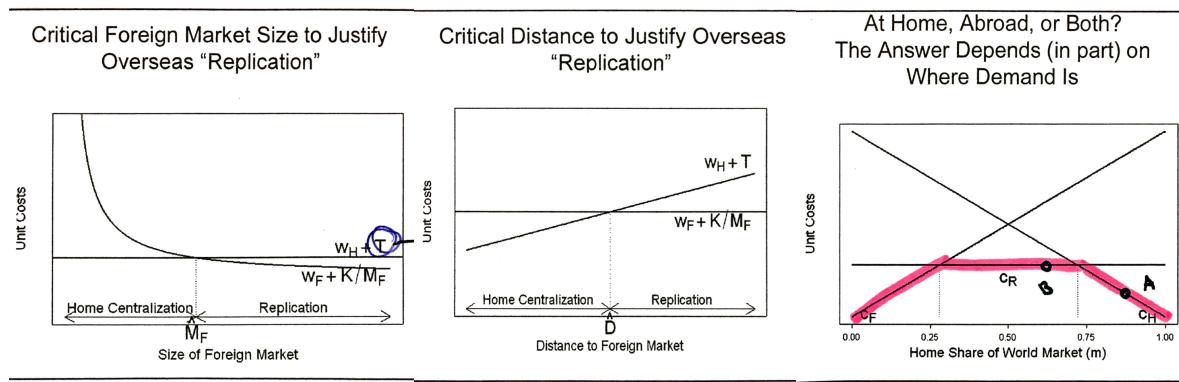
- A multinational enterprise is “an establishment that controls and manages production plants located in at least two countries. FDI is a proxy used to measure their activity.
- Horizontal FDI: when exporting is costly, replication of the production process in a foreign market may be profit-maximizing (e.g. Nestle, Toyota)
- Vertical FDI: In the presence of factor price differences across countries, a producer may find it optimal to fragment production (e.g. Nestle)
- Location: Why is a good produced in at different countries rather than in just one?
- Internalization: Why is production in different locations done by one firm rather than separate firms?
- Note that the cost of exporting is mostly variable, whilst the cost of FDI is mostly fixed.

## Facts

- MNE activity is primarily concentrated in developed countries where it is mostly two-way. Developing countries are more likely to be the destination than the source
  - FDI flow into developing world is now at 52% share
- Relative importance of MNE is higher in capital/R&D-intensive goods
  - US firms serve foreign markets mostly (75%) via foreign affiliate sales
  - Less than 50% of Ford's and Toyota's production occurs in their countries of origin
- Both parent firms and foreign affiliates of MNEs tend to be larger, more productive, more R&D intensive and more export-oriented.
  - TNCs account for ¼ of world GDP

## Head's Model

- Cost of one *effective* unit of labour is  $w_i$ ; Market size is  $M_i$ ; and trade costs of exporting is  $T_i$ ; fixed costs of capital is  $K_i$
- Home(Foreign) centralization:  $C_H = w_H M_H + (w_H + T_F) M_F + K_H$ 
  - strong plant-level scale economies
  - low trade costs to export to foreign(home)
  - large home(foreign) market
  - home(foreign) country has factor advantage
- Replication:  $C_R = w_H M_H + w_F M_F + K_H + K_F$ 
  - Weak plant-level scale economies
  - Markets are similar in size
  - High trade costs impede imports/exports
  - Factor prices are similar



## Brainard Model

- $\pi_{FDI} = (P^j - a^j w^j)Q(P^j) - F$  vs.  $\pi_{EX} = (P^j - [a^i w^i + k(d^{ij}) + t])Q(P^j) - F$ 
  - $F$  is fixed cost
  - $a$  units of labour needed for output and  $w$  cost of unit labour
  - $Q$  market demand where  $P$  is chosen by firm
  - $k$  transportation cost for  $d$  distance and  $t$  tariff
- Presence of a fixed cost means concentration of production in one location yields higher profits all else equal. Presence of transport costs implies it is more profitable to sell to proximate consumers
- Brainard (1997) finds strong empirical evidence, confirmed by Helpman, Melitz and Yeaple (2004)

## Principles of Taxation

### Strategies

- Source-based tax: income from capital is taxed in the country in which income is generated
- Residence-based tax: income from capital is taxed in the country of residence of the owner
- Nationality-based tax: income based on worldwide income regardless of where they reside (i.e. US)

### Double Taxation

- If both do source:  $T_W = t_H Y_H + t_F Y_F$
- If home does residence and foreign does source:  $T_W = t_H(Y_H + Y_F) + t_F Y_F$ . Double tax on foreign!
- To reduce the burden of double taxation, many countries may
  - Negotiate exemptions:  $T_H = t_H(Y_W - Y_F) = t_H Y_H$
  - Foreign Tax Credits:  $T_H = t_H Y_W - t_F Y_F = t_H Y_H + (t_H - t_F)Y_F$ 
    - If  $t_F > t_H$  a higher  $Y_F$  lowers  $T_H$ , thus may set limit  $t_H Y_F$

### MNE Strategy

- Goal of MNE is to maximize post-tax profits  $Y_W - T_W$  where  $T_W = Y_F \left[ t_F^* + \frac{Y_H}{Y_W} (t_H - t_F^*) \right]$
- There are several ways to reallocate income across countries:
  - Transfer pricing (90% of imports involved MNEs and about half these imports were intra-firm)
    - A to B:  $\max \pi = [1 - t_A][p_A X_A + \phi X_B - C(X_A + X_B)] + [1 - t_B][p_B X_B - \phi X_B] = [1 - t_A][p_A X_A - C(X_A + X_B)] + [1 - t_B]p_B X_B + \phi[t_B - t_A]X_B$
    - To avoid transfer pricing gov. can use arm's-length price if market good, or set bounds if not (but may cause distortions since bounds are endogenous to firm)
  - Thin capitalization

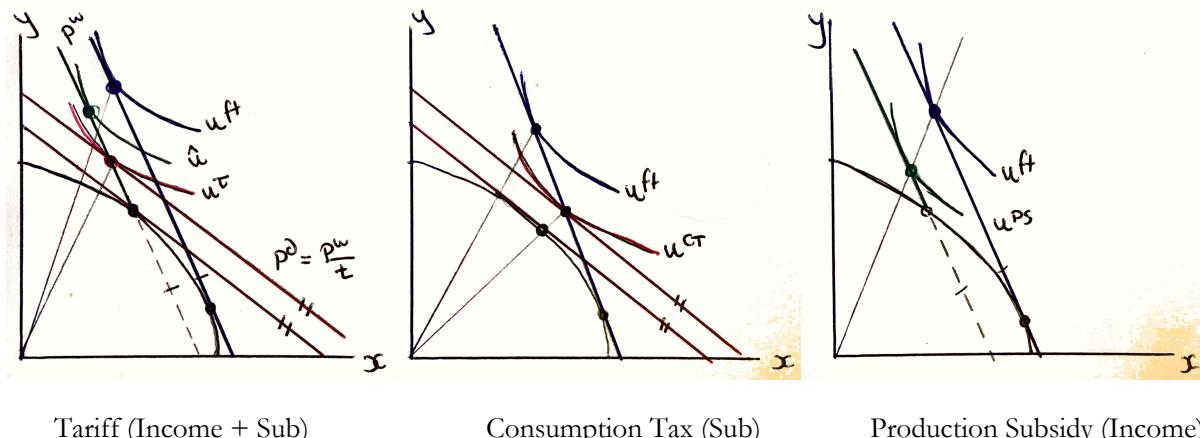
- If a foreign affiliate is financed with debt, this will lower the net income earned.  
Ten-percent higher local tax rates are associated with 2.8% higher debt-to-asset ratios for foreign affiliates of US MNEs
- Tax haven

# Tariffs

## Stylized Facts

- Since 1995 trade policy has been characterized by low/zero tariff but...
  - Rich open systems survive by giving discretion for certain goods (special tariffs ~25%)
  - WTO forced China to have fairly open trade 10% binding rate (vs India 48.6%)
- Increasing importance of Preferential Trade Areas (e.g. EU)
  - Share of intra-PTA trade has nearly doubled from 28% 1990 to 51% 2008
  - 49% of trade occurs between countries that not part of a common PTA
  - Only 30% of global trade is eligible for preferential tariffs. <4% for over 10%-points

## Small Open Economy (PPF-IC)



## Assumptions

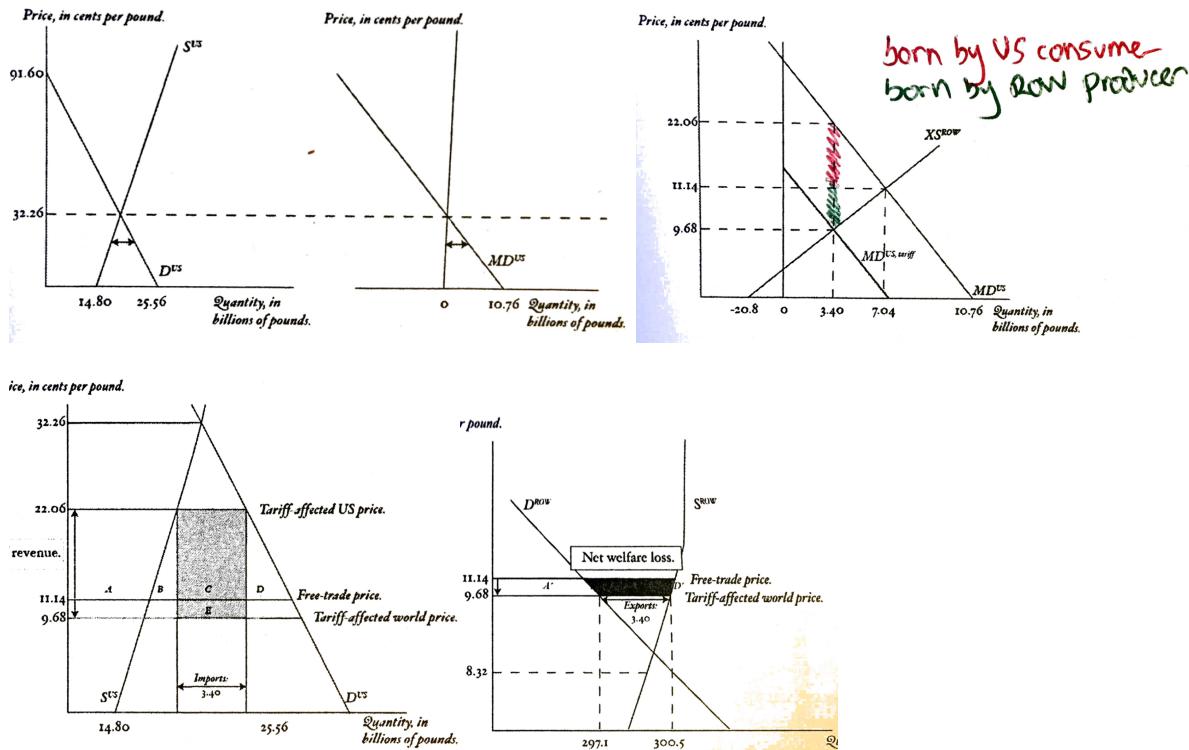
- Having two factors of production with DMR gives us a bowed-out PPF.
- Assume a concave utility function of homothetic citizens, giving us convex ICs.
- World prices  $p^w$  are exogenously determined. This gives us the isocost line.
- There must be balanced trade: Value of consumption must equal the value of production (in  $p^w$ )

## Equilibria

- Free Trade: The country produces where a isocost line is tangent to the PPF (A) and consumes where the same isocost line is tangent to an IC (B)
- Tariff:
  - Changes so  $p^d = \frac{p^w}{\tau}$ , which induces a new production point (A')
  - Revenue is distributed via lump-sum so budget line shifts out and no longer intersects A'
  - Consumption must lie at some point along the balanced trade line (slope  $-p^w$  passing A')
  - Can decompose into separate effects (see graph)
- Consumption Tax: Substitute Effect: Tax on  $x$  changes  $p_x$  for Consumers (not Producers).

- Production Subsidy: Income Effect: Subsidy on  $x$  changes  $p_x$  for Producers (not Consumers).
  - Same relative prices so get C-bundles on same ray
  - Get the same if government subsidies the other good
  - Does not move out PPF! No change in tech
- Targeting Principle: A tariff is never ideal because it achieves two objectives with one policy hence less precise. Two separate policies with one objective would be more socially efficient

## Large Open Economy (SS-DD)



- Use  $MD^{US} = XS^{ROW}$  to solve for prices and quantities. A tariff means  $P^{US} = P^W + \tau$
- This has several effects:
  - ☹ Causes Production (B) and Consumer (D) distortions
  - ☺ Creates ToT (E) gain at expense of ROW [since large] and ☹ redistribution (C)
  - Welfare = B - (D+E). Set tariff optimally to maximize this expression
- Note that for small countries there is no E so they are always worse off!

## Broda, Limao, Weinstein (2008) Model of Optimum Tariffs

### Consumption

- Consume a freely traded numeraire good and  $g$  non-numeraire subject to budget constraint:
  - $U = c_o^h + \sum u_g(c_g^h)$  s.t.  $I^h \geq c_o^h + \sum u_g(c_g^h)$
  - Derive that  $\frac{d\mathcal{L}}{dc_o} = 1 - \lambda = 0$  and  $\frac{d\mathcal{L}}{dc_g} = u'_g(c_g) - \lambda p_g = 0$
- Indirect Utility Function:  $V = I^h - \sum_g p c_g^h(p_g) + \sum_g u(c_g^h(p_g)) = I^h + \sum_g \phi_g(p_g)$

### Production

- Assume numeraire good produced using only labour via CRTS. Wage is normalized so  $w = 1$

- All other goods are produced using labour and a specific factor
- All individuals own one unit of labour and up to one unit of specific factor (so earn rents  $\pi_g$ )

### ***Government***

- Tariffs so  $p_g = (1 + \tau_g)p_g^*$
- Revenue collected:  $r(p_g) = \tau p_g^* m_g^*(p_g) = \tau p_g^* m_g^*(p_g)$
- Hence  $I^h = w + \sum_g \pi_g(p_g) + r_g(p_g)$

### ***Deriving Optimum Tariff***

- Use Market Clearing Condition: MD=XS so  $m_g[(1 + \tau_g)p_g^*] = m_g^*(p_g)$
- Normalizing population to one:  $\max_{\tau_g} W = 1 + \sum_g \pi_g(p_g) + r_g(p_g) + \phi_g(p_g)$ 
  - $\pi_g$  is producer's surplus,  $\phi_g$  is consumer's surplus and  $r_g$  is tax revenue
- FOC gives  $\tau_g p_g^* \frac{dm_g}{d\tau_g} - m_g \frac{dp_g^*}{d\tau_g} = 0 \quad \forall g$ 
  - First term captures domestic distortions and second term captures ToT effect
- Rearranging gives  $\tau_g^{opt} = \omega_g = \left[ \frac{dm_g}{dp_g^*} \frac{p_g^*}{m_g^*} \right]^{-1}$ 
  - Export supply becomes more inelastic, the optimal tariff increases!
  - Backed by empirical evidence and...
  - Even small countries like Bolivia have bargaining power since it is hard for others (especially if in same region) to switch supply chain

## **Trade Policy**

- Reciprocity: One country offers to reduce a barrier trade and a second country “reciprocates” by offering to reduce one of its own.
- Non-discrimination (or Most Favoured Nation): an importing country extends to all trading partners the lowest tariff on a good offered to its “most favored” partner

### Bagwell and Staiger Model of Reciprocity

#### ***Assumptions***

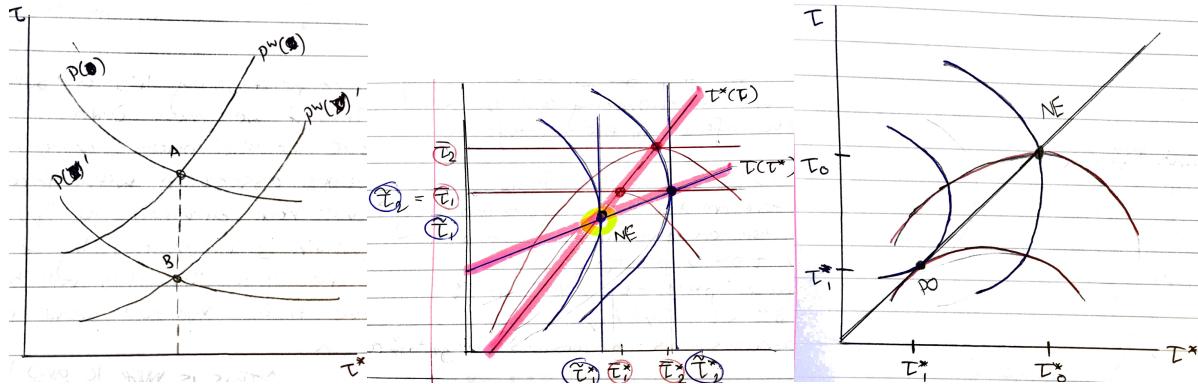
- Two large countries (Home & Foreign  $-$ ), producing two goods ( $x$  &  $y$ ),
- We note that  $p^w = p_x^*/p_y$  so  $p = \tau p^w$  and  $p^* = \frac{p^w}{\tau^*}$
- Trade is balanced (i.e  $p^w M_x = E_y$  and  $M_y = p^w E_x^*$ ) so equilibrium  $\tilde{p}^w$  s.t.  $E_i = M_i^*$
- Political Welfare =  $\gamma_0 PS + \gamma_1 CS + \gamma_2 \text{Revenue}$
- We derive the
  - Iso-world price lines  $p^w(\ )$  (tariff pairs that leave  $p^w$  unchanged)
  - Iso-local price lines  $p(\ )$  (the closer to the origin the less distortion)

#### ***Nash Equilibrium***

- For any given foreign tariff  $\bar{\tau}$ , home will attain the highest feasible IC (i.e. so  $\bar{\tau}$  is tangent to IC). Tracing out the loci of these gives the best response functions.
- Nash Equilibrium (i.e. what stable outcome is feasible without reciprocity) is the point of intersection between the home and foreign best response function.

### Reciprocity

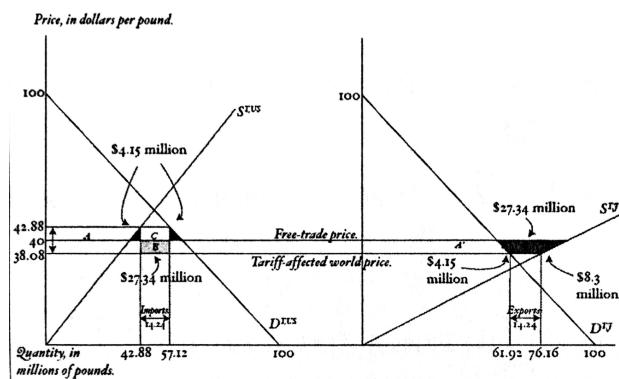
- NE necessarily lies on some world price line  $p^w(\tau)$ . If we move along south-west we leave relative prices unchanged whilst reducing distortions associated with local prices (i.e. reciprocal  $\tau$  reduction)
- Do so until we reach politically optima point (determined by  $\gamma_i$ ) where ICs are tangent
  - If  $\gamma_i = k \forall i$  this will be at the origin (i.e. free trade)
- In the absence of reciprocity our NE outcome is Pareto inferior and sub-politically optimal.
- Any country that unilaterally attempts to lower tariffs will be left worse off.



### McLaren (2013) Model of Stabilization

#### Assumptions and Outline

- Two countries (US and J), both producing and consuming two goods ( $a, t$ ) with homothetic demand. In this example J has a comparative advantage in  $t$ :
  - US in  $t$  sector:  $\max_{\tau^t} W_{US}^t(\tau^t) = CS(P_{US}^t) + PS(P_{US}^t) + [P_{US}^t - P_J^t]M_{US}^t(P_{US}^t)$
  - J in  $a$  sector:  $\max_{\tau^a} W_J^a(\tau^a) = CS(P_J^a) + PS(P_J^a) + [P_J^a - P_{US}^a]M_J^a(P_J^a)$
  - Where the last term is tariff revenue in both cases.
- US  $t$  tariff creates a ToT loss for Japan and efficiency losses in both countries. Same vice versa
- Global cost of US tariff  $W_{US}^t(\tau^t) - W_{US}^t(\tau^t = 0)$ . Similar for Japan tariff



#### Game Theory (Stabilization)

- Gains from defecting:  $\Omega_{US} = [W_{US}^t(\tau^{tN}) - W_{US}^t(\tau^t = 0)]$  and  $\Omega_J = [W_J^a(\tau^{aN}) - W_J^a(\tau^a = 0)]$
- Gains from cooperation:
  - $\omega_{US} = \sum_t^\infty \beta^t ([W_{US}^a(\tau^a = 0) - W_{US}^a(\tau^{aN})] + [W_{US}^t(\tau^t = 0) - W_{US}^t(\tau^{tN})])$

- $\omega_J = \sum_t^\infty \beta^t ([W_J^a(\tau^a = 0) - W_J^a(\tau^{taN})] + [W_J^t(\tau^t = 0) - W_J^t(\tau^{tN})])$
- A trade agreement to implement free trade is self-enforcing iff the discounted present value of cooperating with zero tariffs exceeds the one-period ToT gain with a unilateral Nash tariff
  - $\omega_i > \Omega_i$  for  $i = US, J$
- Folk theorem: FT can be supported as a subgame perfect NE if both countries are sufficiently patient and punish defections from free trade by reverting to the NE in the one-shot game forever

## Grossman and Helpman (1994) Model of Interest Groups

### *Assumptions*

#### Government

- $\max_{\tau} W = A^{\text{cons}} \text{CS}(p) + A^{\text{prod}} \text{PS}(p) + A^{\text{tax}} \text{TR}(p, p^*)$
- Politicians in a democracy value campaign contributions so  $A^{\text{prod}} > A^{\text{cons}} = A^{\text{tax}}$
- Can impose a tariff  $t_i > 0$  in each industry so  $TR = \sum_{i=1}^N t_i m_i(p_i)$

#### Production

- Assume a small open economy that takes world market prices as given  $p_i^*$
- Production of each of the  $N$  goods is according to  $y_i = f_i(L_i, K_i)$  where  $K_i$  is specific
- Numerarie good requires one unit of labour so fix  $w = 1$
- Profits in each sector are  $\pi_i(p_i) = \max_{L_i} p_i f_i(L_i, K_i) - L_i$
- There are two sectors: Industrial sectors with a lobby and Industrial sectors without.

### *Finding Equilibrium*

- Equilibrium tariffs:  $\frac{t_i}{p_i} = - \left( \frac{\delta_i - \lambda_0}{\alpha + \lambda_0} \right) \left( \frac{y_i}{m_i} \right) \left( \frac{dm_i}{dp_i} \frac{p_i}{m_i} \right)^{-1}$ 
  - $\delta \begin{cases} = 1 & \text{if organized} \\ = 0 & \text{if unorganized} \end{cases}$
  - $\lambda_0$  is fraction of the population that owns a share of specific factor
  - $\alpha$  is the weight placed on campaign contributions
  - Last term is elasticity of import demand
- If  $0 < \lambda < 1$  then  $t$  is positive tariff in organized industries where imports are positive

### *Empirical Evidence*

- Goldberg and Maggi (1999): Estimate fit on US tariff structure in 1983. Find evidence but  $\alpha$  (and by extension  $A^{\text{prod}}$ ) is surprisingly small. CS almost 100x campaign contributions
- Bown and Tovar (2011): Estimate fit on Indian tariff structure pre-1990, 1991-92 (liberalization) and 2000-2002. Find supportive evidence.
  - Trade liberalization was partially unwound as politically powerful groups regained protection for their sectors

## Empirical Evidence

### *Bown and Crowley (2013): ToT Theory*

- Note that Bagwell and Staiger Model (see above) implies the following
  - The gains to cooperating  $\omega^*(\tau_{\text{Coop}}(k, k^*), \tau_{\text{Coop}}^*(k, k^*))$  are fixed (since  $k$  is exog.)
  - The gains from defecting  $\Omega^*(k, k^*, 0, \tau_{\text{Defect}}^*)$  fluctuate.

- Thus probability of gov. cheating should...
  - Increase intertemporally with increases in import flows  $M(k^*, P^*)$
  - Increase cross-sectionally with the inverse elasticities of supply and demand  $\frac{1}{\eta_{Xk} + \eta_{Mk}}$
  - Decrease cross-sectionally with the variance of imports  $\delta_{ik}^m$
- Thus regress  $\tau_{ikt} = \beta_0 + \beta_1 M_{ikt} + \beta_2 \left( \frac{1}{\eta_{Xk} + \eta_{Mk}} \right) + \beta_3 \left( \frac{M_{ikt}}{\eta_{Xk} + \eta_{Mk}} \right) + \beta_4 \delta_{ik}^m + \epsilon_{ikt}$  using US import tariffs against 49 countries under the US's antidumping and safeguard laws over the 1997–2006
- Empirics is supportive. Find that for anti-dumping tariffs a one standard-deviation increase in...
  - lagged import growth  $M_{ikt}$  increases  $\text{Pr}(\text{tariff})$  by 35%
  - $\frac{1}{\eta_{Xk} + \eta_{Mk}}$  increases  $\text{Pr}(\text{tariff})$  by 88%
  - $\delta_{ik}^m$  decreases  $\text{Pr}(\text{tariff})$  by 76%

***Tang and Wei (2009) [Political Commitment]***

- Why do small countries, upon joining trade agreements, reduce tariffs drastically.
- Hypothesize that trade agreements are a commitment device used by domestic government that faces a time-consistency problem in tariff setting
  - Free trade maximizes welfare in LR once resources have been optimally re-allocated but in SR the government faces pressure from lobbies to set tariffs
- Use natural experiment in WTO/GATT by comparing developing countries that joined WTO pre-1994 based on if they had to make a “substantive commitment”
- Countries that had to take substantial reforms received a temporary benefit after accession (lasting ~5y) that let the economy is permanently larger (~20%)
- Most pronounced among countries with poor governance, suggesting this channel is causal and that binding policy enforced by a credible third party serve as a (partial) substitute for good governance

# Development Accounting

- Income inequality has increased: US:Poorest GDP/capita was 10:1 in 1870 but 45:1 in 1990

\*\*Caselli (2005): Accounting for Cross-Country Income Differences.

## ***Headline***

- This paper looks to see how much of the cross-country income differences the factor-only model can explain (as opposed to TFP) and, subsequently, what the nature of TFP differences is.
- Using **CD model**, finds that TFP explains ~60%. Much of this appears to be because of differences in sectoral weighting, especially agriculture. Also notes that poor surprisingly use  $K$  more efficiently!

## ***Motivation***

- Wants to check the robustness of development accounting and thereby quantify the relationship  $Income = F(Factors, Efficiency)$ . Can we further identify the causal mechanisms?
- Diagnostic tool: Tells patients whether or not they are suffering from a certain ailment but cannot reveal the underlying causes
- If factors matters we should focus on factor accumulation rates (e.g. support higher investment); if efficiency we should focus on barriers to tech adoption (e.g. disseminate best practices)

## ***Methodology***

- Use CD  $y = Ak^\alpha h^{(1-\alpha)}$ .  $A$  is backed out as a residual and becomes a “measure of our ignorance” and we “chip away” at it by improving our methodology.  $y_{KH} = \frac{y}{A}$  is our factor-only model.
- (1) Two measures of success for  $y_{KH}$ :  $s_1 = \frac{Var[\log(y_{KH})]}{Var[\log(y)]}$  and  $s_2 = \frac{y_{KH}^{90}/y_{KH}^{10}}{y^{90}/y^{10}}$  (less sensitive to outliers)
- (2) Sectoral differences: Assume there are two sectors:  $Y_A = A_A K_A^{\alpha_A} (L_A h_A)^{\beta_A} (T_A)^{1-\alpha_A-\beta_A}$  and  $Y_{\bar{A}} = A_{\bar{A}} K_{\bar{A}}^{\alpha_{\bar{A}}} (L_{\bar{A}} h_{\bar{A}})^{1-\alpha_{\bar{A}}}$ . Use a sample of 65 countries.
- (3) Non-neutral differences: Assume  $Y = [\alpha (A_k K)^{\sigma} + (1 - \alpha)(A_h Lh)^{\sigma}]^{\frac{1}{\sigma}}$  and competitive factor markets (need two equations for two unknowns) to solve  $A_k = (1)^{\frac{1}{\sigma}} \frac{y}{k}$

## ***Key Findings***

### 1a. Factor-Only Model explains little

- Factor-only model explains little ( $s_1 = 0.39, s_2 = 0.34$ ). Worst when sub-sample includes poor countries (poor v poor; rich v poor). Actually works alright amongst OECD ( $s_1 = 0.6$ )

### 1b. Robustness Checks

#### *Not why:*

- Estimates the capital stock  $K$  using  $K_t = I_t + \delta K_{t-1}$  where  $K_0 = I_0/(g + \delta)$ . Assume standard practice  $\delta = 0.06$ . What if not? Sensitivity to changes is minimal.
- $L$  is number of hours worked, proxied via working population. Is there a systematic difference? Rich work fewer hours but the poor (TFP under-est.) have higher rates of unemployment (TFP over-est.)
- Model only looks at quantity not quality of inputs for  $A_h$ . What if a function of test scores? Does not substantially improve the explanatory power and relies on a small sample size (28)
- Assume  $h = e^{\varphi(s)}$  where  $s$  is avg. years of school and the function  $\varphi()$  piecewise linear. What if CRTS ( $\varphi(s) = \varphi_s s$ ) and we change  $\varphi_s$ ? Require  $\varphi_s = 1.25$  (IRL est. 1.1) for  $s_i = 0.75$

***Maybe why:***

- $k$  is more variable across countries than  $h$ , so increasing  $\alpha$  increases  $s$ . Standard practice is assume  $\alpha = 1/3$ . What if not?  $\alpha = 0.4$  is sufficient for  $s_1 = 0.5$ ;  $\alpha = 0.6$  brings complete success.
- Model only looks at quantity of inputs for  $A_h$ . What if a function of health and nutrition? Increases explanatory power by 1/3 (backs Shastry and Weil (2003)). But doing same with birthweight doesn't
- Equipment shares vary, hence so does the embodied-R&D (communication 2280 vs other transport 57). Could rich countries simply be using higher quality equipment? Depends on substitutability!
- Many believe gov.'s I is less productive because less-accountable, especially in poor countries. Implies "effective" variance of  $K$  is larger. Could try to separate out public investment or break it down.

**2. Sectoral (i.e. agricultural) differences explain a lot of this**

- Differences in aggregate TFP could be because of variations in the weights in GDP of sectors with different sectorial-level productivity. Hence break down into agriculture and non-agriculture...
- Factor-only model explains almost nothing in agriculture (~85% TFP) but does better than usual explaining differences outside.
- Three proximate reasons for poor countries' poverty: much lower labor prod in agr; larger share of employment in agr., which is less productive; and their somewhat lower labor prod outside agr.
  - If poor countries had US agricultural labour productivity, country inequality would fall 97% (disappear)! 90:10 percentile ratio of labor productivity is 22 in aggregate but 45 in agriculture
  - If poor countries had US agricultural employment country inequality would fall by 2/3. Poor countries have as much as 90% of their workforce in agriculture, rich countries as little as 3%
  - But... cross-country non-agricultural productivity differences are still sufficiently large that income inequality would fall by about 1/2 if poor countries were as productive as the US

**3. Non-Neutral Differences**

- Assumed differences in TFP are uniform (some countries use all of their inputs more efficiently). Instead find that poor countries have a higher  $A_k$  and rich countries a higher  $A_h$ !
- Perhaps countries face a menu of technology choices and choose optimally based on  $K$  and  $h$  endowment (i.e. remedy factor endowment via endogenous TFP!)
  - If all countries had USA tech and we vary elasticity of substitution ( $\eta$ ), model outperforms CD for  $\eta < 1$  and has perfect fit at  $\eta = 0.5$  (not implausible!)
  - If all countries had access to the same "menu" of observed  $(A_k, A_h)$  combinations (more sensible), the factor-only model loses significant explanatory power but very sensitive to  $\eta$

## Further Discussion

- Development accounting has nothing to say on fundamental causes (only proximate) and how these Factors and Efficiency interact. It is 'only' a diagnostic tool.

***\*Gollin et al. (2014)***

- **Motivation:** Worry that agricultural output data may be badly measured: Poor countries have unreliable statistical agencies and macro data requires using international, quantity-weighted prices.
- **Method:** Use evidence from disaggregate [i.e. micro] sources focusing on physical measures of labor productivity for maize, rice, and wheat (scientists and econ). Compare this to macro FAO estimates.
  - Why these? Account for ~1/2 of calories consumed, does not require aggregation with international prices, have data on yields (estimate prod whether good is sold self- consumed)
- **Key Findings:** Macro and micro observations are very similar ("close to 45 degree line"): Large disparities in agricultural labor productivity are real. Identify land/worker as key driver.

# Geography

\*\*Dell, Jones, & Olken [DJO] (2012): Temp. shocks and econ. growth

## ***Headline***

- This paper looks to see if climate can explain within country differences in growth. More generally, this supports the geography hypothesis.
- Using a **OLS reg.**, which controls for fixed country, it finds that temp affects growth but only in poor countries (+1C = -1.4%-points growth). This works through agriculture, industry, and politics.

## ***Motivation***

- The existing literature explores climate-development relationship in two ways:
  - Avg. temp and aggregate development across countries shows that hot countries are poorer (national income falls 8.5% per Celsius) but... driven by national characteristics
  - Look at micro evidence to quantify various climatic effects and then aggregates these to produce a net effect on national income but... incredibly complicated
- Hence this paper looks at year-to-year fluctuations in temperature and precipitation (1950-2003) within countries (fixed country factors!), examining aggregate outcomes

## ***Methodology***

### Set-Up

- Regress  $g_{crt} = \alpha_c + \gamma_{rt} + \beta_1 T CLIM_{crt} + \beta_2 (CLIM_{crt} \times POOR_c) + \epsilon_{crt}$ .
  - Where  $c$  is country (country fixed effects),  $r$  continent (different regions may be growing at different rates), and  $t$  year.  $CLIM$  is proxied separately through temperature and precipitation
  - Including  $POOR$  allows us to examine heterogenous effects (poor countries may spend more time outdoors, can't afford AC, etc.)

### Robustness Checks

- Do several robustness checks (area-weighted climate, exclude Sub-Saharan, add countries with <20y data) and use different datasets. Results remain significant.
- May be that temperature has nonlinear effects. Limited power to assess this given the few degrees of variation in temperature within each country.

## ***Key Findings***

### 1. Temperature matters in poor countries

- Short Run: Statistically negative effects of higher temperatures on growth, but only in poor countries with +1C reducing growth by 1.4%-points. Changes in precipitation are insignificant.
- Medium Run: Including up to 10 lags sees +1C reduces growth by 1.9%-points. Hence little evidence that countries can eliminate all negative consequences.
- Long Run: May be different as countries may adapt, mitigating short run economic impacts observed, and/or sustained climatic changes may have its own effects (e.g. soil quality). No data yet.

### 2. This works through agricultural, industrial, and political channels

- Temperature could affect economic activity directly (e.g. agricultural yields and industry) or indirectly by hindering its ability to grow in the future (e.g. investments and political economy).

- Agriculture is only part of the story. +1C in POOR is associated with -2.7%-points growth in agr. output and -2.0%-points in industrial output. But... demand spillover?
- Higher temperatures lead to internal political instability. +1C in POOR is associated with +3.1%-point probability of coups. But... no sig effect on start or conclusion of conflicts.
- Note, it is unclear how these channels interact with each other

\*\*Acemoglu, Johnson, & Robinson [AJR] (2012): Reversal of Fortune

### ***Headline***

- This paper seeks to show that there was a reversal of fortunes from 1500 to present amongst former colonies. More generally this weakens the geography hypothesis in favor for institutions.
- Using **OLS reg.**, finds a reversal in relative incomes, show it was related to industrialization, and provides evidence that the interaction between institutions and industrialization in 19thC was key

### ***Motivation***

- Simple geography hypothesis (determines work effort, technology, and/or disease burden) does not predicts a reversal of fortune since it is time-invariant.
- Complex theories include time varying characteristics (see later):  $Y_{it} = \beta_0 + \beta_1 G_{it} + \beta_2 T_t G_{it}$  where  $G$  is geography,  $t$  time and  $T_t$  time varying characteristic. If we can date reversal we can test this too.
  - Sachs (2000): "Temperate drift hypothesis": Areas in the tropics had an early advantage, but later agricultural technologies (e.g. domesticated animals) favored temperate areas

### ***Methodology***

#### Set-Up

- To establish reversal, paper measures economic prosperity in 1500 via two proxies: urbanization (main) and population density (additional). Then relate this to modern log GDP/capita
  - Kuznets (1968): Economic development > structural change > countryside-city migration
  - Bairoch (1988): Urbanization requires large agricultural surplus and the possibility to trade
- To establish institutional link, paper relates 1500 prosperity with contemporary institutions via two proxies: protections against expropriation risk (first) and constraints on the executive (second).

#### Robustness

- Control for continent dummies, colonial identity, religion, distance from equator, temperature, humidity, resources, and if landlocked. Also run regression excluding "neo-Europe".
- But... look only at colonized countries (Is it sensible ignoring Europe? Could we use geography to explain why Europe colonized the world?)
- Why do we measure countries? They're not like people or static (US Native Americans vs. White Immigrants). Does this tell us anything useful?

### ***Key Findings***

#### 1. There was a reversal of fortune, whose nature contradicts Geography Hypothesis

- Contra-Simple: Robust negative association between economic prosperity in 1500 (using both proxies) and today. E.g. Mughals in India and Incas in the Americas now poor; Australia now rich.
  - A 10%-point lower urbanization in 1500 is associated with ~2x GDP/capita today in most parsimonious specification
- Contra-Complex: Introduction of agricultural techniques (from 16thC) occurred before the reversal (19thC), closely related to industrialization. Geographic factors don't seem to explain IR.

## 2. Instead propose Institutional Hypothesis

- Institutions are persistent, but contrary to geography they can be changed instantaneously. European colonialism caused “institutional reversal”, critical for IR
- Find that being prosperous in 1500 is associated with poor institutions today (note this does not identify a causal mechanism!). Why?
  - Relative prosperity and a large population made extractive colonial institutions profitable. Population could be forced to work or taxed via existing structures. Elites block innovation.
    - Whether a society has institutions of private property or extractive institutions may matter much more when new technologies require broad-based economic participation (i.e. IR)
  - Relatively poor regions were sparsely populated and this induced Europeans to settle in large numbers and develop institutions encouraging investment
    - E.g. early attempt to colonize Argentina failed because of low population density of natives (contra Paraguay). Now has larger share of Europeans and much richer than neighbors.

## Further Discussion

- **Montesquieu (1750):** The Spirit of Laws focused on climate, arguing that an “excess of heat” made men “slothful and dispirited”
- **Jared Diamond (1997):** Timing of the Neolithic revolution (caused by geography) determined the nature of food production, which was the fundamental driver of European colonialism.

# Institutions

\*\*AJR (2001): The Colonial Origins of Comparative Development

## ***Headline***

- This paper seeks to show that colonial institutions determine contemporary economic development. More generally, this paper argues in favor of the institution hypothesis.
- Using an **IV OLS reg.**, with settler mortality an exogenous variable for institutions, this paper shows a robust, causal relationship. Once included, proximity to the equator has no significance in Africa.

## ***Motivation***

- Theory states that countries with better "institutions" (secure property rights and less distortionary policies) will invest more in physical and human capital, hence use these factors more efficiently
- Old approaches focused on the identity of the colonizer. This paper focuses on prior conditions instead (like Engerman & Sokoloff (1997))

## The Hypothesis

- Problems with investigating this are reverse causality (rich economies can afford better institutions) and OVB (hence economies will differ both in their institutions and income)
- Hence we need a source of exogenous variation in institutions. This paper proposes the following:  

$$\text{potential settler} > \text{settlements mortality} > \text{early institutions} > \text{current institutions} > \text{current performance}$$
- This rests on three historical premises:
  1. Colonial institutions differed: "extractives states" sought to transfer as much of the resources of the colony to the colonizer; "Neo-Europe" sought to replicate European institutions
    - Manning (1982) estimates that 50% of 1905-14 GDP in Dahomey was extracted by the French a mercantilist system of monopolies and regulations

2. Colonization strategy was influenced by the feasibility of settlements
  - Pilgrim fathers decided to migrate to the US rather than Guyana because of a lower mortality rates. Australia was chosen for convicts instead of Lemane.
3. State and institutions persisted even after independence. One small elite simply replaced another.

### ***Methodology***

#### Set Up

- Use a 2SLS instrumental variable:
  - 1<sup>st</sup>:  $R_i = \alpha_0 + \alpha_1 \log M_i + \alpha_2 \mathbf{X}'_i + \nu_i$  where  $R$  is protection against expropriation,  $M$  is settler mortality,  $\mathbf{X}$  is a vector of other covariates, and  $\nu$  is a random error term.  $H_0: \alpha_1 = 0$
  - 2<sup>nd</sup>:  $\log y_i = \beta_0 + \beta_1 R_i + \beta_2 \mathbf{X}'_i + \epsilon_i$  where  $y$  is income per capita,  $R$  is treated protection against expropriation,  $\mathbf{X}$  is a vector of covariates, and  $\epsilon$  is a random error term.  $H_0: \beta_1 = 0$
- *Strength*: Mortality rates are not the only, or even the main, cause of variation in institutions. Yet all we need is that they are a source of exogenous variation. This is satisfied comfortably.
- *Exclusion*: settler mortality rates could be correlated with the current disease environment, which may have a direct effect on economic performance. But...
  - Malaria and yellow fever killed many settlers but not generally indigenous adults. More generally their risk has been reduced by modern medicine.
  - Malaria depends much on micro climates. Hence it is unlikely to be a proxy for some simple geographic or climactic feature of the country
  - Disease is highly endogenous. It is the poorer countries with worse institutions that have been unable to eradicate malaria

#### Robustness

- *Basics*: Withstand controls for colonizer identity, legal origin, climate, religion, geography, natural resources, soil quality, ethnolinguistic fragmentation. Not driven by British White Colonies or Africa
- *Exclusion*: Results withstand the inclusion of controls for the current disease environment and the current fraction of the population of European descent.
- *Simple Overidentification Test (C, S, M)*: Eases concern that our empirical approach might capture the effect of settler mortality working through other channels.
- *Measurement Error*: Institutions variable can have considerable error (very hard to capture all of it), so if anything attenuation may bias results downwards
- *Alternative*: Results are consistent when using yellow fever rather than malaria (attractive alternative strategy because yellow fever is mostly eradicated today but has less variation)

### ***Key Findings***

- 1<sup>st</sup>: Past institutions (C) alone explain 20% of the variation in the index of current institutions (R); fraction of Europeans in 1900 (S) explains 30%; settler mortality (M) explains 27%
- 2<sup>nd</sup>: Large and precise ( $\beta_1 = 0.96, SE = 0.16$ ): Improving Nigeria's institutions to the level of Chile could, in the long run, lead to as much as a 7-fold increase in Nigeria's income
- Once the effect of institutions on economic performance is controlled for, neither distance from the equator nor the dummy for Africa is significant. Strong blow against geographic explanations.

\*\*Pappaioanou & Michalopoulos [PM] (2014): National Institutions and Subnational Development in Africa

## ***Headline***

- This paper seeks to investigate the relationship between institutions and development in Africa, accounting for ethnicity and geography. More generally, it argues against the institutions hypothesis.
- Using a **OLS reg.**, finds the relationship collapses across 200+ split African regions. Confirmed by **Reg. Discontinuity**. But great heterogeneity (~23% conform, clustering around the capitals).

## ***Motivation***

- AJR shows that institutions matter but historiography and some case studies disagree. This paper want to test whether the relationship still holds true once accounting for ethnic fixed effects.
- Further want to be able to identify in what cases institutions matter, thereby coming closer to a fundamental explanation of development.

## ***Methodology***

### Set Up

- Use quasi-experiment of 'arbitrary' African borders drawn by colonizers before independence and largely before settlement. Split 200+ ethnicities and gives 500+ observations
  - Alesina, Easterly, and Matuszeski (2011) ~80% of African borders are straight
- To overcome the paucity of economic data across African regions, use satellite images of light density (building on Henderson et al. (2012)), giving two units of measurement.
- Regress  $y_{i,c} = a_0 + a_1 IQL_c + a_2 PD_{i,c} + a_3 AREA_{(p),i,c} + a_4 X_{(p),i,c} + a_i + \epsilon_{(p),i,c}$ 
  - where  $IQL$  is national institutional quality,  $PD$  log population density,  $AREA$  log land area,  $X$  a vector of additional controls, and  $\epsilon$  the random error
- Then investigate distance from capital But... due to endogeneity (omitted variables, reverse causation, etc.) do not ensure causal link but are useful to quantify the correlation at the capital

### Robustness

- Large sample of all partitioned ethnicities in Africa means less sensitive to the "external validity" arguments, unlike simple Case Studies
- Also run spatial regression discontinuity (RD) analysis. By focusing on areas very close to the border (25-50km each side), further neutralize the role of unobservable factors

## ***Key Findings***

### 1. National Institutions do not matter once controlling for ethnic fixed effects

- Holds for both units of analysis and across both measurements of institutions: Coefficients on rule of law (0.65 to 0.19) and control of corruption (0.79 to 0.26).
- RD cross-sectional estimates fall by 2/3+ once ethnicity fixed effects added, becoming insignificant (from 0.68 to 0.083; from 0.86 to 0.09)
- Ethnicity fixed effects are jointly significant at 99% confidence level and most are individually significant as well. Suggests African development has a strong local component

### 2. Results are very heterogeneous: If near the capital, institutions do matter

- National institutions are statistically insignificant for 60% of sample, positive significant for 23% (e.g. Ambo), negative significant for 17% (e.g. Anyi).
- Only positive significant when near the capital. If so a one-standard-deviation increase in the control of corruption index increases the probability that a pixel is lit by ~7%
- Afrobarometer Survey data on law enforcement and national identification appears to weaken monotonically when we move away from capital.

## Further Discussion

### *Origin of the Colonizer (early work)*

- Note that the Institutional Hypothesis says nothing about how to improve institutions (equilibrium outcome vs. fundamental cause)
- **Hayek (1960):** Hypothesized that British common law tradition was superior to the French civil law for economic outcomes
- **La Porta et al. (1999):** Common-law countries and former British colonies have better property rights and more developed financial markets.
- **North et al. (1998):** Former British colonies prospered relative to former French, Spanish, and Portuguese colonies because of good inherited economic and political institutions

### *African Historiography*

- **Herbst (2000):** historical evidence de-emphasizes the importance of colonial and contemporary countrywide institutions in the hinterland
- **Mamdani (1996):** Europeans' presence in Africa was largely limited to the coastline and the capital cities due to the lack of infrastructure and unfavorable geography.
- **Bates (1983):** African national leaders did not even try to extend state's power in the countryside, focusing on consolidating power in the capital and large urban centers.

### *Recent Economic Literature*

- **Campante et al. (2013):** link regional capital city isolation with mis-governance and economic efficiency
- **Lewis (1954):** proposed coexisting "dual" economic-institutional framework: Africa has customary rules dominate the countryside and colonial-national institutions near the capital

### **\*Aghion, Alesina, & Trebbi (2004)**

- **Motivation:** Can we endogenise political institutions? Super majorities have a tradeoff between restraining the “tyranny of the majority” and enabling control.
- **Method:** Examine actual supermajorities in the developing world versus the hypothesized ‘optimal’ choice predicted by their model amongst both developing and developed countries.
  - $M^* = \frac{1}{2} - \frac{2Ab(1-p)}{I^2\gamma}$  where  $b$  is the cost of expropriation,  $p$  is the probability of a “good leader”  $I$ , and  $\gamma$  is the value of reform.  $A$  and  $I$  relate to the population distribution.
  - Would explain why countries with lower levels of GDP/capita are less insulated, why older constitutions (less franchised) insulate less, and why insulation tends to increase in times of crisis
- **Key Findings:** Find a positive and significant correlation between polarization and insulation, in accordance with the model.
  - Note that adoption of optimal choice depends if decision is made behind a "veil of ignorance" or by a fraction of the population (i.e. elite)

# History

\*\*Nunn (2008): The Long Term Effects of Africa's Slave Trades

## ***Headline***

- This paper seeks to investigate the relationship between the slave trade and subsequent economic performance in Africa and how. More generally, it wants to see how history shapes development.
- Using an **IV OLS reg.**, with sailing distance an instrument for slaves exported, it finds a robust negative relationship because it led to ethnic fractionalization and weakened political structures

## ***Motivation***

- Africa experienced four slave trades for ~500 years (contra ~75y colonialism, removing 18m). Manning estimates that by 1850 Africa's population was only half of what it should have been
  - Rich historical literature that, because people of similar ethnicities enslaved one another (raiding and accusations), this impeded the formation of broader identities. No economics study of this yet.
    - E.g. Portuguese slaver trade was key to impeding the Jollof Confederation and undermined the Kongo monarchy.
    - Herbst (2000): The impact of the slave trades may have been felt most strongly after colonial independence when many states reverted to local structures
- Slave trade > Weak historical institutions > Weak post-colonial institutions > Underdeveloped*

## ***Methodology***

### Set-Up

- Uses shipping data to calculate the number of slaves exported from each coastal country and uses ethnic identity (inferred from docs) to estimate the number that came from inland countries
- *Basic:* Regress  $\ln y_i = \beta_0 + \beta_1 \ln \left( \frac{\text{exports}_i}{\text{area}_i} \right) + \beta_2 \mathbf{C}'_i + \beta_3 \mathbf{X}'_i + \epsilon_i$ 
  - Where  $y$  is real GDP/capita in 2000,  $\mathbf{C}_i$  dummy variables for colonizer origin, and  $\mathbf{X}_i$  a vector of controls (geography, climate, % of Islamic pop., legal origin, natural endowment)
  - But... selection bias? Prosperous (i.e. densely populated) areas had the largest numbers of potential slaves; violent areas were able to resist (e.g. Gabon vs. Portugal). Hence...
- *Instrumental:* Uses distances from each African country to the locations where slaves were demanded. Has the advantage of reducing omitted variable bias and establishing causality.
  - Exclusion: "relies on the presumption that although the location of demand influenced the location of supply, the location of supply did not influence the location of demand." (see below)
- *Channel:* Goes on to try and identify causal channel by examining correlation between the slave trade and ethnic fractionalization (as well as centralization) to confirm hypothesis
  - But... only 52 observations so should only be viewed as "preliminary" and strategy here is to simply investigate whether the data are consistent with the historic accounts

### Robustness

- Mapping problem? Because ethnicities tended to be much smaller than countries, the mapping of ethnicities into countries generally is not problematic. Believe they have an accuracy of 83-98%.
- Sampling bias? Slaves from the interior ethnicities are underrepresented (only those who made it to the port are counted) but... would bias our estimates towards zero.
- Exclusion? Distances to the slave markets may be correlated with distances to other locations that are important for economic development.
  - But... if so we would expect to also observe a positive relationship between the distance measures and income outside of Africa. This is not the case.

### ***Key Findings***

- Finds a robust, significant, and negative relationship between slaves exported from each country and subsequent economic performance, both in basic and IV specification. Pure  $\beta_1 = \sim 2.1$  (sig at 1%)
- Correlation between slave exports and current ethnic fractionalization is strong and positive, with state centralization it is negative. Consistent with channel but cannot prove causation.

\*\*Dell (2010): The Persistent Effect of Peru's Mining Mita

### ***Headline***

- This paper seeks to investigate whether Mita mines in Peru matter for development and, if so, how. More generally, it attempts to specify the mechanism through which historical effects persist.
- Using a **Reg. Discontinuity** finds a negative relationship: Mita lowers consumption by around 25% and increases stunting by 6%-points. Identifies land tenure and public goods as channels.

### ***Motivation***

- Uses a case study of micro-data to see if it is consistent with AJR's finding of historical persistence, which was reached via general macro-data general.
- Wants to be able to identify the exact channels through which such effects persist, something which was not achieved by AJR.

### ***Methodology***

#### Set-Up

- Uses the quasi-natural experiment of Spanish colonizers well-defined Mita, requiring 200+ communities to send 1/7 of their adult male workforce to the mines from 1573
- Regress  $c_{idb} = \beta_0 + \beta_1 mita_d + \beta_2 X_{id} + f(\text{geographic location}_d) + \phi_b + \varepsilon_{idb}$ 
  - Where  $c$  is the outcome variable (household consumption or child stunting),  $mita_d$  is dummy variable,  $X_{id}$  a vector of controls,  $f(\cdot)$  the RD polynomial (controlling for smooth functions of geographic location) and  $\phi_b$  is a set of boundary segment fixed effects

#### Robustness

- Exclusively focuses on the part of the border not coincident with mountains where these variables are statistically identical.
- Results are robust to controls for elevation, slope, rainfall, fertility, ethnicity, demographic, and pre-econ measurements.

### ***Key Findings***

- Mita lowers consumption by around 25% and increases stunting by 6%-points
- Why? Finds that Mita is associated with lower hacienda (landowning class) until 1940, public goods, and a higher fraction of subsistence farming. Hence hypothesis that...
  - Non-Mita regions established hacienda, who ensured a stable land tenure system with property rights and public goods (incentive to invest given property rights and means to lobby).
  - Mita regions saw colonizers restrict the formation of this (minimize competition for scarce labour) and promoted communal land tenure, which was abolished in 19<sup>th</sup>C with no replacement
- Contradicts Engerman & Sokoloff (1997) who hypothesized that high land inequality is the fundamental cause of Latin America's poor long-run growth performance contra North America
  - But... not appropriate comparison since Latin America because pre-hacienda institutions did not provide secure property rights or protection from exploitation

## Further Discussion

### **\*Teso, E. (2014)**

- **Motivation:** Growing literature links the degree of women's participation in the labor force to the prevailing cultural beliefs about the role of women in society. What explains these beliefs?
- **Hypothesis:** Male shortage > Women take on traditionally male jobs > Persists. Why?  
Hazan and Maoz (2002): Woman who works incurs the cost of violating the social norms, which is decreasing in the number of women working in the previous generation. Creates multiple equilibrium  
Fernandez et al. (2004): Man inherits social norms for women from the working status of his mother. Once in the marriage market, men will force this view onto their wife and society
- **Methodology:** Use quasi-natural experiment of demographic sex ratio shock caused by trans-Atlantic slave trade (40-50 men per 100 women in some areas) to higher female labour participation
- **Key Findings:** Women of most exposed ethnic groups are more likely to be work (esp. high-ranking jobs) and more empowered in survey (household decisions, domestic violence, political feminism)
- **Robustness:**
  - Robust to controls for European influence, initial prosperity, historical state capacity
  - Use distance of an ethnic group to the coast as an instrument for trans-Atlantic trade. Confirms.
  - Placebo test using Indian Ocean slave trade, which did not exhibit gender preference. Confirms.

### **\*Nunn & Wantchekon (2011)**

- **Motivation:** Nunn (2008) finds that the slave trade had a significant negative effect on long-term economic development. What is the exact causal mechanism?
- **Hypothesis:** Slave trade created a culture of mistrust that persists to this day. (Rules-of-thumb do not develop in a vacuum but rather evolve according to which yield the highest payoff)
- **Methodology (i):** Use distance of ethnic groups from the coast as an instrument for number of slaves taken. Finds a strong positive relationship.
  - Exclusion?: Africans were not engaged in overseas external trade so other channels are unlikely. Directly control for Saharan trade and run falsification tests
  - Control for European influence, precolonial prosperity, and precolonial politics. Unobservable need to be 3-11x greater to explain away.
- **Key Finding (i):** Strong results that ethnic groups most exposed to the slave trades exhibit lower levels of trust (relatives, neighbors, other ethnicities, and local government)
- **Methodology (ii):** Decompose effect into two channels (internal vs. social) by looking at what matters: avg. # of slaves taken from individuals' current location or their historic ethnic group
  - If internal dominates then ethnic group matter, if external then current location
- **Key Findings (ii):** Both are important, but internal channel is at least twice as large

## Culture

\*\*Tabellini (2010): Culture and Institutions

### ***Headline***

- This paper seeks to find the relationship between inherited culture and contemporary development in European regions. More generally, it seeks establish the source of historical persistence.

- Using a **IV OLS reg.**, with historical school enrollment and Constraints on Exec as instruments for culture, it finds that culture is important.
- But... preliminary evidence on Italy suggests that the institutional channel dominants this effect. At “Culture” is still largely a black box.

### ***Motivation***

- Existing literature uses cross-country variation to argue that *Historical Institutions > Contemporary Institutions > Economic development*. Hence, this paper uses within country variation, thereby holding fixed national institutions.

### ***Methodology***

#### Set Up

- Estimate culture through three indicators that should promote development (trust, control, respect) and one that should hurt it (obedience)
- *First Stage:* Regress  $Y = \alpha + \delta C + \beta Y_0 + \gamma X + e$ 
  - where  $Y$  is regional per capita output,  $C$  indicator of culture,  $Y_0$  urbanization in 1850,  $X$  other regressors (school enrollment in 1960 and country dummies) and  $e$  the unobserved error term
- *Second Stage:*  $C$  and  $e$  are likely to be correlated. Hence break down  $C = a + dC_0 + bY_0 + cX + u$ 
  - Do not observe  $C_0$  directly so use literacy rate and Constraints on the Executive as instruments.
  - Exclusion: A very strong assumption
    - Control for direct effects: contemporary school enrollment, political institutions (the country fixed effects), and past development (urbanization in 1850)
    - Control for indirect effects: past literacy may affect sectoral composition of employment; past poverty may cause a public infrastructures gap (use Italian sub-sample)

#### Robustness

##### *The Good*

- Can rule out reverse causality since culture is shaped by the past not current economic development.
- Replace level of output with growth between mid-70s and 2000. Results remain significant
- Test over-identifying restrictions since we have two instrumental variables. Not rejected when culture is measured by a broad indicator; it is rejected for two individual cultural variables.
  - Suggests that an excessively narrow definition of culture does not fully capture the channels through which history affects current development

##### *The Bad*

- Use World Value Surveys to measure culture but the average number polled in each region is small:  $\sim 320$  and median  $\sim 130$ . Hence unlikely to be representative.
- !!! Control for quality of government institutions in Italian sub-sample via judicial variable. Culture becomes insignificant and *negative*. Treat this with caution due to few degrees of freedom

### ***Key Findings***

#### 1. (Historical) culture matters for development

- *First Stage:* There is a strong and significant correlation between all measures of culture and current development (note the exception of wealthy France despite its culture)
  - Education: Find that a 1% increase in the literacy rate at the end of the 1800s is associated with a 0.85% increase in current per capita output relative to the EU average
  - Politics: If southern Italy had had the same political institutions as Lombardy, its current income would now be higher by about 17%.

- *Second Stage:* Effect of purified culture on economic development is large and statistically significant and with the expected sign, for all indicators of culture

## 2. Many hypothesis as to why, which remain to be tested

- Culture determines extent to which people innovate or take risks (Galor and Ashraf (2007))
- Culture determines extent to which people work hard (Doepke and Zilibotti (2008));
- Mutual trust facilitates the functioning of anonymous markets. This enables specialization
- Generalized morality improves the functioning of government institutions (Tabellini (2008))

## Further Discussion

### What is Culture?

- Reluctance to incorporate it since it is broad and its channels vague that it is difficult to design testable hypotheses.
- GSZ hence define culture as “those customary beliefs and values that ethnic, religious, and social groups transmit fairly unchanged from generation to generation”.
  - Restricting analysis to two channels enables us to identify a causal effect to economic outcomes.
  - Focus on inherited culture (e.g. religion and ethnic background) eliminates reverse causality
  - Maintains utility maximizing model. Culture simply affects associated parameters
- Why does culture change slowly?
  - Inter-generational transfer: Parents have a natural tendency to teach their children what they have learned from their own parents
  - Vested interests: Organizations that play a role in promoting culture (e.g. church, academia, state) want to continue promoting beliefs that provide them with rents.

### Academic Debate:

#### *Pro-Culture*

- **Weber (1905):** regarded the “Protestant Work Ethic” as crucial to the development of capitalism via emphasizing predestination and success in worldly activity
- **Banfield (1958):** Attributes the underdevelopment of southern Italy (a.k.a. Meridionale question) to “amoral familism.” *History > Culture > Economics*
- **Putnam (1993):** Social Capital explains Meridionale question: South lacked free city-states due to Normans > no “sworn pact” > less SC (e.g. Judicial rulings take longer despite same structure)
  - SC: “those persistent and shared beliefs and values that help a group overcome the free rider problem in the pursuit of socially valuable activities”

#### *Pro-Trust*

- **Arrow (1972):** “Virtually every commercial transaction has within itself an element of trust”. Especially if unknown counterpart, short time horizon, and imperfect legal protection.
- **Knack & Keefer (1996):** Part of New Cultural Economics. Trust is easily incorporated. Find sd increase in country-level trust increases economic growth by more than 1/2 sd.

#### *Contra-Culture*

- **Marx (1867):** Saw religion (and culture more generally) as a byproduct of the relations of production
- **Coleman (1990):** Part of the marginal revolution. Religion and social norms are the result of a group-level optimization.
- **Henrich et al. (2001):** Tribes whose subsistence activities require larger economies of scale (i.e. cooperation) offer more in ultimatum game. Supports Marx but shows it persists beyond

### **\*Guiso, Sapienza, & Zingales [GSZ] (2006)**

- **Trust:** GSZ (2003): Being raised religiously raises the level of trust by 2%; regularly attending religious services by another 20%. Differs substantially across denominations. *see Knack & Keefer*.
  - Control for health, gender, age, edu, class, income and country fixed effects. Results are independent of whether person is still religious
  - Catholics brought up after liberalizing Vatican II (born after 1960) are indeed more trusting and tolerant, even when including secular dummy.
  - GSZ (2009): Eu countries that trusts another more tends to exchange more goods and financial assets with it, and to engage more in direct investment. Hold after typical controls!
- **Thriftiness:** GSZ (2003): Explanatory power of a culture for national saving is akin to power of the life-cycle model (i.e. growth rate of income): +sd in importance to teach = +1.8%-point in  $s$ 
  - Difference in denominations: Catholics are 3.8% more likely and Protestants (1% sig) and 2.7% more likely than atheists (5% sig) to view teaching thrift to their children as important.
  - Reverse causality? Use religious denomination in each country as an instrument. Impact doubles in size but significance weakens (5 to 10%)
- **Politics:** GSZ (2006): Americans with known African ancestors are 20% more in favor of redistribution than those of British origin.
  - Holds after controlling for whether the respondent is white and demographic variables like income, education, gender, age and health status
  - Increasing preferences for redistribution by one standard deviation raises the ratio of direct/indirect taxation by 14-20% of the sample mean.

### **\*GSZ (2016)**

- **Motivation:** Assess empirically Putnam's hypothesis: Do Italian cities that achieved self-government in the Middle Ages exhibit higher social capital today? Then test Banfield's channel.
- **Methodology (i):** Exclusively look at variation within Northern Italy (fixed climate, geography, etc.)
- **Key Findings (i):** + sd in the length of independence = + 2.5% nonprofit organizations; +4.5% organ donation; -2.75% math cheats. # of non-profits is 25% in former free city states
- **Methodology (ii):** Use whether a city had a bishop in 11thC as an instrument for city-state status (facilitated the "sworn pact"). Note that exclusion here is a strong assumption (religiosity!)
- **Key Findings (ii):** Presence of a bishop is correlated with higher civic capital in the North but not in the South and only for bishop seats established before 1400.
- **Channel:** Build on Banfield (history > self-efficacy i.e. empowerment > civic capital)
  - 8th-graders (reflect parents and teachers) of former free city-states display more self-efficacy
  - Towns exhibiting a higher self-efficacy measure have also higher civic capital

### **\*PM (2013)**

- **Motivation:** Do pre-colonial institutions (i.e. culture) still matter today?
- **Methodology:** Compare spatial distribution of ethnicities before colonization with regional variation in contemporary economic performance proxied by satellite images of light density at night.
- **Robustness:**
  - Control for local geographic features (disease, resource endowment), other ethnic-specific cultural and economic variables, as well as country fixed effects.
  - Holds when limiting sample to pairs of adjacent ethnic homelands in the same country but with different pre-colonial institutions
  - Do not get significant results when using a variety of alternative pre-colonial ethnic characteristics (occupational specialization, economic organization, polygamy, slavery).

- **Key Findings:** Find a strong association between pre-colonial ethnic political centralization and regional development.
- **Channel:** Inability of post-independence African states to broadcast power beyond the capitals. Hence the reliance on local ethnic-specific structures for tax and public goods
  - In 1990s, 14/39 African countries passed legislation to formally recognize the role of ethnic institutional structures in settling property rights disputes and enforcing customary law
  - Herbst (2000): In centralized ethnicities, there was access to some formal legal resolution mechanism and some form of property rights steadily emerged

# Political Economy

\*\*Miguel, E. (2004). Tribe or nation?

## ***Headline***

- This paper seeks to test whether central government nation-building policies affect interethnic cooperation in Meatu (Tanzania) compared to Busia (Kenya).
- Using an **OLS reg** with an **interaction term** it finds that local ethnic diversity has a significantly more negative effect on local public good provisions in Busia.

## ***Motivation***

- Firstly, test the belief that ethnically diverse societies have less public goods. Serious implications since Africa is both the most ethnically diverse and poorest continent
- Secondly, show that any such problem can be overcome through creating a strong national identity, further legitimizing state intervention.

## ***Methodology***

### Set Up

- Use the quasi-natural experiment of arbitrary colonial-era boundaries and Tanzania's enforced nation building (Kiswahili, dismantling of tribal authorities, equal regional distribution of resources)
- Both regions rely on community to raise funds for local public goods: Kenyan harambe (village fund raisers) and Tanzanian standard contributions.
- Regress  $Y_{ic}^k = \alpha_1^k + \alpha_2^k KENYA_{ic} + X_{ic}\beta_1^k + \{X_{ic} * KENYA_{ic}\}\beta_2^k + \tau_1^k ELF_{ic} + \tau_2^k \{ELF_{ic} * KENYA_{ic}\} + u_{ic}^k$  where  $H_0: \tau_2^k = 0$ 
  - $k$  is outcome type (local primary school funding per pupil, desks per pupil, latrines per pupil, classrooms per pupil, and the proportion of water wells with normal flow)
  - $i$  is community,  $c$  country, and  $X$  a vector of controls
- Use seemingly unrelated regression (SUR) to test collective  $k$

### Robustness

#### *The Good*

- Use of multiple  $k$  provides additional statistical power. The confidence intervals when data are pooled across outcomes is considerably narrower than the interval for any single outcome.

#### *The Bad*

- Small sample size of only two regions in two countries. Would allow us to generalize results and make them more robust.

- Lack of longitudinal data. Must assume that current interethnic cooperation would have been similar in regions in the absence of the nation-building policy divergence
- Do not know that Tanzania's national identity is causal mechanism. Could be that forced villagization improved interethnic cooperation over the long run by promoting frequent interactions. Hence rely on qualitative evidence.

### ***Key Findings***

#### Ethnic diversity is a problem in Kenya but not Tanzania

- Kenya:  $(\tau_1 + \tau_2)$ : Negative for all five  $k$  and statistically significant so for school funds per pupil and desks per pupil. SUR rejects  $H_0: \tau_1 + \tau_2 = 0$  at 5% level
  - Change from ethnic homogeneity to avg. level of diversity is associated with a drop of approximately 25% in school funding per pupil
- Tanzania:  $(\tau_1)$ : Positive for all four primary school outcomes and statistically significant so for latrines per pupil. SUR cannot reject  $H_0: \tau_1 = 0$  at 5% level
- Interactive:  $(\tau_2)$ : Negative in four of the five outcomes we examine and is negative & statistically significant so for desks per pupil (5% level). SUR rejects  $H_0: \tau_2 = 0$  at 5% level

#### Qualitative interviews suggest national identity is key

- Busia: ethnic "us versus them". Headmaster: Fight over which ethnic group "will take control of the school" was central challenge to fundraising as parents do not feel "ownership". Find that there are fewer social sanctions.
- Meatu: such arguments are "un-Tanzanian". Primary School: Committee members were puzzled at the suggestion that ethnic divisions could play a role and didn't know affiliation of absentee. 97% of village respondents said ethnic relations were "good".
- Overall, stresses the importance of state-led intervention. Social capital is not exogenous but can be actively shaped by policy and this can help overcome the problem of ethnic diversity

## Further Discussion: Public Goods

#### Public Goods and Social Capital

- ***Olken & Singhal (2011):*** Use micro data from 10 countries to show that informal contributions are used to augment formal taxation for local public goods
  - Widespread: 20%+ households make informal payment in 9/10 countries (50%+ in many cases). Especially pronounced in rural areas
  - Diverse: Form of payment differs and are often in-kind (e.g. 10-76% contribute labour, ranging from 0.2-14 days per year)
  - Socially determined: Indonesian survey find only 8% report they get to choose whether they pay; 20% how much they pay; 38% report official sanction for failing to comply

#### Heterogeneity in Theory

- ***Alesina et al. (1999):*** Individuals from different ethnic groups prefer distinct types of public, hence there is less agreement and thus less funding.
  - Model via  $u_i = g^\alpha(1 - l_i) + y - g$ , which leads to  $g^* = [\alpha(1 - \hat{l}^m)]^{\frac{1}{1-\alpha}}$
  - Note: does not explain where ethnic tastes come from or how this can be solved by policy
- ***Miguel & Gugerty (2005):*** Social sanctions are imposed more effectively within ethnic groups than between groups (i.e. larger free rider problem)
  - Implies policy should promote power sharing, where elites coordinate their ethnicities.

Community based monitoring

1. Monitor announces plan  $m$ :  $\max_m$  individual PG benefit – monitor cost
  2. Bureaucrat chooses effort  $e$ :  $\max_e$  punishment – effort cost
- **Banerjee et al. (2010):** Finds no impact on teacher absence and poor education in Indian region. Uses **RCT** on Village Education Committee, which at the baseline do not function
    - No treatment significantly increased involvement or output despite well-attended meetings
      - T1: village-wide meeting to provide VEC details; pamphlets to members on responsibilities
      - T2: 1+ train members and give report cards templates to present at village-wide meeting
      - T3: 2+ training to construct reading camps
  - **Björkman & Svensson (2009):** Finds massive impact on quality and quantity of health provision in Uganda. Uses **RCT** on Health Unit Management Committee by providing report cards and two rounds of meetings.
    - A year after the first round of meetings, found a 0.14 z-score increase in weight of infant, 33% reduction in u5 mortality, 20% increase in general outpatient services
    - Use variation in treatment intensity to find significant relationship between degree of community monitoring and health utilization/outcomes. Works through behavioral changes of the staff
  - **Olken & Benjamin (2007):** Finds it depends using Indonesian rural villages road building. Uses **RCT** on 3-person village implementation committee assigned with constructing 1-3km road
    - Treatment via invitations (vary magnitude and whether they distribute it through village government or primary school) and comment forms (summary of which is read out at meeting)
    - Compare reported expenditure versus actual expenditure, which is estimated via core samples and survey of suppliers (cost of materials) and villagers (cost of wages)
    - Find that treatment made it more likely for people to raise corruption issues. But...
      - Invitations only reduced ‘theft’ of labour, not materials (i.e. if has a direct impact)
      - Comments forms only worked if distributed via schools (i.e. if bypasses local elite)

## Further Discussion: Modelling Voting

**\*Miller (2008)**

- **Median Voter Theorem:**  $p_1 = p_2 = p_m$  is weakly dominant. Assumes single-peaked preferences, vote maximizing politicians, and a democratic system where intensity of preference does not matter.
- MVT predicts that changes to electorate (i.e.  $p_m$ ) will reflect in policy. Uses US state-level suffrage laws as quasi natural experiment to monitor effect on municipal health spending.
  - Notes women are more health concerned, preferring more expenditure on clean water
  - Suffrage was followed by an increase in municipal spending and hygiene campaigns, which reduced child mortality 8-15% (or 20,000 annual deaths nationwide)

**\*Chattopadhyay & Duflo (2004)**

- **Motivation:** MVT predicts that reservations will not reflect in policy as  $p_m$  stays same. Want to test this. Further want to investigate the effect of reservations via the citizen-candidate model.
- **Methodology:** Uses the fact that 1/3 of Indian village council heads are *randomly* required to be female as natural experiment, investigating impact on local public goods. Use a **OLS Regression**.
  - Uses formal concerns raised as proxy for gender preferences (West Bengal: F complain more about water and roads; Rajasthan: F complain more about water but less about roads)
- **Robustness:** Check that this works through elected women’s personal preferences, not because they have less experience, less likely to be re-elected, or come from disadvantaged backgrounds

- **Key Findings:** Has a significant effect: if gender gap of formal concerns for a public good is 10%, the provision of that good increases by .16 sd in West Bengal, and .44 sd in Rajasthan

- **Citizens Candidate Model:** Use Osborne and Slivinski (1996) to investigate effect of reservations:  
*Set Up*

1. Citizens decide whether to run for office by trading off the probability of being elected (getting to implement their personal optimum) against the fixed cost of running  

$$U = -|x_j - \omega_i|[-\delta_i]$$
where  $x_j$  is winner's policy,  $\omega_i$  own preference, and  $\delta_i$  cost of running
2. Citizens vote for candidates, knowing their personal preferences. Person with most votes wins
3. Policy  $x_j$  is set equal to winner's own personal preference
  - o  $p_1 = p_2 = m$  can no longer be equ! Each candidate has an incentive to drop out, thereby no longer incurring  $\delta_i$ . New equ is symmetric around the median:  $p_1 = m + \epsilon$ ;  $p_2 = m - \epsilon$ .
    - $\epsilon$  cannot be too small ( $\epsilon > \delta$ , else there is no incentive to run)
    - $\epsilon$  cannot be too large (otherwise a third candidate would enter in-between)
  - o Now assume women face a higher cost of running for office  $\delta_M < \delta_F$  due to social stigma...

*Proposition 1:* If  $\delta_F$  is too large, no woman will run in the absence of reservation.

- o No woman runs unopposed: Only women with strong gender preferences will want to run. A moderate man can enter and win for sure.
- o No woman runs against a man: Happens if even the largest equation we can sustain before a third party enters does not compensate cost of running

*Proposition 2:* If reservations run and  $\delta_F$  is too large no one will run. This means society relies on the 'default' option, which can decrease the utility for women and possibly the median voter too.

*Proposition 3:* If reservations cause women to run (and otherwise they would not), this can increase the utility of women and the median voter.

## ***Agency Model***

### Principles

#### *Moral Hazard*

- Elected official chooses  $a$  where they prefer 0 (get benefit  $b$ ) but electorate prefers 1
- If re-elected get benefit  $B$  (perks of being in office)
- Will choose  $a = 1$  iff  $B[P(\text{reelect}|a = 1) - P(\text{reelect}|a = 0)] \geq b$ . If term limit,  $a = 0$  for sure

*Selection:* Assumes politicians have fixed action and voters try to identify 'good'

### Set Up

- Three types of politician: good ( $\alpha$ ), bad ( $\beta$ ), and opportunistic ( $1 - \alpha - \beta$ )
- *First Period:*
  - o Politician randomly drawn from distribution. They choose action  $a$
  - o Voters observe a signal (don't know if politician tried to improve econ, only how econ performs). If  $a = 1, s = 1$  with probability  $1/2$ ; if  $a = 0, s = 1$  with probability 0
  - o Decide if to re-elect. If not they get a new random politician
- *Second Period:* Assume end of the world. Good chooses  $a = 1$ , rest  $a = 0$

### Analysis

- Use Bayesian logic to infer that opportunistic will behave well in the first period to get reelected
  - o  $P(\text{good}|s = 1) = \frac{\alpha}{\alpha + (1 - \alpha - \beta)a}$ . This is greater than  $\alpha$  so reelected
  - o  $P(\text{good}|s = 0) = \frac{0.5\alpha}{0.5\alpha + \beta + (1 - \alpha - \beta)(1 - 0.5a)}$ . This is smaller than  $\alpha$  so not reelected

- Special cases: If  $\alpha = 0$  voters do not care about reelection so opportunistic will behave bad in first period as well. If  $\beta = 0$  the signal becomes completely useless.

### Empirical Evidence

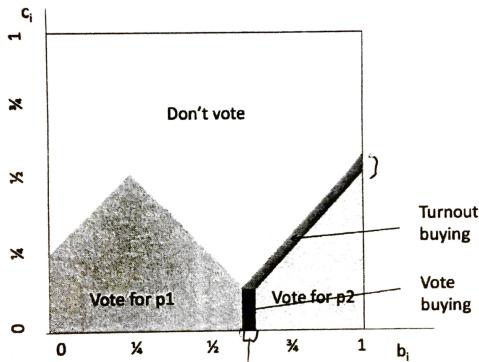
- **De La O (2010):** Use random, staggered introduction of Progresa (conditional cash transfer) as natural experiment to evaluate impact on 2000 Mex pres election via **difference-in-differences**.
  - Early villages had 7% increase in voter turnout and 9% increase in incumbent vote share
- **Manacorda et al (2010):** Use PANES (anti-poverty program) as quasi-natural experiment to evaluate impact on support for Uruguay incumbent party via **discontinuity regression**
  - Those that just estimated to have just made the cutoff are 13%-point more likely to support the government than those who did not
- **Banerjee et al (2010):** Distribute report cards on candidates to Delhi slums and evaluate impact on voting behavior (**RCT**).
  - Turnout increased 3.5% and cash-based vote buying decreases by 19%
  - Bad performing incumbents receive significantly fewer votes
  - Voters only react to clear and direct information (spending in slums matters, overall does not)
- **Ferraz & Finan (2008, 2011):** Use 2003 Brazilian government randomly selected municipalities to public ally audit as a natural experiment. Compare electoral outcomes before and after, controlling for corruption
  - **2008 Motivation:** Do voters punish and reward politicians based on corruption?
  - **Key Findings:** Report (good or bad) that has a significant impact on electoral performance. Most pronounced in municipalities where local radio was present to divulge the information
  - **2011 Motivation:** Are mayors less corrupt if they are up for reelection (i.e. Moral Hazard)?
  - **Key Findings:** significant 27% less resource misappropriation in municipalities where mayors can get reelected. Most pronounced when info is accessible and judicial punishment likelier.

### **Vote Buying Model**

#### Set-Up

- Model via  $u_i = \begin{cases} -|x_j - \omega_i| + 0.5 - c_i + m_j & \text{if vote for } j \\ 0 & \text{otherwise} \end{cases}$
- Note that it does not matter who wins (probability of actually being pivotal is small)
  - *Turnout buying:* Cheapest to convert
- Note that if there is a secret ballot, parties cannot enforce contract. Either only target turnout or rely on people being “reciprocal”

#### Analysis



Empirical Evidence

- **Finan & Schecter (2012):** Is vote-buying sustained through reciprocity in the 2006 municipal election in Paraguay? Combine survey information on vote buying with experimental data on reciprocity amongst middlemen.
  - P1 gets  $X$ . Decides how much to send P2  $s$ .  $s$  gets tripled. P2 decides how much to send back  $r$ .  
Reciprocity can be measured by  $\frac{dr}{ds}$
  - A 1 sd increase in reciprocity increases likelihood of experiencing vote-buying by 44%.
- **Hsieh et al (2011):** Use quasi-natural experiment of Chavez publicizing signees and threatening retaliation. Opposition is associated with a 5% drop in earning and 1.3%-point drop in employment.

# Human Capital

&lt; Nutrition &gt;

Basic Theory of Poverty Trap

- Hunger and poverty were always linked: many countries originally set poverty lines to capture the notion of poverty based on hunger (budget needed to afford rent and a set number of calories)
- **Mazumdar (1958):** Nutrition-based poverty trap. Poor cannot afford to eat enough, making them less productive. Hence S-shaped relation between income today and tomorrow (capacity curve)
- **Barker (1990):** Conditions in uterus have long-term impact on a child's life chances.
- Both of these open the possibility for a "big push": A limited and temporary intervention can have large and long-lasting benefits. This goes beyond redistribution.

Empirical Evidence Against Poverty Trap*Almost everyone is outside the Poverty Trap*

- **Banerjee and Duflo (2008):** Typical Udaipur household could spend up to 30% more on food if it completely cut expenditures on alcohol, tobacco, and festivals.
- **Deaton and Subramanian (1996):** In Maharashtra 1983, a 1% rise in expenditure led to 0.67% rise in food expenditure of which  $\frac{1}{2}$  (0.35%) went to new calories. Poor spent ~5% on sugar.
- **Deaton & Dreze (2009):** Despite rapid growth in income (and relative fall in prices), the share of the budget devoted to food in India has declined at all levels. Yet half of u5 are stunted.
- **Jensen and Miller (2008):** Chinese households that randomly received rice/wheat subsidies consumed less of those and instead more meat (Giffen!). Overall caloric intake did not increase.

*The Poverty Trap may not even exist*

- **Strauss (1986):** A 10% increase in calories amongst self-employed farmers in Sierra Leone resulted in a <4% productivity. Implies an inverted-L (i.e. concave) not S shaped capacity curve.
- **Case & Paxton (2008):** Wage boost from height disappears once controlling for IQ. Conclude that what matters is good nutrition in early childhood.

*Micronutrients are not used despite being affordable*

- **Field et al (2009):** Children born to mothers who were given iodine during pregnancy completed between 0.3-0.5 years more schooling compared to other siblings. This is v affordable!
- **Thomas et al (2006):** In Indonesia random workers who received iron supplements gained a huge boost compared to placebo group. Benefits were ~\$46 a year with just \$7 cost.

*Why?*

- Employees may not realize they become more productive and hence do not pay more. But a Philippines study found workers ate 25% more on piece rate days (rather than flat rate)
  - The importance of micronutrients was not fully understood, even by scientists, until relatively recently. Not everyone has the info, effects are slow/unobservable, and suspicion of outsiders
  - Orwell: “You don’t want to eat dull wholesome food. You want to eat something a little tasty. There is always some cheap pleasant thing to tempt you.” This also links to status.
  - May also in part be a practical phenomenon in India. Less leakage of calories (i.e. diarrhea) or that individuals need fewer calories because of a decline in heavy physical work.
- 

< Health >

### **\**Duflo, Banerjee, Deaton (2004): Udaipur Health Project***

#### Supply Side

- Public facilities exist on paper but are rarely open: sub centers are closed 56% of the time and staff have a 45% absence rate. Closures are not only frequent but also unpredictable.
  - When government/NGO monitored nurses attendance spiked but usage did not respond and after 6 months figures returned to base level
- India faces a chronic shortage of nearly two million doctors and four million nurses. Hence large private sector has emerged, accounting for 57% of visits and 65% of costs.
- Quacks are common (41% do not have a medical degree), especially in rural: est. 1.6m rural informal providers vs. <1m trained.

#### Demand Side

- The health state is atrocious (~90% of the population is undernourished and 1/2+ are anemic), but the population does see itself as sick (62% rate themselves mid/good)
  - This mismatch between perceptions and reality implies that most individuals will consequently not seek out the necessary treatment, resulting in a demand side deficit
- Households spend much on health care regardless of income (~7%). Poor spend as much on short-duration ailments as rich but much less on chronic. Instead use bhopas (cannot afford the former).
- Treatments emphasizes injections and antibiotics not tests (68% vs. 3% of visits). But 81%/75% report that their last visit to a private/public facility made them feel better
  - Why? Since most diseases are self-limiting any curative is going to appear effective. Meanwhile preventative care has no immediate link.
- Time inconsistent preferences and/or low perceived benefits. Free immunization camps saw 83% of children not complete course. Also very high price elasticity for these services.
  - Can overcome via incentive of plates (weakly held preferences). The same does not work for other issues (e.g. marrying off daughters)
  - Why? Costly today and benefits are obtained in the future, hence a tendency to procrastinate; post-hoc rationalization; learning about health care is inherently difficult not only for the poor
- “Psychological sunk cost”: People are more likely to use if they pay (signal quality). But... bed net demand, though sensitive to price, is not to income. 15% richer are only 5% more likely to buy one.

### **\**Das et al (2016)***

- In rural India the private sector dominates primary care (83% of visits) even in markets with a qualified public doctor offering free care through public clinics. Why?
- Fake patients were coached to present symptoms for 1,100+ unannounced visits.

- Quacks exerted significantly higher effort and performed no worse than public providers. Public doctors with a private practice are more likely to offer correct treatment in their private role.
- Positive correlation between private fees charged and measures of quality but also with unnecessary treatment. No correlation between salaries and outcome in the public sector

### Further Discussion

- Low hanging fruit: Fewer than 40% of the world's infants are breast-fed exclusively for six months despite it being essentially free. Bleach is very cheap in Zambia, yet only 10% use it to treat water
  - **Bleakley (2010):** Many health different traps (miss work/school, generational spillovers if in pregnancy). A child in Latin America who grew up malaria-free earns 50% more their entire adult life
  - **Das et al (2008):** Quality is very low across developing countries even though access has improved. Used "vignette" in cross country study: 3 minutes, 3 questions, 3 treatments
  - **Dupas (2009):** finds that providing age-disaggregated information on HIV prevalence rates affects the incidence of risky sexual behavior among girls in Kenya
- 

## < Education >

### Supply Side

- **Duflo (2001):** After first oil boom Indonesia engaged in a classic supply-driven program. Compare wages via discontinuity regression to an extra year of primary school raised wages by ~8%
- Claim that governments have mistakenly focused on quantity rather than quality. Thus limited increase in skills and productivity. Government should intervene.
- Globally ~50% of teachers in public schools don't show up and 14-50% of students don't.
- Hence private schools are located near the worst performing public schools, and there teachers are 8%-points more likely to show up

\*\*Banerjee et al (2007): Remedyng Education

### ***Headline***

- This study in partnership with Pratham seeks to investigate the (A) effectiveness of Indian education and (B) if "teaching at the right level" can improve its quality.
- Using an **survey** they find that quality of education is poor but, via an **RCT**, that its treatment can be highly effective in fixing this.

### ***Motivation***

- In India, despite a huge increase in inputs over the past decade (0.2m more schools, 3m more teachers, 12m more Grade 8 students) and enrollment at 96% levels of learning have decreased.
- Is it really this bad and can this be fixed?

### ***Methodology***

- First ran an exhaustive survey to quantify learning problems then...
- ... 16,000 kids received 120h of instructions tailored to their ability by young women (not teachers). Classes were based on skills not age; classes focused on basic skills not curriculum.

### ***Key Findings***

- Aggregate enrollment figures mask tremendous variation (71% across age, grade, and region) and there are a large number of children being "left behind", especially in a rural setting.
  - 35% of 7-14 year-olds couldn't read a paragraph; 70% couldn't do second-grade math.

- But... “teaching at the right level” rather than “teaching to the top of the class” increased avg. test scores of all by 0.28 sd, mostly due to large gains by children at the bottom.

### Demand Side

- Claim that building schools and hiring teachers us useless unless there is a corresponding demand for education on the ground. Thus government should not intervene.

*Education is another form of investment...*

- **Foster and Rosenzweig (1996):** Areas that were better suited to the new seeds introduced by the Green Revolution saw education increase faster since this exogenously increase RoR
- **Oster and Steinberg (2013):** Introducing a new ITEs center causes an increase in the number of children enrolled in primary school in the local area, driven by English language schools.
- **Jensen (2012):** Business process outsourcing centers organized recruiting sessions for young women in randomly selected Indian villages, which three years later still caused significant increase in employment, education, and BMI of girls. Parents noted that daughters were now more valuable.

*... Thus RoR perception is crucial*

- Parents: Madagascar study shows they believe year of primary education increase earnings by 6%, junior by 12% and secondary by 20%. Thus incentivizes “pick a winner” rather than IRL flat line.
  - **Barrera et al (2008):** Families that entered two children in the Colombian cash transfer and one won were less likely to enroll the other than families where both lost
- Teachers: Many schools still have a ‘colonial’ curriculum that is meant to train the elite, not the general population. This often comes with prejudices.
  - **Hannah & Linde (2009):** Indian teachers gave significantly lower grades to lower-caste students when revealed. Especially prevalent amongst low caste teachers themselves!
- Children: Self-fulfilling prophecies are not only damaging internalized by children themselves
  - **Steele (1999, 1995):** Both women and African Americans perform worse when reminded of their demographic
- **Gould et al (2003):** Can overcome this. Airlifted Ethiopian Jews (w/ parents having ~1.5y of education) and immigrant Russian Jews (~11.5y) had statically similar graduation rates in Israel

\*\*Jensen (2010): Perceived Returns To Education and Demand for Schooling

### ***Headline***

- This paper seeks to investigate the relationship between (A) perceptions of education RoR and reality and (B) if correcting these has an impact on completion rates.
- Using an **IV OLS reg.**, with a treatment and control group, it finds that there is a perceptions and gap and that fixing this has a significant, if limited, impact on education rates.

### ***Motivation***

- (A) Do students have accurate perceptions about the returns on education? (B) Does correcting these perceptions have an impact on educational attainment?
- Becker’s canonical model of human capital views education as an investment, which is based on the perceived returns versus costs of attending schools. Providing info may be a cost-effective strategy.
- Students make their schooling decisions on the basis of limited or imperfect information, especially in developing countries

- Why? the decision is made at a younger age; do not have guidance counsellors; little data available on the labour market; residential segregation

### ***Methodology***

- (A) Survey randomly selected eighth-grade boys across the Dominican Republic about what they believe the returns to secondary education to be.
- (B) Random treatment group is then given information on the higher measured returns and then followed up on to see if this intervention made any difference on their school decisions.

### ***Key Findings***

*Demand Side is necessary...*

- (A) Students overestimated the value of primary by 11% and underestimated secondary by 14%. Implied NPV of personal lifetime income without secondary school is 11% greater than with!
  - (B) Treatment group raised perceived returns by RD\$366 and completed 0.20–0.35y more of school over the next four years as well spending 11 more minutes/week on homework.
  - A RD\$1,000 increase in perceived returns increases likelihood of returning to school next year by 8%-points, of completing high school by 9%-points, and years of schooling by 0.37”
- ... but insufficient*
- A RD\$1,000 increase, closing the perception gap, would only increase secondary completion rates by 9%-points, whereas 70% of students do not complete secondary school.”
  - Intervention has biggest effect on rich students (+0.33y) and no effect on the poorest even though perception increase by the same amount. Poverty and credit constraints are limiting factors!

## Further Discussion

- **Lucas (1988):** Worker productivity depends on the aggregate skill level
- **Romer (1990):** societies with more skilled workers generate more ideas and grow faster
- **Benhabib & Spiegel (1992):** Little to no relationship between measured human capital and income throughout 1965–1985. Where has all the education gone?
- **Nguyen's (2008):** finds that providing information on the returns to schooling in Madagascar not only improves enrolment but also performance.

## **Foreign Aid**

### Brief History of Development Policy

- *1950-70s:* Focused on raising rate of investment to GDP and private investment was usually not trusted. Resulted in debt accumulation due to unproductive investments and 1980s debt crisis.
- *1980-90s:* Attention shifted to replicating East Asian tigers, which combined export orientation and macroeconomic stability. Inspired Washington Consensus' SAPs but had same effect.
- *2000-10s:* Second-generation reforms stressed the importance of institutions and free markets. Still believed today but don't know how to get from here to there.
- *Today:* Shift from broad, general questions to much narrower ones as per “Poor Economics”. Literature focuses much more on unique context and microeconomics of economic development.

## Is Aid good? – Perspectives

- ***Sachs (2005) The End of Poverty:*** Argues that world poverty could be eliminated in twenty years if the rich world donated \$195bn annually.
  - Poverty Trap occurs whenever the scope for growing income/wealth at a very fast rate is limited for those who have too little to invest: S versus Inverted-L shaped curve
- ***Easterly (2001) The Elusive Quest For Growth:*** Argues that there is no such thing as poverty traps and hence aid is wasteful.
- ***Moyo (2009) Dead Aid:*** Argues that aid prevents people from searching for their own solutions, corrupts and undermines local institutions, and creates a self-perpetuating aid agencies
- ***Sen (1990) Development As Freedom:*** Defines poverty not just as a lack of money; it is not having the capability to realize one's full potential as a human being.

## Is Aid good? – Evidence

- ***Aid is significant:*** Excluding private aid \$103.6bn in 2006 and \$2.3trn over past 50 years
- ***But doesn't seem to work:*** Over past 42y \$0.5trn+ has flown in Africa yet median /capita growth is ~0. Top quarter of aid recipients received 17% of their GDP in aid but near-zero growth
- ***But this could be endogeneity:*** Donor governments targeted aid to low-growth countries (reverse causality) or third factors, such as crises, induced both higher aid and worse performance (OVB)
- ***Yet the countries that did succeed largely did so without aid:*** China and South East Asia vs. Africa
- ***Nunn and Qian (2014):*** US Food Aid and Civil Conflict
  - ***Motivation:*** Many have accused humanitarian aid of promoting conflict by incentivizing aid stealing and feeding militias. Is this true?
  - ***Methodology:*** US food aid shipments (endog) are strongly determined by US wheat production (exog). Run difference-in-difference comparing conflict between countries that regularly receive US aid and those that don't in years of high and low production.
  - ***Key Finding:*** An increase in US food aid increases the incidence and duration of civil conflicts.