

# **Simple Mathematical Inequalities that Elucidate the Underdevelopment of National Economies**

**Mark Figueroa  
SALISES, UWI, Mona  
Mark.figueroa@uwimona.edu.jm**

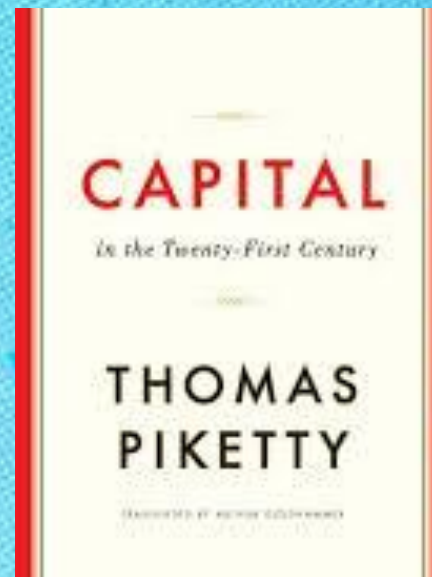
**Conference on the Economy  
Addressing Contemporary Local and Regional Challenges for  
Sustainable Development  
Sub-Theme: Caribbean Economics and Economies  
UWI, St Augustine, October 9-10, 2014**

# Outline

- **Piketty: Profits, Economic Growth & Inequality**
- **Lewis & Girvan: Saving & Investment Rates, Foreign Ownership & Denationalization**
- **Francis: Unsustainable Debt & Accumulation**
- **Pantin: Unsustainable Mineral Extraction**



# PIKETTY'S INEQUALITY



$$r > g$$

**Income Inequality Increases**

**r** = Rate of Return on Capital

**g** = Economic Growth Rate



# LEWIS/GIRVAN INEQUALITIES



$$\dot{i}_F > \dot{i}_N$$

**Leads to Economic Denationalization**

**$\dot{i}_F$  = Growth in Foreign Investment**

**$\dot{i}_N$  = Growth in National Investment**



# LEWIS/GIRVAN INEQUALITIES



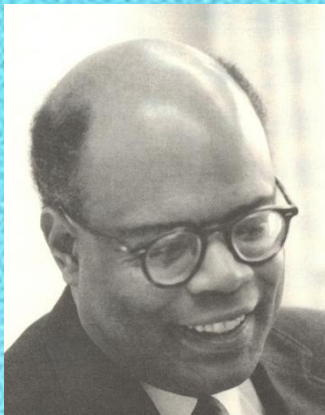
Assume  $S = I$

$$S_F > S_N$$

Leads to Economic Denationalization

$S_F$  = Foreign Savings Invested

$S_N$  = National Savings Invested



# LEWIS/GIRVAN INEQUALITIES



$$g < c ; t < e$$

**National Savings Decline  
(Private and Government)**

**$g$  = Economic Growth Rate**

**$c$  = Consumption Growth Rate**

**$t$  = Tax Revenue Growth Rate**

**$e$  = Government Expenditure Growth Rate**

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# LEWIS/GIRVAN INEQUALITIES



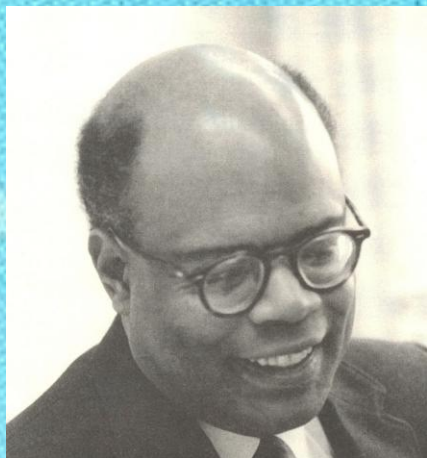
Where

$$r_F > r_N$$

**Denationalization May Intensify**

**$r_F$  = Return on Foreign Investment**

**$r_N$  = Return on National Investment**



# LEWIS/GIRVAN INEQUALITIES

$$t_F r_F < t_N r_N$$



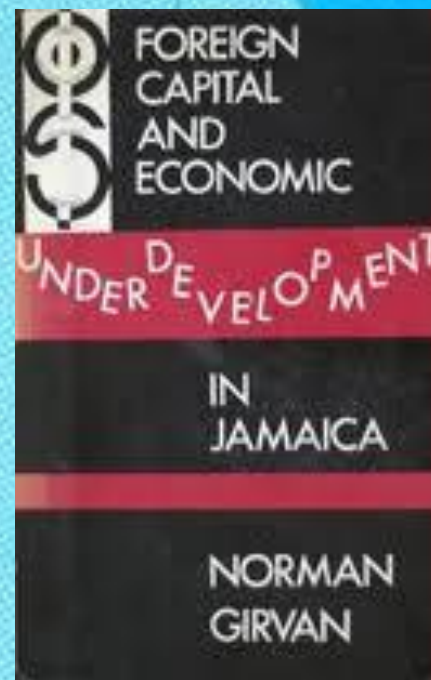
## Denationalization Results

$t_F$  = Tax Rate on Foreign Profits

$t_N$  = Tax Rate on National Profits

$r_F$  = Return on Foreign Capital

$r_N$  = Return on National Capital





Department of

**Economics**

**THE DYNAMICS OF DEBT  
IN THE JAMAICAN  
ECONOMY**

or

**Domar vs. Omar:  
The Burden of Debt and  
the National Income**

By A.A. Francis

# FRANCIS'S INEQUALITIES



$$r > g$$

With Continuous Rollover,  
Debt Tends to Infinity

$$\lim_{t \rightarrow \infty} \frac{Dt}{Yt} = \begin{cases} \infty & \text{for } r > g \\ \frac{D_0}{Y_0} & \text{for } r = g \\ 0 & \text{for } r < g \end{cases}$$

**t = Time**

**r = Interest Rate on Debt**

**Y = Income**

**g = Economic Growth Rate**

**D = Debt Stock**

# A PANTIN INEQUALITY

$$p > a$$

**Depleting Asset is  
Mined Unsustainably**

**$p$  = Rate of Depletion of Asset**

**$a$  = Resulting Growth in Assets**



# Summary

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Foreign Ownership & Denationalization**
- **Francis: Unsustainable Debt & Accumulation**
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# Thank You

