Reallocation and Productivity

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Motivation

- Fundamental question in development economics: Why some countries are rich and others poor?
- A consensus in the literature is that income differences across countries are mostly explained by differences in labor productivity and in particular total factor productivity (TFP)
- One perspective is that the allocation of factors across micro production units is at the core of productivity differences

Outline

(1) Some income facts

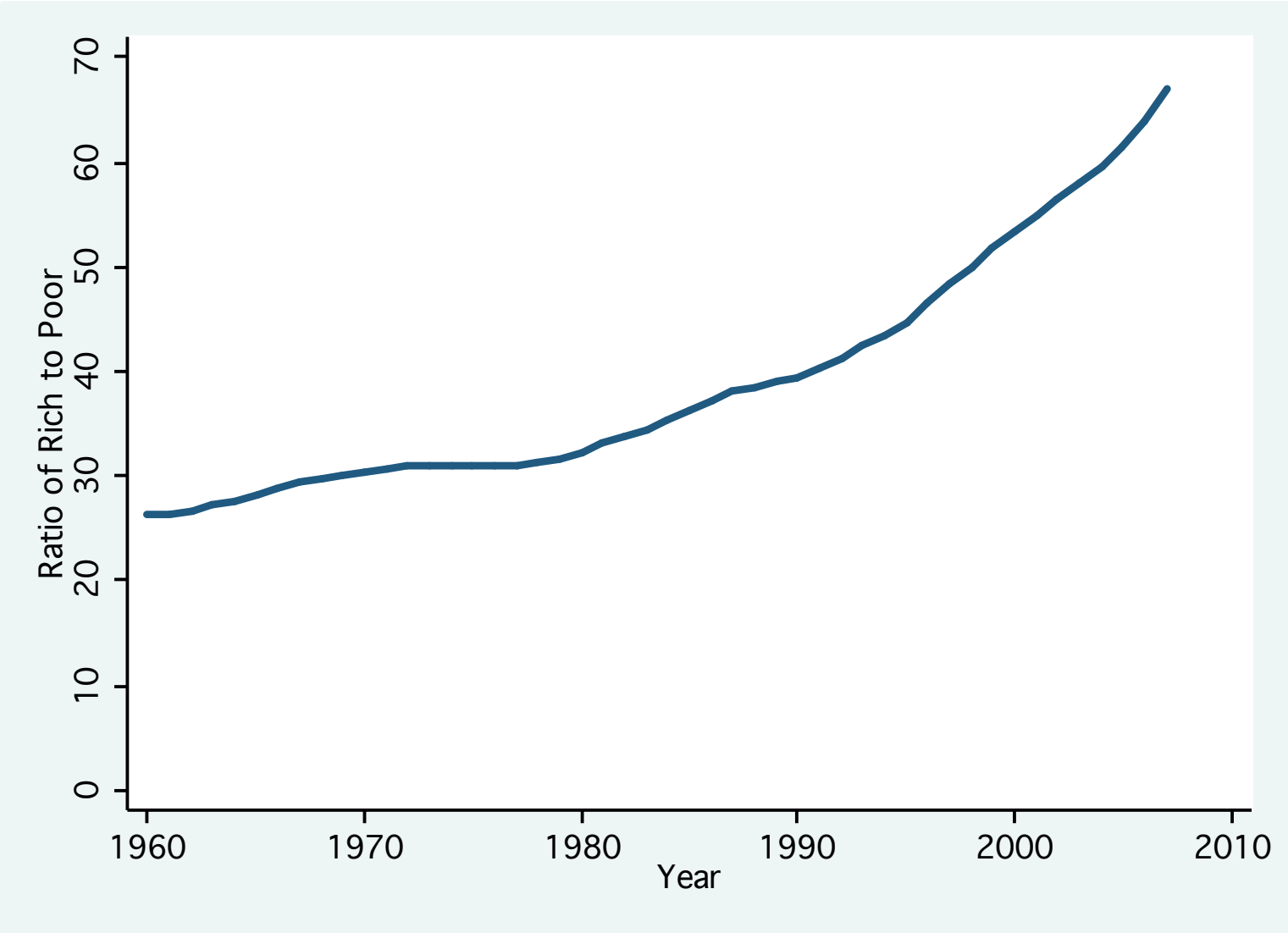
(2) Reallocation across sectors

(3) Reallocation across establishments

(4) Misallocation and productivity in agriculture

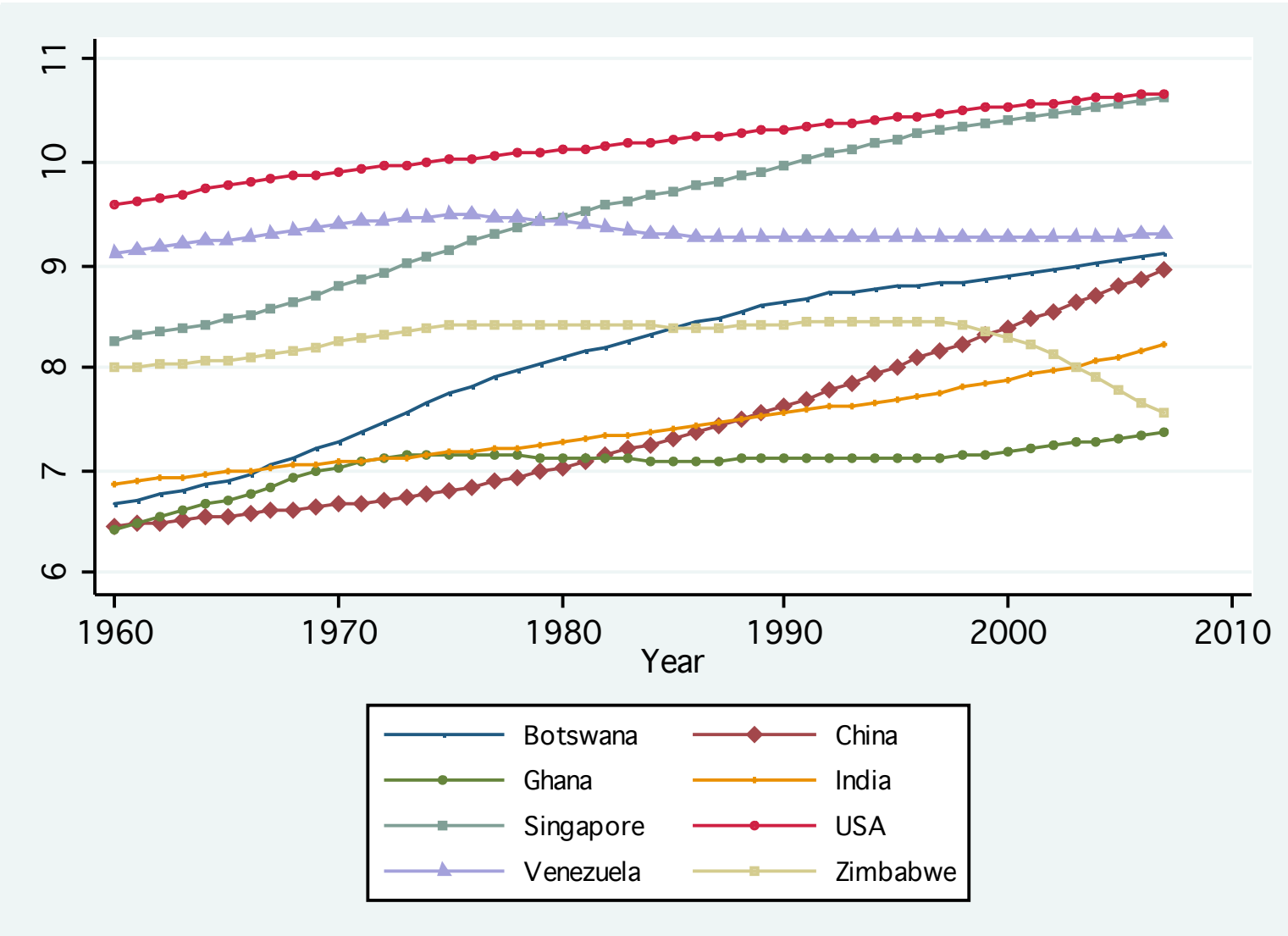
Facts

GDP per Capita – Ratio Rich to Poor



Ratio of average richest and poorest 5 percent of countries

GDP per Capita–Selected Countries (in logs)

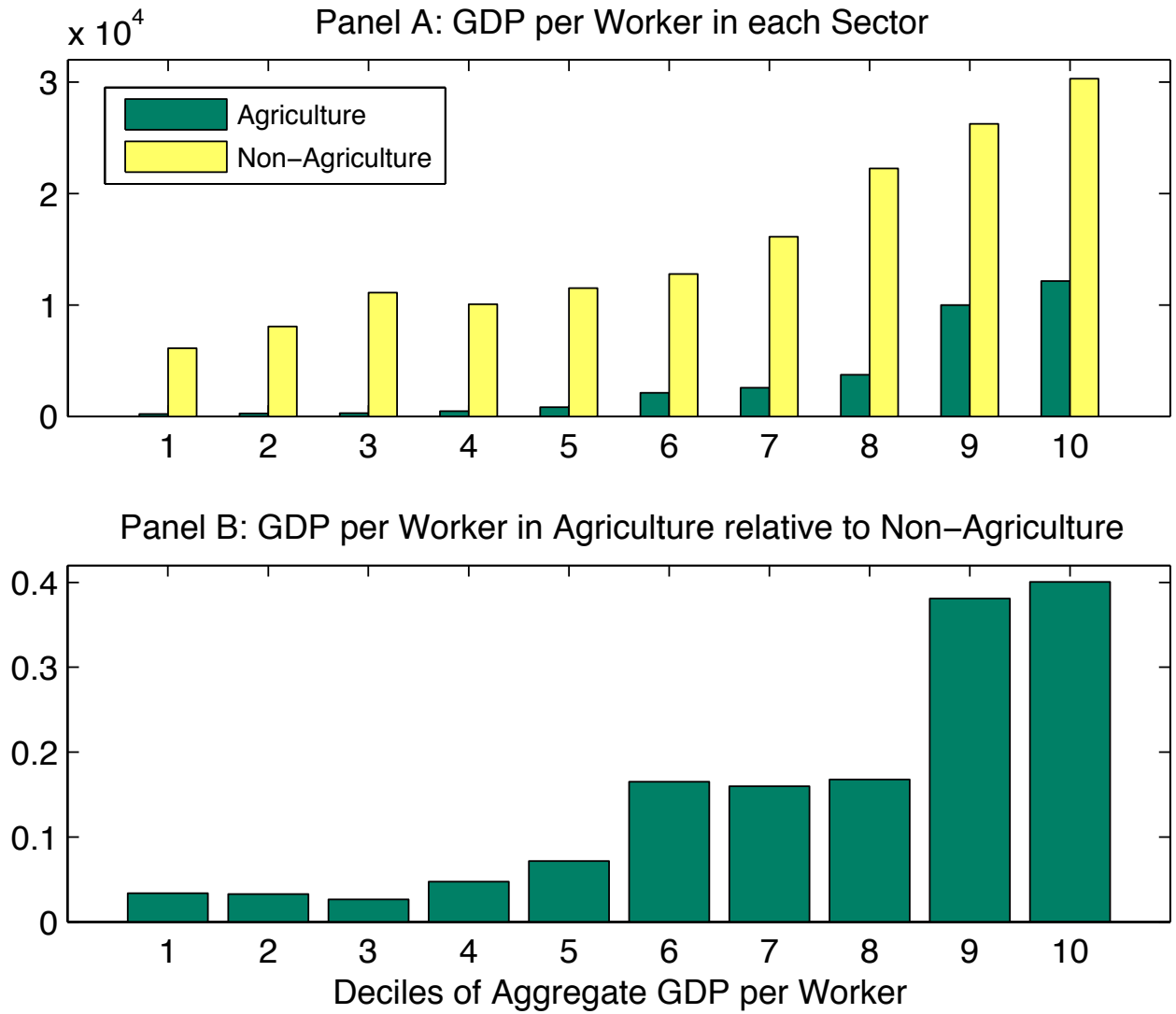


Reallocation across Sectors

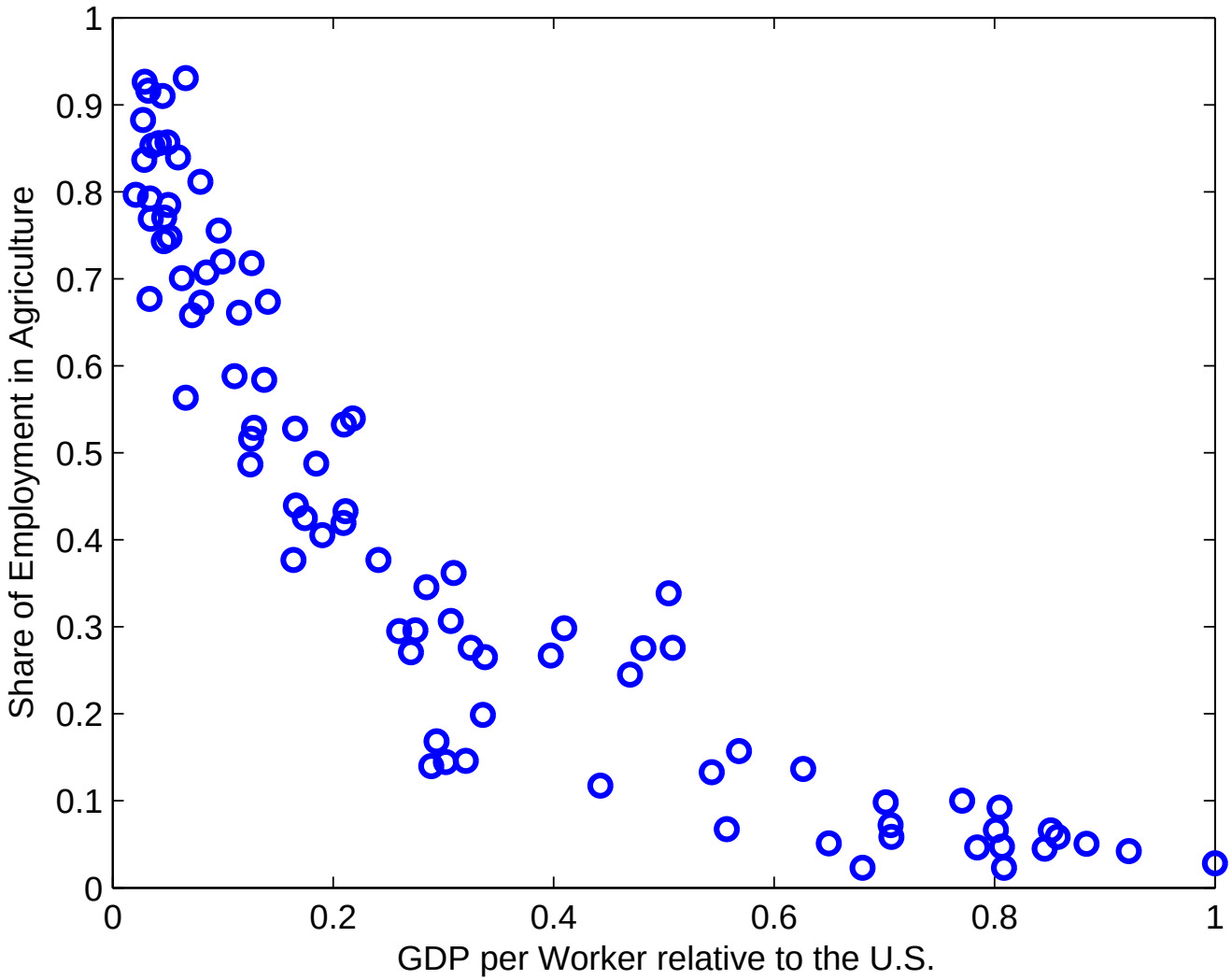
The Role of Agriculture

- Restuccia, Yang, and Zhu (2008) “Agriculture and Aggregate Productivity: A Quantitative Cross-Country Analysis”
- Poor countries are much less productive in agriculture than in non-agriculture than rich countries
- Despite being much less productive in agriculture, poor countries allocate most of their labor to agriculture

Labor Productivity in Agriculture across Countries



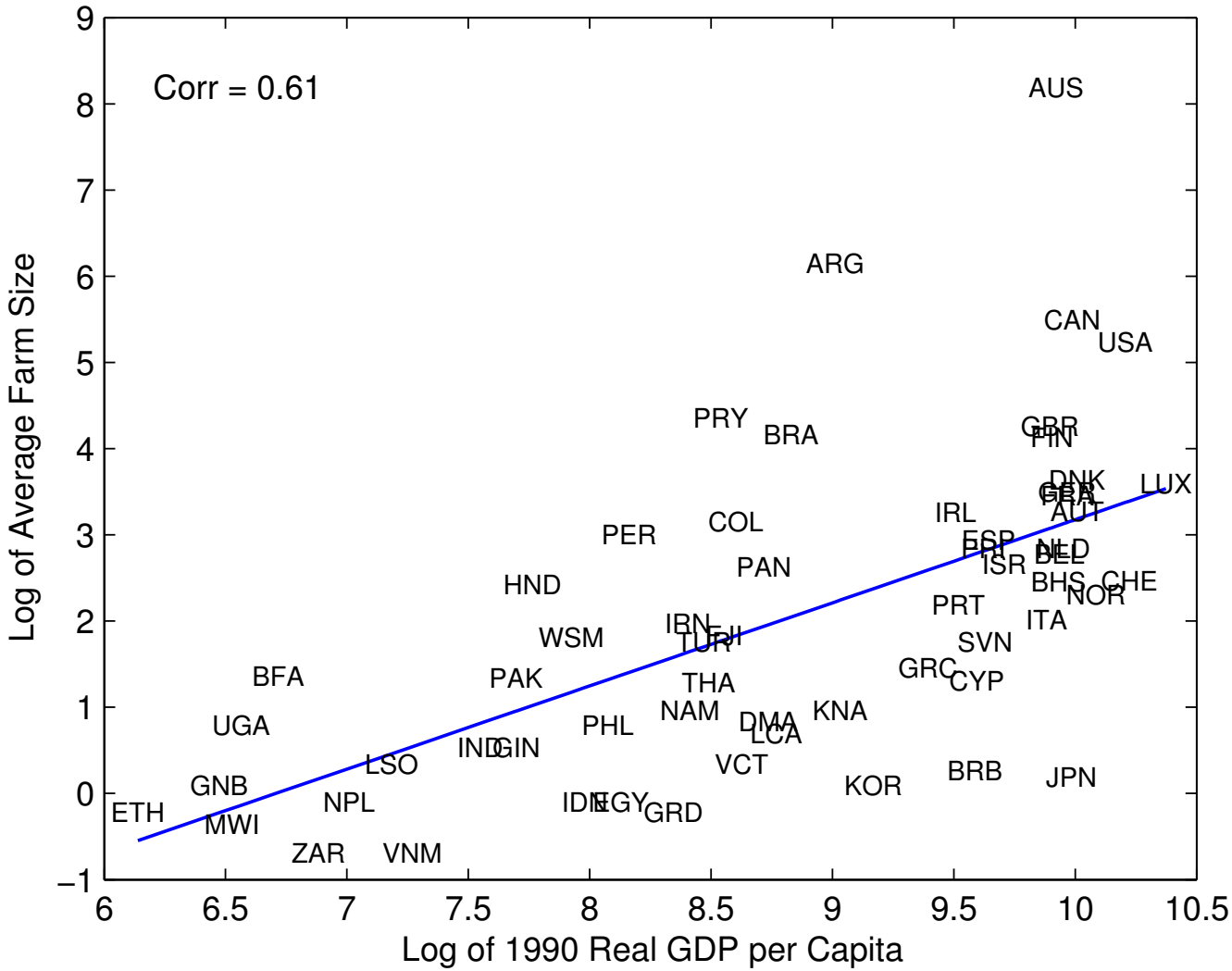
Share of Employment in Agriculture



The Role of Agriculture

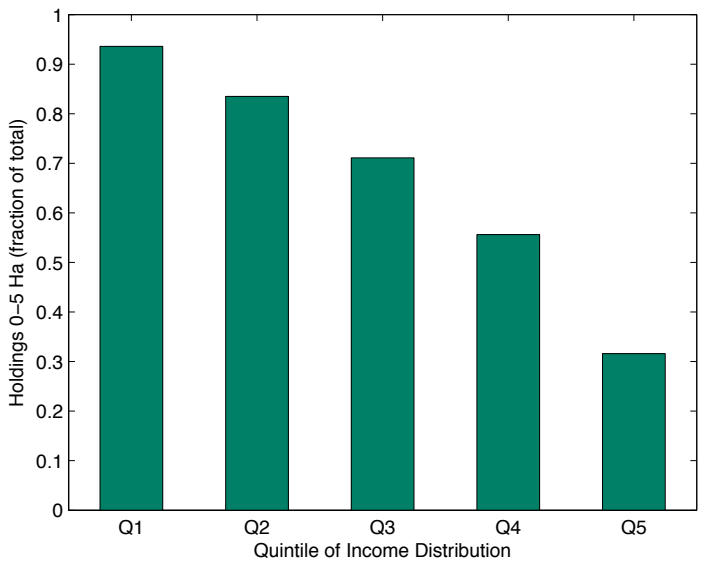
- These two facts make agriculture account for more than 80% of the aggregate productivity differences between rich and poor countries
- A standard model of the reallocation of labor away from agriculture implies, given the sectoral productivity gaps, the allocation of labor across sectors observed in the data
- Key question (and challenge) in the literature is to explain the low agricultural productivity in poor countries
- Adamopoulos and Restuccia (AER, forthcoming) emphasize the reallocation of factors across heterogenous farms to explain low productivity and farm size in poor countries

Average Farm Size across Countries

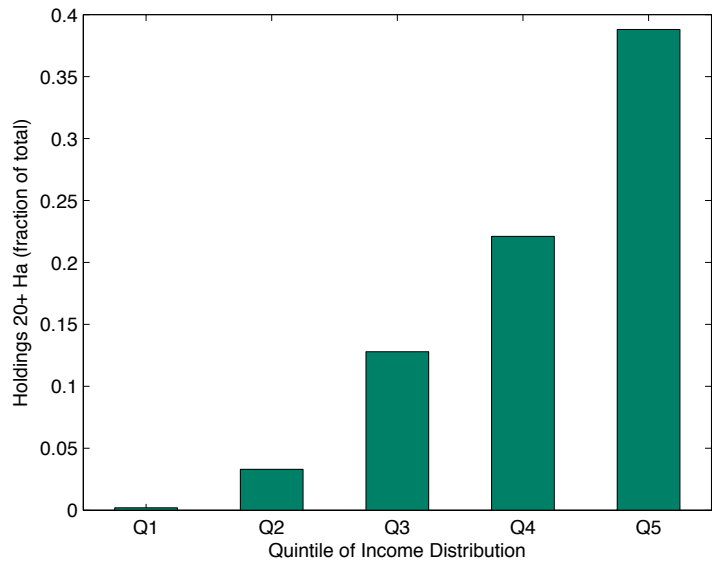


Farm Size Distribution across Countries

Small Farms (<5Ha)



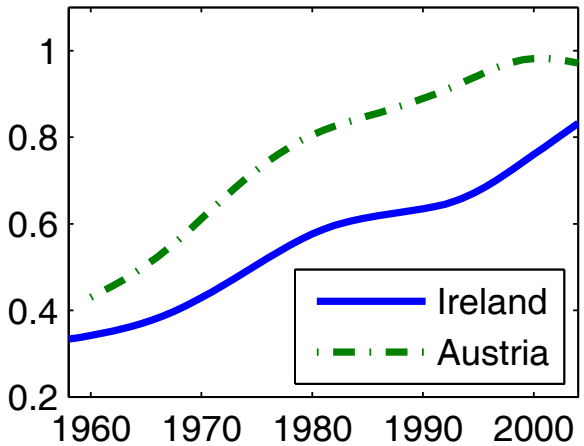
Large Farms (>20Ha)

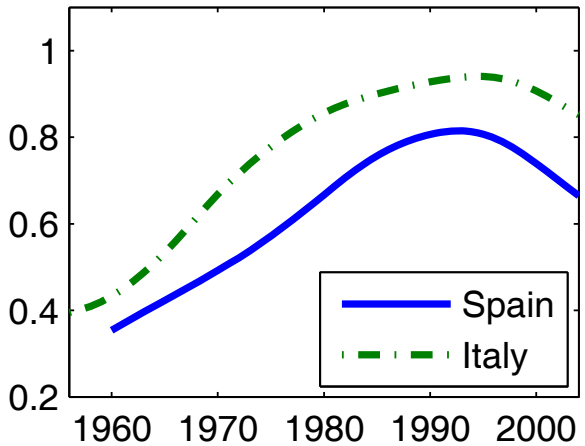


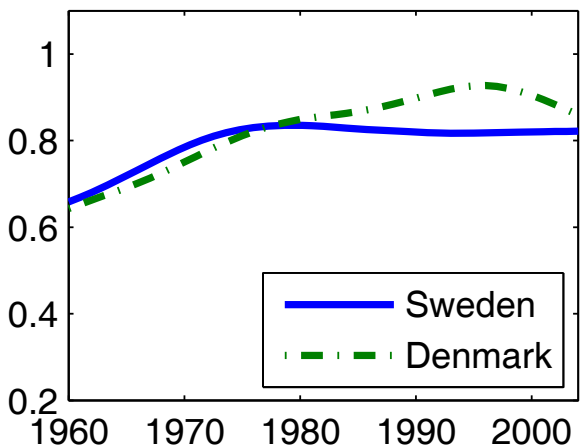
The Role of the Structural Transformation

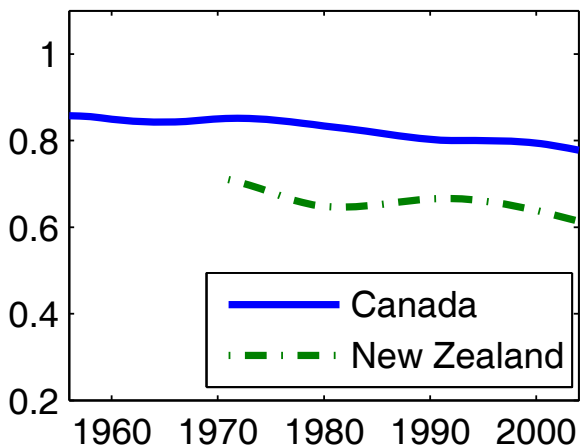
- Duarte and Restuccia (2010) “The Role of the Structural Transformation in Aggregate Productivity”
- Systematic reallocation of employment and hours across agriculture, industry, and services
- Systematic differences in productivities across sectors and countries
- These facts can explain many country experiences over time of productivity catch up, slowdown, stagnation, and decline
- For developing and developed countries
  - industry accounts for a large fraction of the aggregate productivity catch up
  - low productivity in services and lack of productivity catch up accounts for all the episodes of slowdown, stagnation, and decline

Relative GDP per Hour – Selected Countries

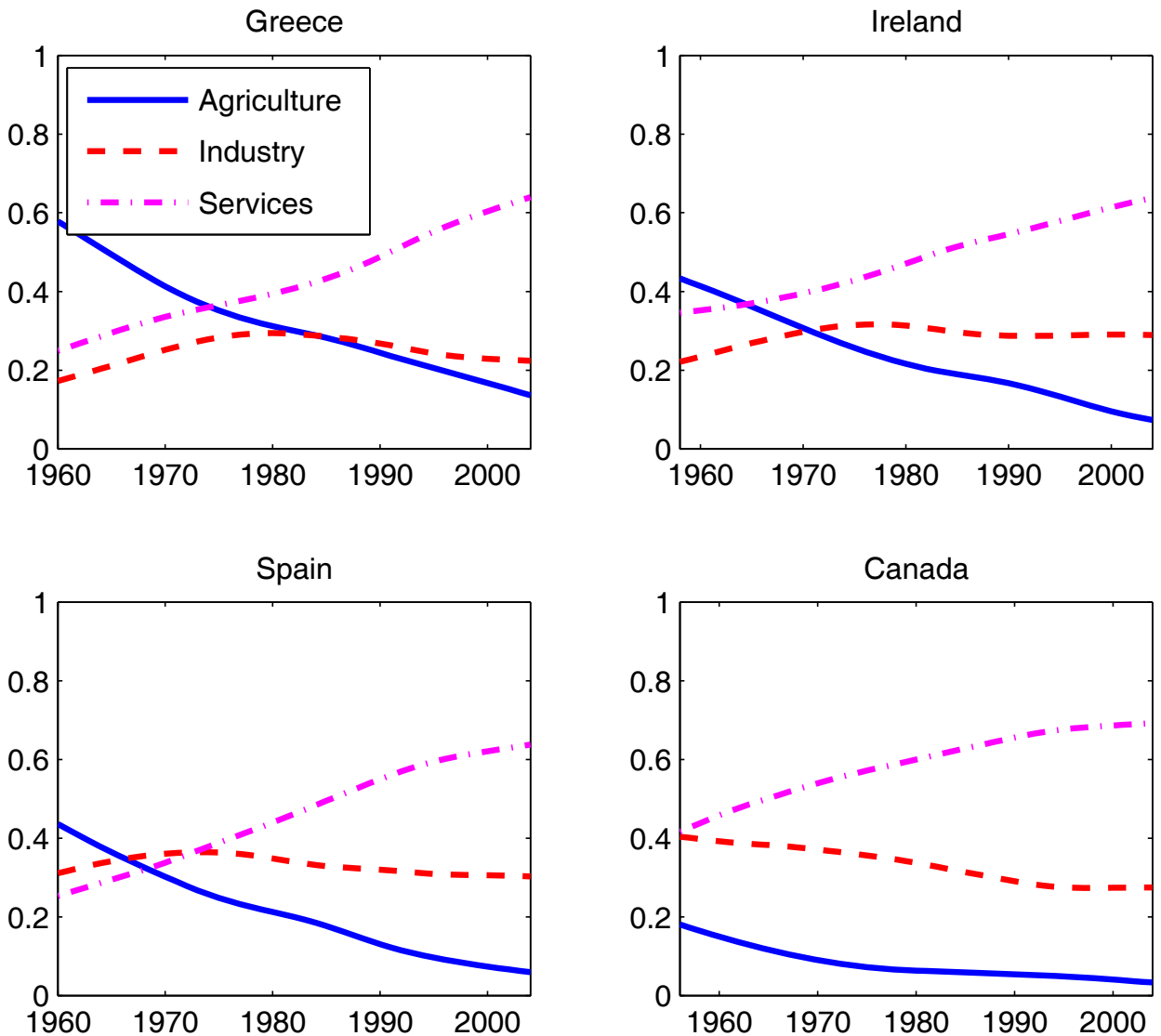




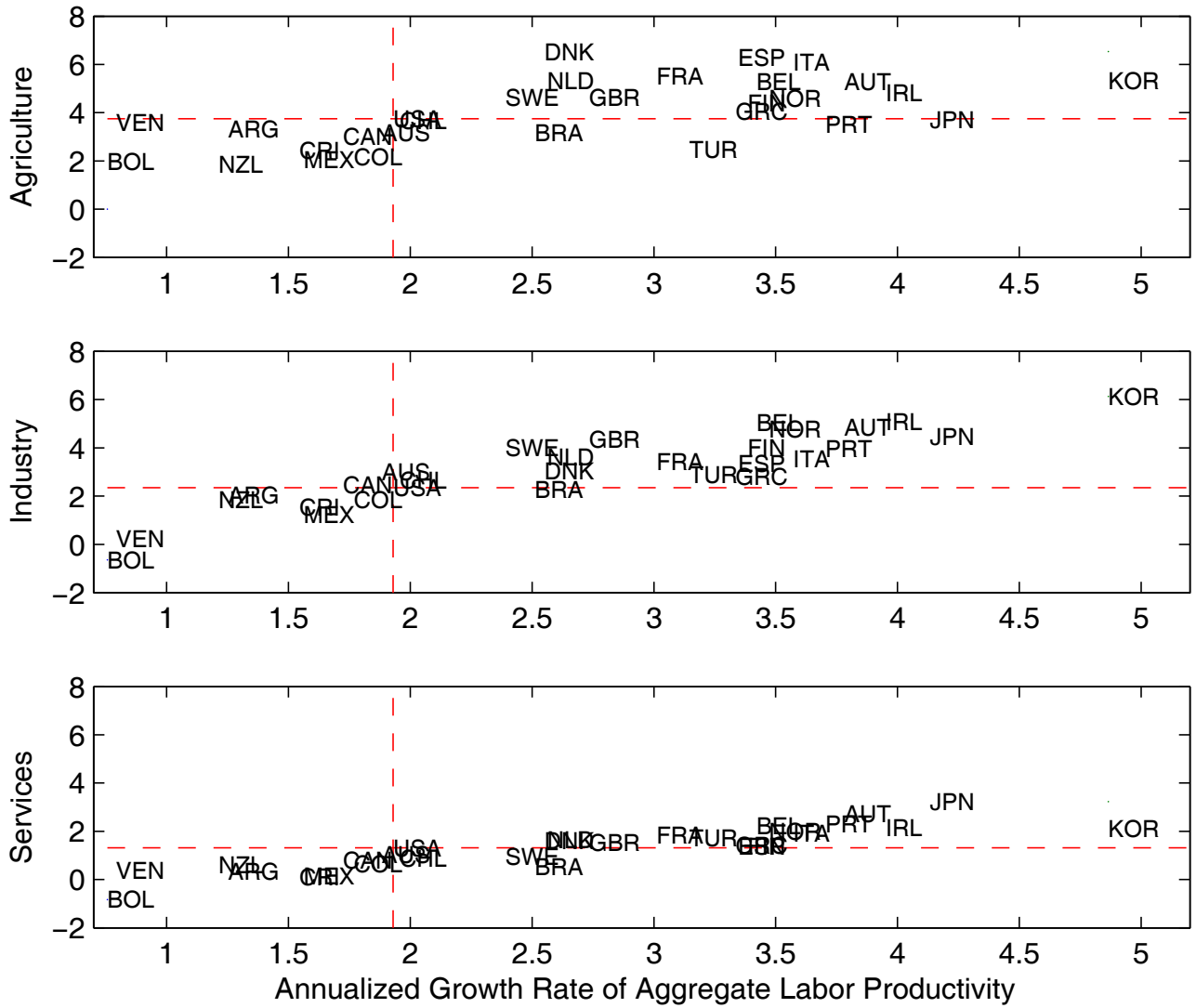




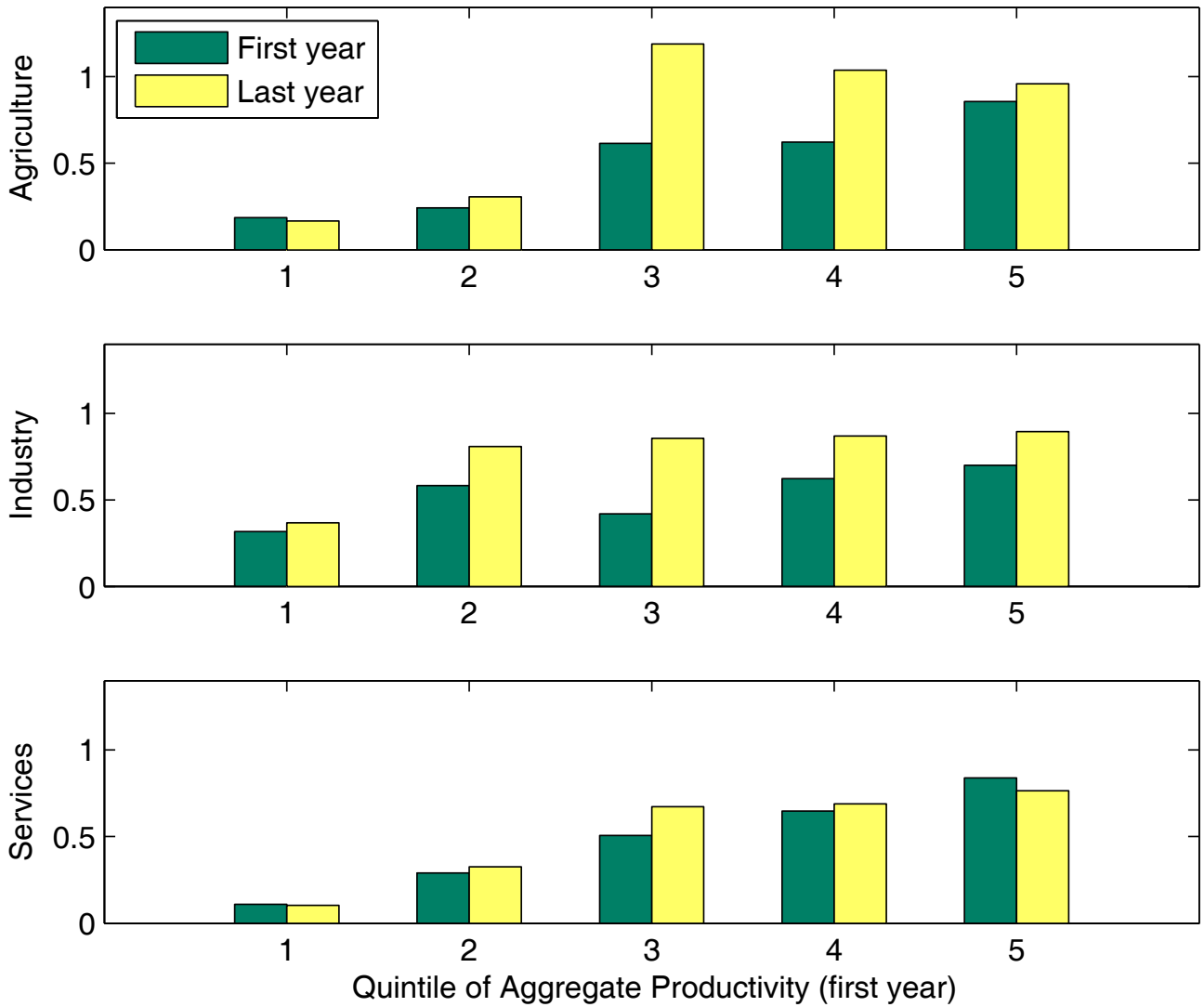
Share of Hours across Sectors – Selected Countries



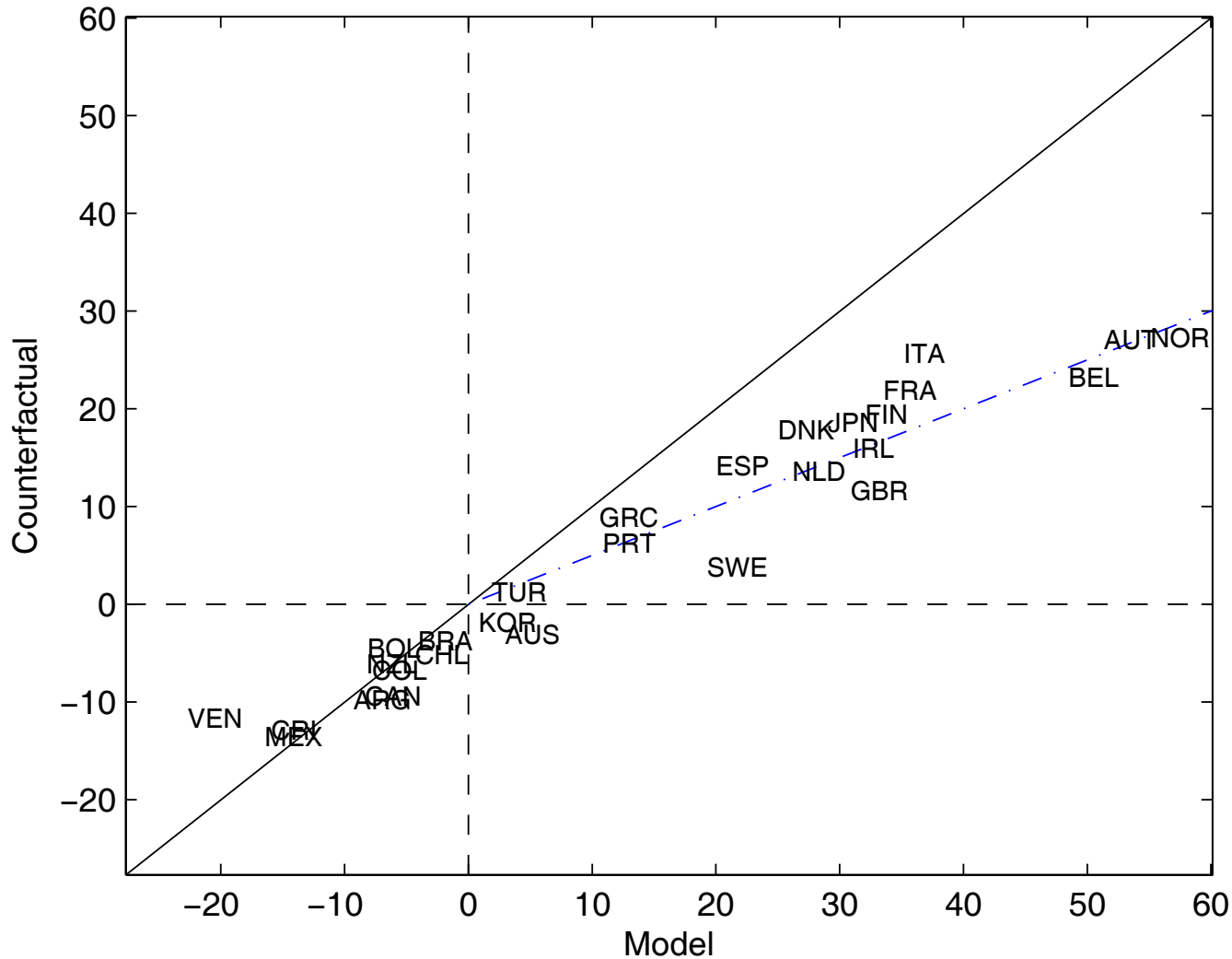
Sectoral Growth Rates of Labor Productivity (%)



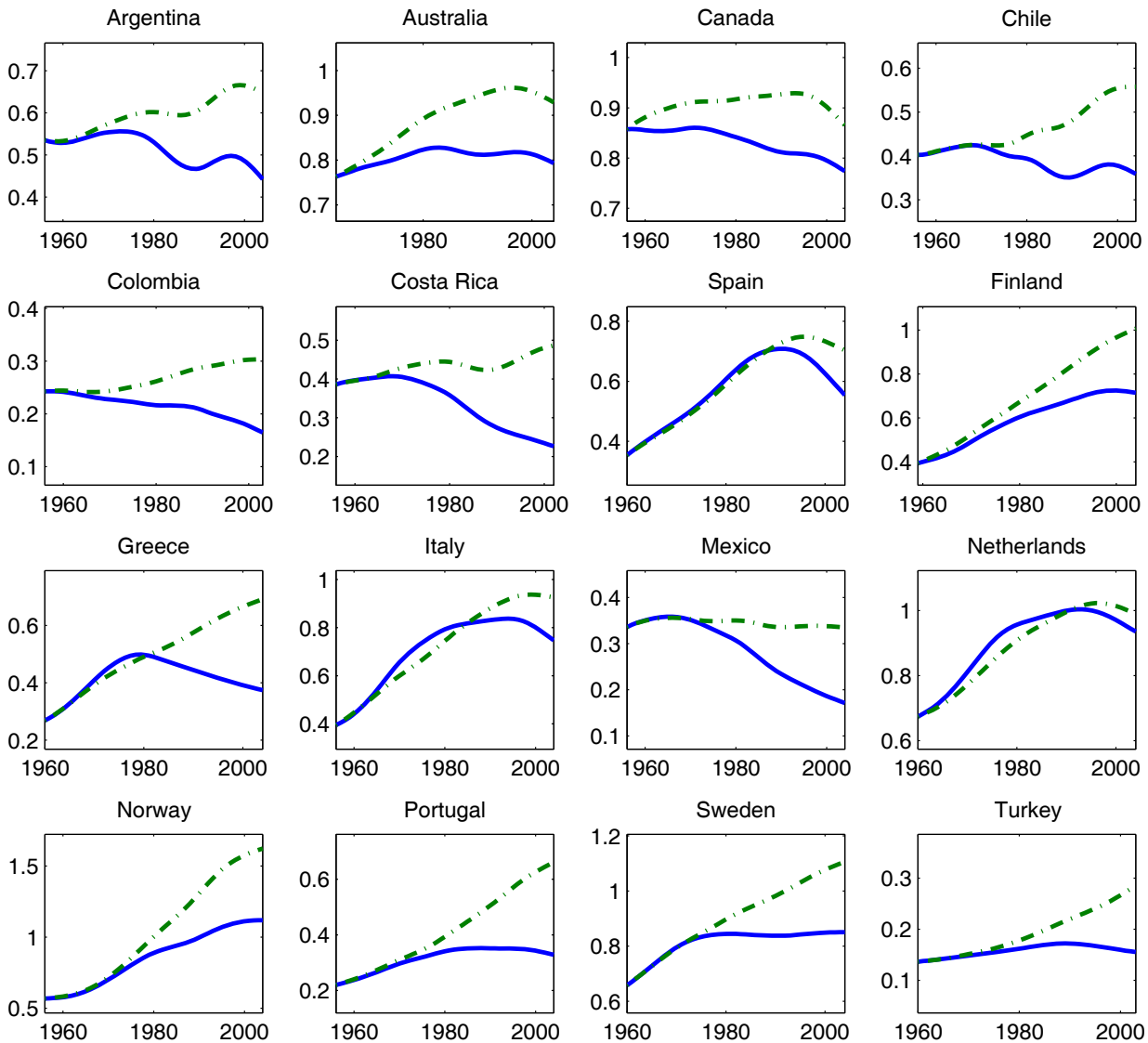
Relative Labor Productivity



Rel. Aggregate Productivity–Importance of Industry Catch-up



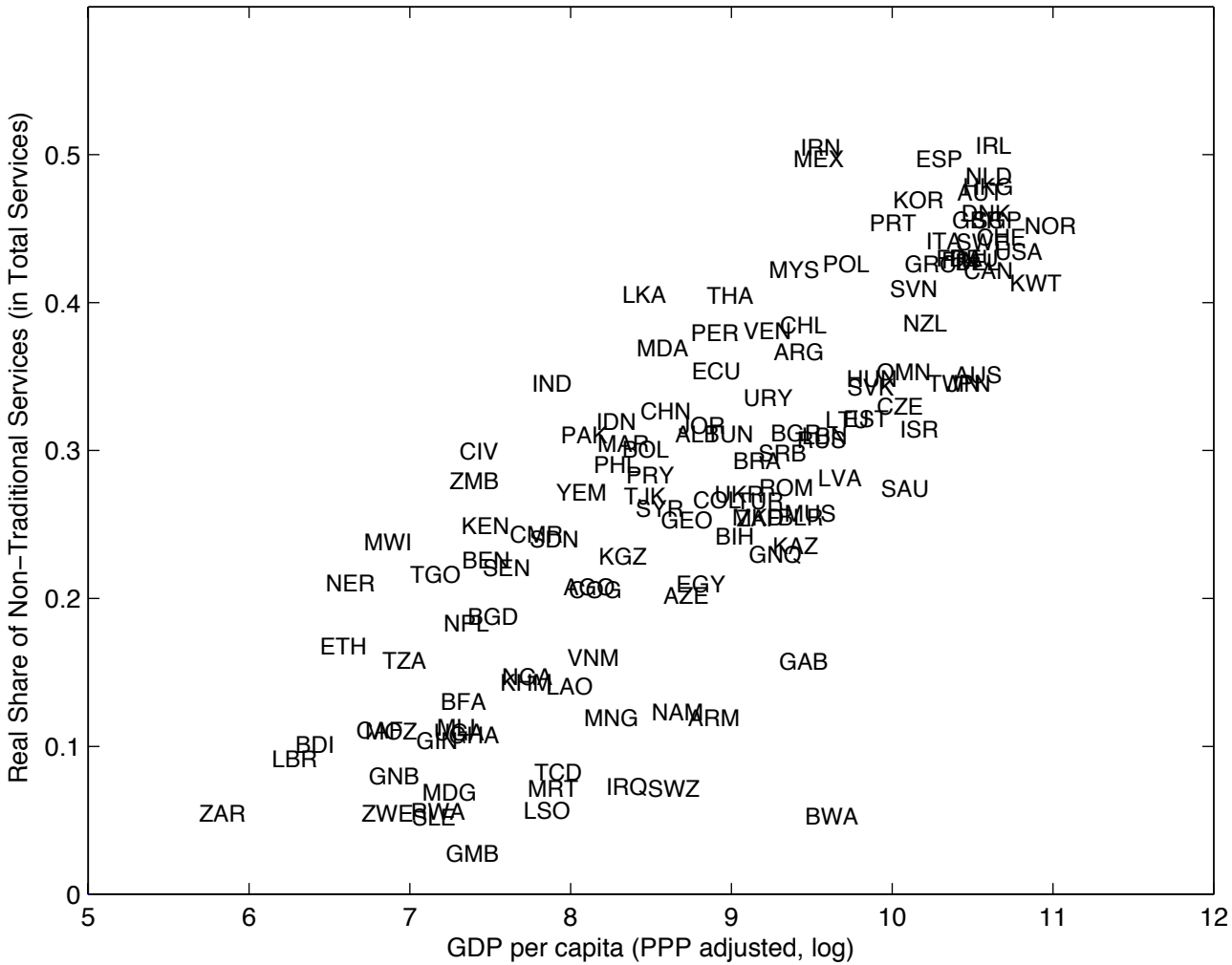
Rel. Agg. Productivity–Importance of Services



More on Services

- Duarte and Restuccia (2014) “Relative Prices and Sectoral Productivity”
- Systematic reallocation of real consumption from traditional services (non-market, non-tradable) to non-traditional services (market, tradable, modern)
- Contrary to total and traditional services, the relative price of non-traditional services falls with development
- Important implications for sectoral productivity analysis, especially in the services sector

Structural Transformation within Services



Development Accounting

	Relative GDPpc	m	A_i s	s_T	s_N
Income elasticity	–	1.12	0.87	0.79	1.16
D_{10}	0.89	0.76	0.93	1.04	0.79
D_5	0.13	0.06	0.22	0.31	0.12
D_1	0.02	0.01	0.03	0.05	0.01
Ratio D_{10}/D_1	49.3	83.5	28.8	21.0	83.0

Reallocation across Establishments

Resource Allocation with Heterogeneous Production

- Extensive literature on income differences across countries with focus on a stand-in firm and aggregate barriers or distortions
- Micro evidence: allocation of resources across productive uses may be important
  - Baily, Hulten, and Campbell (1992)
- Restuccia and Rogerson (2008) “Policy Distortions and Aggregate Productivity with Heterogeneous Establishments”

Framework

- Hopenhayn (1992) industry equilibrium embedded into a standard neoclassical growth model
- Basic framework: static economy with heterogenous establishments i that produce a single good
- Establishment i produces according to $z_i f(k_i.h_i)$, fixed cost of operation $\bar{y}$, endowment of K and H inelastically supplied
- Misallocation
  - Efficient allocation maximizes output (net of fixed costs) by solving: (1) which establishments operate, (2) allocation of capital and labor across operating establishments
  - If either (1) or (2) distorted, net output will be lower and since K and H fixed, measured TFP will fall

Idiosyncratic Distortions

- Credit market imperfections and non-competitive banking systems
- Public enterprises
- Trade restrictions
- Labor market regulations
- Corruption and selective government industrial policy

Quantitative Impact of Misallocation

- Distortions that are correlated with establishment productivity more damaging (strong weakening of the size and productivity correlation)
- Hypothetical correlated idiosyncratic policies generate drops in aggregate measured TFP between 30 to 50%

Empirical Evidence

- Hsieh and Klenow (2009) “Misallocation and Manufacturing TFP in China and India”
- Use theory and micro data on manufacturing establishments to assess extent of misallocation and its aggregate productivity impact
- Extent of misallocation much larger in China and India than in the United States, eliminating those differences can increase aggregate TFP by 30 to 60%
- Methodology applied to many other countries with similar results for extent of misallocation

Extensive Literature Studying Specific Policies and Institutions

- Review in Restuccia and Rogerson (2013) and Hopenhayn (2013)
- Firing taxes: Hopenhayn and Rogerson (1993)
- Financial frictions: Banerjee and Duflo (2005), Buera, Kaboski, and Shin (2011), Greenwood, Sanchez, and Wang (2013)
- Size-dependent policies: Guner, Ventura, and Xu (2008)
- Trade liberalization: Eslava et al. (2013)

Are These Differences in TFP Important?

- Capital accumulation (both physical and human capital) can amplify these differences
- Relative GDP per worker (y) can be written as:

$$\frac{y_i}{y_j} = \left(\frac{A_i}{A_j}\right)^{\frac{1}{(1-\alpha)(1-\gamma)}}$$

- With $\alpha = 1/3$ and $\gamma = 0.46$, TFP elasticity is 2.8
- For example a 50 percent relative TFP translates into a 14 percent relative GDP per worker

Beyond Static Misallocation

- Amplification channel through the effect of misallocation on the distribution of establishment-level productivity
- Micro data indicates important differences in the distribution of establishment productivity, Hsieh and Klenow (2009, 2012)

Misallocation and Productivity in Agriculture

Misallocation and Productivity in Agriculture

- Land reforms in developing countries
  - Adamopoulos and Restuccia (2014) “Land Reform and Productivity: A Quantitative Analysis with Micro Data”
- Land misallocation in Malawi
  - Restuccia and Santaeulalia-Llopis (2014) “Land Misallocation and Productivity”
- Bottom line of these and other studies: efficiency of land markets may be key for productivity in the agricultural sector

Land Reforms in Developing Countries

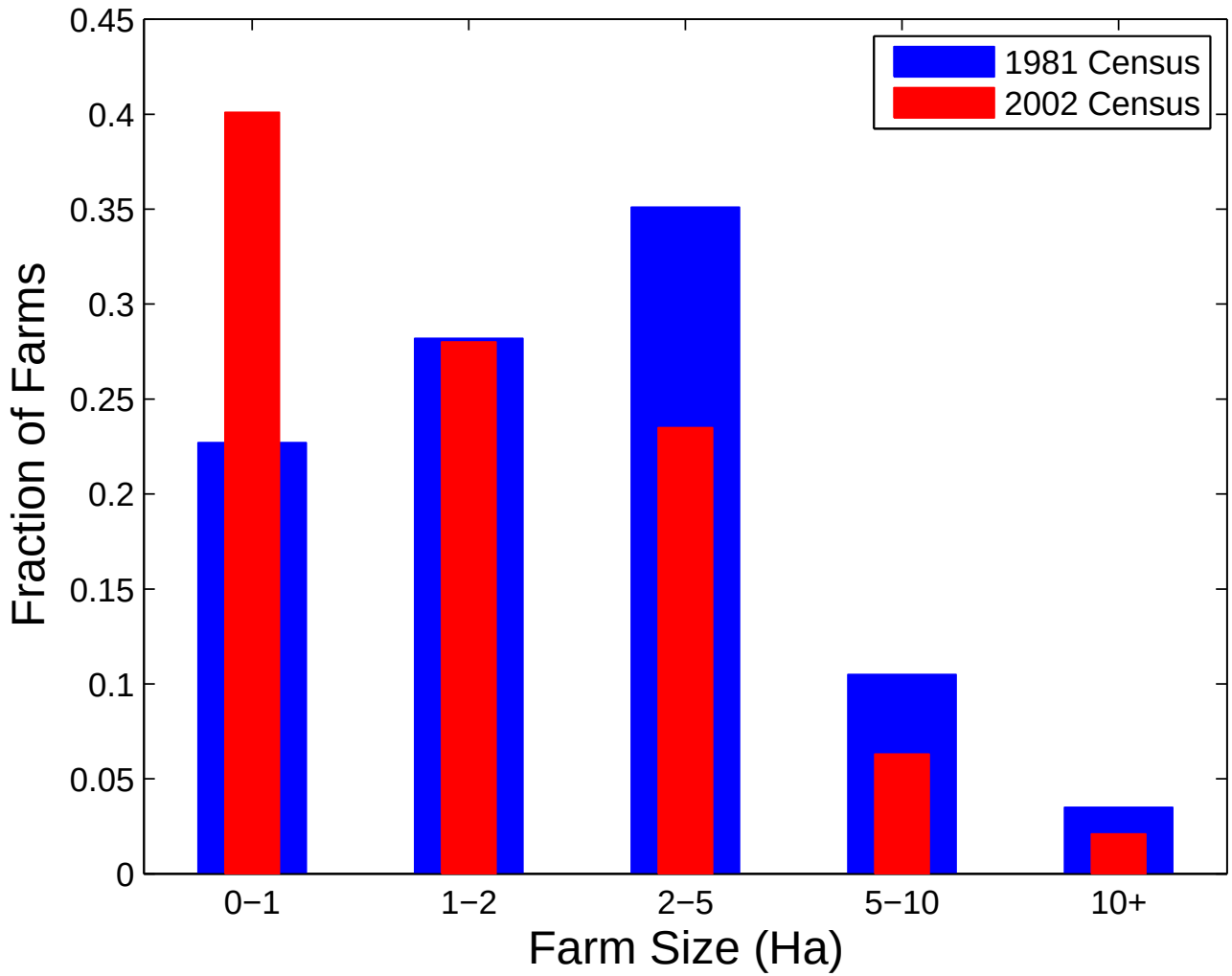
- Typically involve redistribution of farm land above a given ceiling from land-rich to land-poor
- Often coupled with a “shutting down” of land sales and/or rental markets.
- Prevalent in developing countries in the second half of the 20th century.

Some Land Reforms

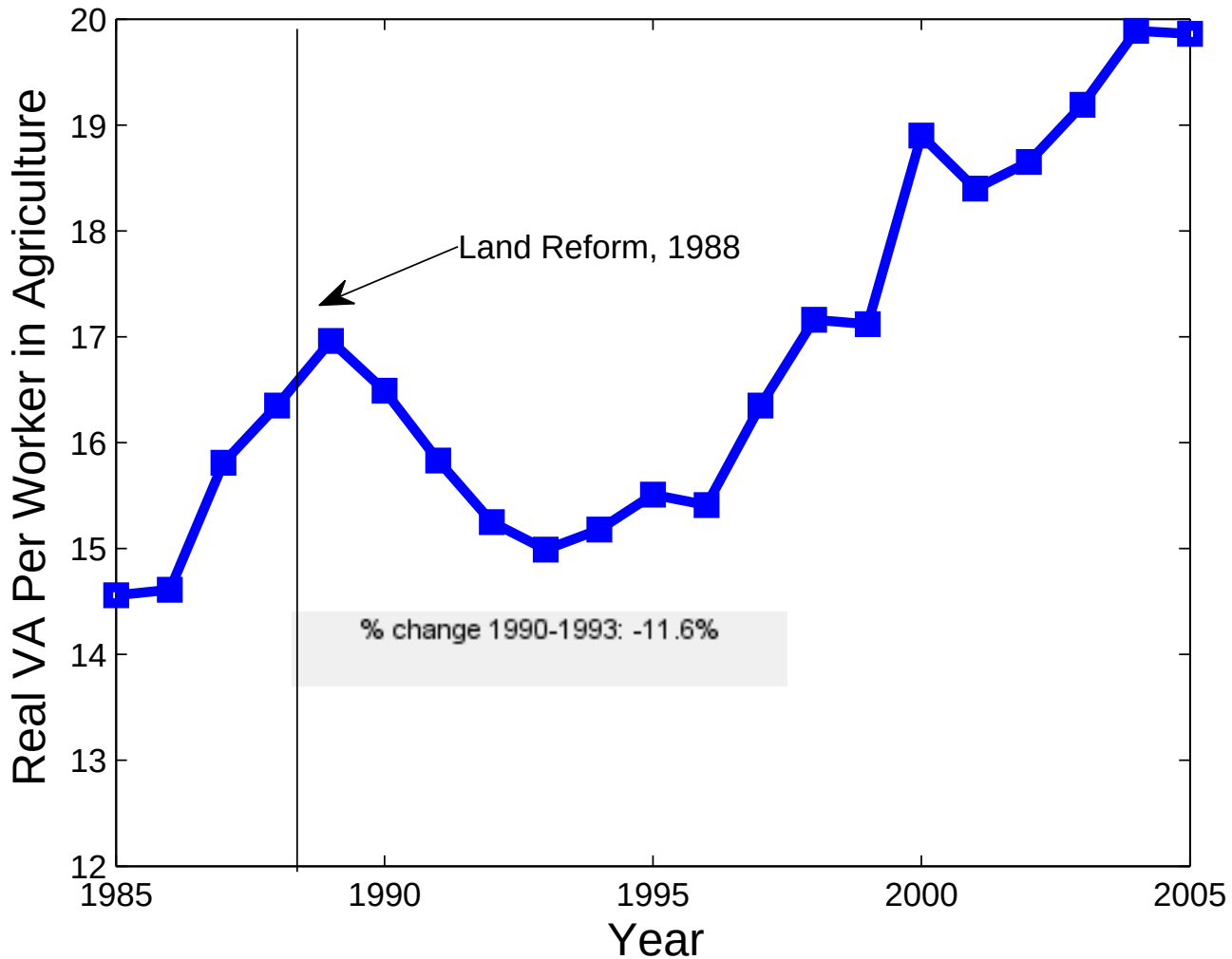
Country	Change in AFS (%)	Land Reform Period	Ceiling on Land Size (Ha)
Bangladesh	-49.1	1984	8
Ethiopia	-44.1	1975	10
India	-25.8	by early 1970s	by province: 4-53
Korea	-21.5	1950	3
Pakistan	-11.5	1972, 1977	61, 40
Sri Lanka	-26.2	1972	10-20
Philippines	-29.6	1988	5

- AFS drops after all these reforms against the tendency for AFS to increase over time

Size Distribution of Farms – Philippines



Agricultural Labor Productivity - Industry Accounts



Aggregate Effects of Land Reform in Philippines

	Government Land Redist.	Market Land Redist.	Data
Farm Size	-33.9	-9.3	-29.6
Productivity	-15.9	-5.0	-11.6
Landless (%)	-20.0	-4.0	-19.0

- Market-based redistribution generates less than 1/3 of the effects

Degree of Enforcement of Reform

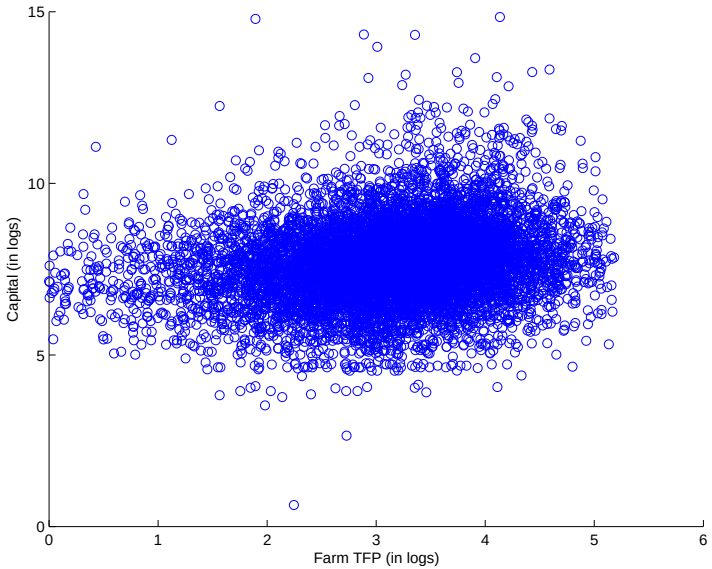
	Enforcement			
	$\theta = 0.8$	$\theta = 0.4$	$\theta = 0.1$	$\theta = 0$
Average Farm Size	-33.9	-40.5	-43.9	-47.1
Ag. Labor Productivity	-15.9	-22.5	-28.1	-33.5

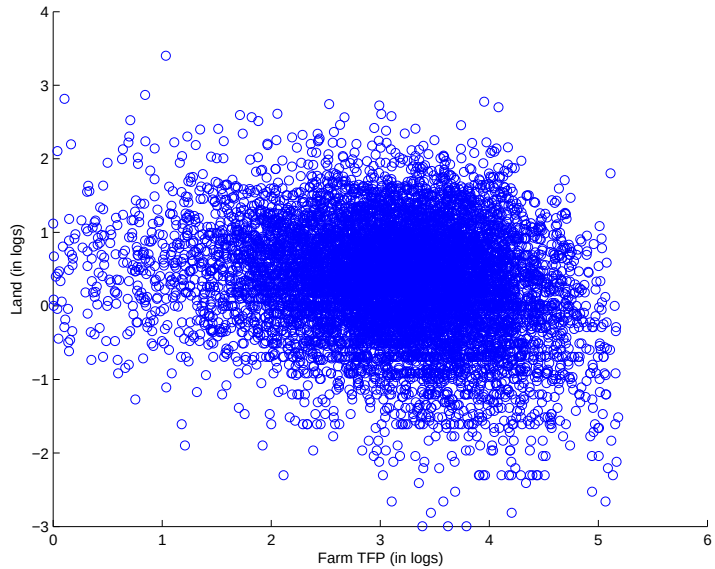
- Enforcement of reform ceiling is quantitatively important for the magnitude of size and productivity drop

Land Misallocation in Malawi

- Large, representative micro data with excruciating detail on agricultural production and productivity
- Land markets largely undeveloped in Malawi
  - more than 70% of land is inherited
  - almost none of the land comes with a title
  - almost no rentals
- Land fairly evenly distributed across households at very low operational scales
  - more than 70% of households operate less than 2 acres of land

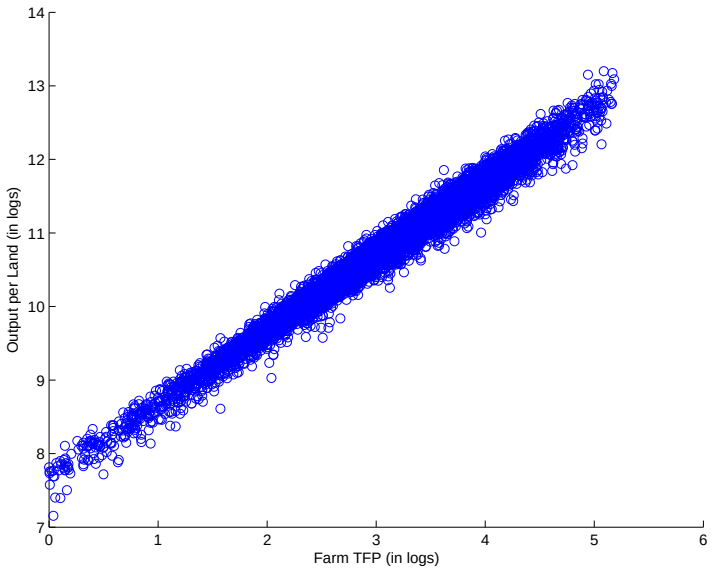
Farms by Productivity

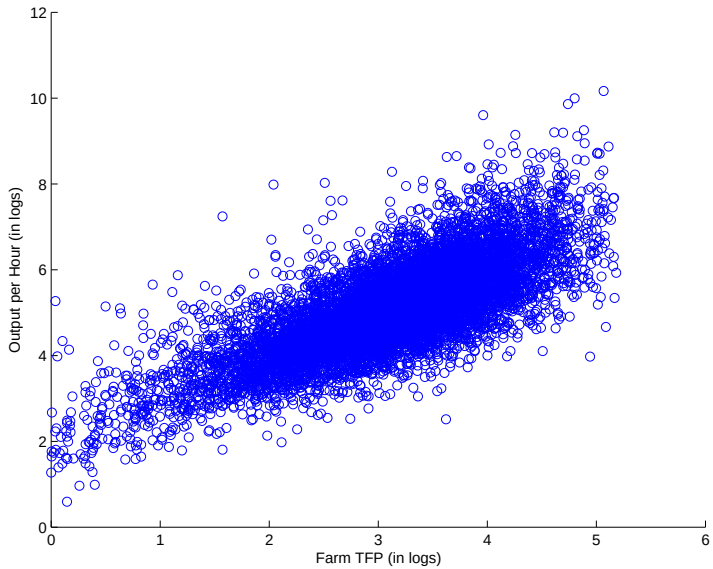




- Capital and land size not related to productivity!

Farms by Productivity





- Land productivity increases with farm TFP, indicative of misallocation!
- Eliminating land misallocation among existing farmers in Malawi can increase agricultural productivity by a factor of 4-fold

Wrapping Up

- Explaining why some countries are rich and others poor a monumental task
- Welfare implications of reducing income differences are enormous
- Lots of progress has been made with exciting developments using a quantitative approach
- Low productivity in agriculture key for the very poor countries
- Productivity differences in services becoming the dominant factor in developed and developing countries
- While there are many important issues of measurement, understanding the sources of productivity differences in services is likely a productive area for future research