Was Marx Right?

Development and Exploitation in 43 Countries, 2000-2014

Tomas Rotta

Goldsmiths College, University of London

tomasrotta.wordpress.com

Objective

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To assess **Marx's hypotheses** about economic development on a **world scale**

How?

Estimate Marxist variables from the **World Input-Output Database** (WIOD)

Create a **new panel dataset** for **43 countries** in the **2000-2014** period

Estimate **productive** and **unproductive activities** for each country

Compare Marxist variables at the **global level**, **between countries** and **within countries**

Compare results across **different productive-unproductive classifications**

Develop an estimation methodology and create a **software in R** that automates every step

Authors

Tomas Rotta

Goldsmiths, University of London

Rishabh Kumar

University of Massachusetts at Boston

Marx's hypotheses

Marx

Axioms

In the capitalist mode of production, economic activities can be classified into two categories:

Productive activities (PA) = produce goods and services **for profit** and **create value**

Unproductive activities (UA) = draw their incomes from the pool of value added that PA create

Only productive human labor creates value in the capitalist mode of production

The labor time directly and indirectly required to reproduce (not produce) a commodity determines its value

Competition induces companies to adopt capital-intensive labor-saving technology

Marx

Hypotheses about the long run

OCC = $\frac{\text{constant capital}}{\text{productive labor}}$ ratio tends to rise (because of labor-saving capital-intensive technology)

Exploitation rate of productive labor tends to rise (to increase profits)

OCC tends to rise faster than the rate of exploitation of productive labor

Average profit rate tends to fall as countries develop (because r = e/OCC)

Empirical evidence from 43 countries, 2000-2014

Marx was right on a global scale, but subject to important modifications

Methodology

Methodology

World Input-Output Database (WIOD):

WIOD = WIOT + SEA for **56 sectors** in **43 countries** from **2000 to 2014**

WIOT = multi-country input-output matrices

= 2,474 rows by 2,687 columns for each year

SEA = country-level data on capital stock, wages, and employment

Convert the entire WIOD to Marxist variables in US dollars

Estimate productive and unproductive activity from WIOT and SEA

Consolidate the transformed data into a **panel dataset** with nearly 400 variables

Estimate Marxist variables for countries and for the world economy

R software with 7,000 lines of code to automate all steps (R code will be posted on GitHub soon)

Methodology

From the global input-output matrices (WIOT) we compute:

$$ValueAdded\ {}^{WIOT}_{PA,i,t} = TotalValue\ {}^{WIOT}_{PA,i,t} - Inputs\ from\ PA\ {}^{WIOT}_{PA,i,t}$$

$$NetIncome\ {}^{WIOT}_{UA,i,t} = GrossIncome\ {}^{WIOT}_{UA,i,t} - Inputs\ from\ UA\ {}^{WIOT}_{UA,i,t}$$

Two robustness tests:

First robustness test: 4 different classifications of productive and unproductive activity

Second robustness test: compute variables with and without adjustment for self-employment

Empirical results

Results

Marx was right at the world level, but subject to important modifications

Evidence at the global level

World profit rate declined because the OCC rose faster than the rise in the rate of surplus value

Wage share of productive labor was roughly constant from 2000 to 2014

Value added and capital stock in productive activity relocated rapidly towards China

In 2014, China already had the greatest capital stock in productive activity in the world, and was second in value creation

Productive activity rose in countries that gained weight in the global economy (China)

Unproductive activity rose in countries that lost weight in the global economy (United States, Western Europe, and Japan)

Output, capital stock, and employment of productive activity grew faster than unproductive activity at the world level from 2000 to 2014

Results

Evidence between and within countries

Rich countries have lower OCC and lower rates of surplus value

Because labor compensation is much higher in rich countries

Citizenship-based inequality between countries dominates class-based inequality within countries

Rich countries have lower profit rates

because of the rise in the capital stock tied up in unproductive activity

Rich countries have greater output, capital stock, and employment in unproductive activity

Despite the growth of unproductive activity within most countries, the impressive growth of productive activity in China ensured that productive activity grew faster than unproductive activity at the global level

Profit rates declined at the aggregate global level, between countries, and within countries

Results

Robustness of the empirical findings

2000-2014 is a period of intense globalization and deepening of global value chains

China became a WTO member in 2001

Capitalism has become a truly global production system

Results derive from global input-output data, covering 56 sectors in each of the 43 countries

Global input-output data show:

- value flows between sectors within the same country
- value flows between sectors across different countries
- quantify global value chains

Results are robust across 4 different classifications of productive and unproductive activities

Only the levels of the variables change across classifications, not their trends

Results are robust to the adjustment for self-employment (larger in poor countries)

Thank you

Slides available at

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Appendix

Marx

Corollaries

Profit originates from surplus value = unpaid productive labor share of value added

Value added = total value – value of productive inputs
= unpaid productive labor + paid productive labor
= surplus value + value of labor power

$$\text{Rate of surplus value} = \frac{\text{surplus value}}{\text{value of labor power}} = \frac{\text{unpaid productive labor}}{\text{paid productive labor}}$$
$$= \text{rate of exploitation of productive labor}$$

$$\text{Rate of exploitation of unproductive labor} = \frac{\text{profit of unproductive activity}}{\text{paid unproductive labor}}$$

Marx

Hypotheses

Capital-intensive labor-saving technology increases the organic composition of capital (OCC):

$$\text{OCC} = \frac{\text{value of constant capital}}{\text{value of labor power}} = \text{‘capital-productive labor’ ratio in value terms}$$

Capital-intensive labor-saving technology displaces productive labor, the source of surplus value

Because of capital-intensive labor-saving tech, the OCC tends to rise faster than the rate of surplus value

Average profit rate tends to fall in the long run:

$$r = \frac{\text{surplus value}}{\text{constant capital}} = \frac{\text{rate of surplus value}}{\text{OCC}}$$

Companies need to increase the rate of surplus value to counteract the fall in the profit rate

Rate of surplus value tends to rise

Table 1: List of countries in the World Input-Output Database (WIOD)

AUS	Australia	**ITA**	Italy
AUT	Austria	**JPN**	Japan
BEL	Belgium	**KOR**	South Korea
BGR	Bulgaria	**LTU**	Lithuania
BRA	Brazil	**LUX**	Luxembourg
CAN	Canada	**LVA**	Latvia
CHE	Switzerland	**MEX**	Mexico
CHN	China	**MLT**	Malta
CYP	Cyprus	**NLD**	Netherlands
CZE	Czech Republic	**NOR**	Norway
DEU	Germany	**POL**	Poland
DNK	Denmark	**PRT**	Portugal
ESP	Spain	**ROU**	Romania
EST	Estonia	**RUS**	Russia
FIN	Finland	**SVK**	Slovakia
FRA	France	**SVN**	Slovenia
GBR	UK	**SWE**	Sweden
GRC	Greece	**TUR**	Turkey
HRV	Croatia	**TWN**	Taiwan
HUN	Hungary	**USA**	USA
IDN	Indonesia	**ROW**	Rest of the world combined
IND	India		
IRL	Ireland		

Table 2: Summary of Productive and Unproductive Activities

Case 1 Baseline with knowledge rents	**Case 2** Baseline without knowledge rents	**Case 3** Conventional Marxism	**Case 4** Minimal unproductive activity
Productive Activities	**Productive Activities**	**Productive Activities**	**Productive Activities**
Agriculture, Fishing, Mining	Agriculture, Fishing, Mining	Agriculture, Fishing, Mining	Agriculture, Fishing, Mining
Manufacturing, Construction, Equipment repair	Manufacturing, Construction, Equipment repair	Manufacturing, Construction, Equipment repair	Manufacturing, Construction, Equipment repair
Transportation, Telecommunications	Transportation, Telecommunications	Transportation, Telecommunications	Transportation, Telecommunications
Energy supply, Water and waste treatment	Energy supply, Water and waste treatment	Energy supply, Water and waste treatment	Energy supply, Water and waste treatment
Productive services, Education, Health	Productive services, Education, Health	Productive services, Education, Health	Productive services, Education, Health
Trade margins (wholesale and retail)	Trade margins (wholesale and retail)	Knowledge and information production	Trade margins (wholesale and retail)
	Knowledge and information production		Knowledge and information production
			Finance and insurance
			Real estate activities
Unproductive Activities	**Unproductive Activities**	**Unproductive Activities**	**Unproductive Activities**
Public administration, defense, social security	Public administration, defense, social security	Public administration, defense, social security	Public administration, defense, social security
Finance and insurance	Finance and insurance	Finance and insurance	Extraterritorial organizations
Real estate activities	Real estate activities	Real estate activities	
Knowledge and information production		Trade margins (wholesale and retail)	
		Advertising and market research	
		Legal and accounting activities; activities of head offices; management consultancy activities	
		Administrative and support service activities	
Excluded Activities	**Excluded Activities**	**Excluded Activities**	**Excluded Activities**
Households as employers and producers for own use	Households as employers and producers for own use	Households as employers and producers for own use	
		Extraterritorial organizations	

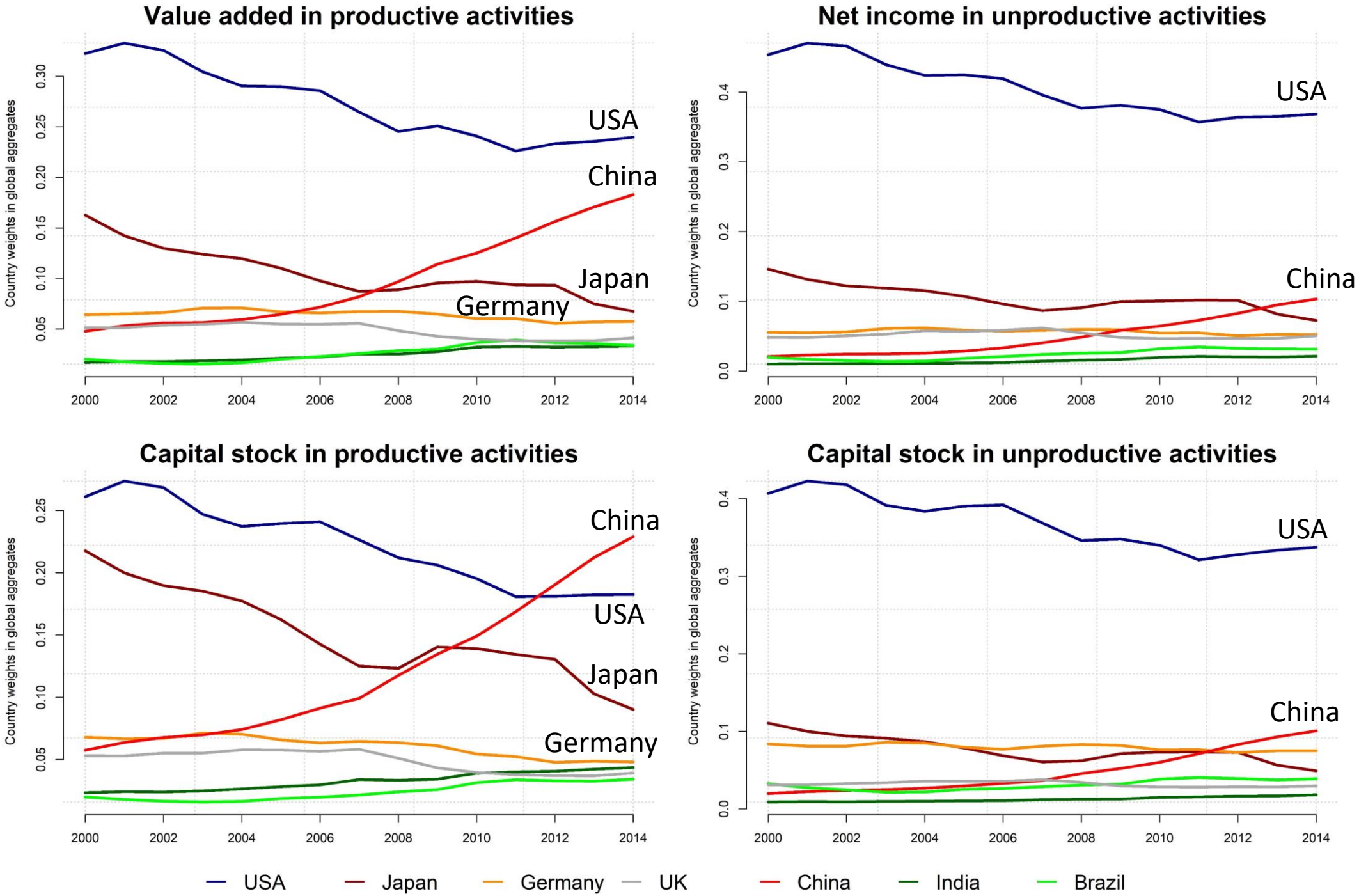
Value added in productive activities
Country weights in global aggregates
0.05
0.10
0.15
0.20
0.25
0.30
2000
2002
2004
2006
2008
2010
2012
2014
USA
China
Japan
Germany
Net income in unproductive activities
Country weights in global aggregates
0.0
0.1
0.2
0.3
0.4
USA
China
Capital stock in productive activities
Country weights in global aggregates
China
USA
Japan
Germany
Capital stock in unproductive activities
Country weights in global aggregates
USA
China
USA
Japan
Germany
UK
China
India
Brazil

Table 3: Global aggregates of Marxist variables regressed on linear time trend

Dependent variable	Case 1 Baseline with Knowledge Rents	Case 2 Baseline without Knowledge Rents	Case 3 Conven-tional Marxism	Case 4 Minimal Unproductive Activity
Rate of surplus value	0.005817**	0.006498***	0.008718***	0.006184***
Organic composition of productive capital	0.054043***	0.05158***	0.062268***	0.06111***
Organic composition of total capital	0.0707***	0.06878***	0.084159***	0.064173***
Organic composition of unproductive capital	0.016657*	0.0172**	0.021891*	0.003063**
Rate of profit on total capital	-0.000423*	-0.000276	-0.000239	-0.000478**
Rate of profit on productive capital	-0.002819***	-0.002047***	-0.002823***	-0.000713***
Net income of unproductive activity over the value added of productive activity	-0.00201***	-0.001582***	-0.003879***	-0.000573**
Ratio of knowledge rents to net income of unproductive activity	-0.000319**			
Capital stock: unproductive to productive ratio	-0.015368***	-0.012234***	-0.0177***	-0.001166***
Persons engaged: unproductive to productive ratio	0.002634***	0.002253***	0.005371***	0.000749***
Number of employees: unproductive to productive ratio	-0.000241***	-0.000624***	-0.000902**	-0.000971***
Employee compensation: unproductive to productive ratio	-0.002035***	-0.001349***	-0.003563***	-0.000973***
Employee plus self-employed compensation: unproductive to productive ratio	-0.001383***	-0.000935***	-0.002375***	-0.000654**

Note: Significance levels are 10%(*), 5%(**), 1%(***). OLS estimates. Independent variables: intercept and linear time trend. Dependent variable in levels. Regressions include global aggregates for the 43 countries listed in **Table 1** over the 2000-2014 period. Persons engaged are employees plus self-employed workers. Variables adjusted for self-employment in productive and unproductive activities.

Table 4: Within-country and between-country components of Marxist variables regressed on log of real GDP per capita in US dollars

	Case 1		Case 2		Case 3		Case 4	
	Baseline with Knowledge Rents		Baseline without Knowledge Rents		Conventional Marxism		Minimal Unproductive Activity	
Dependent variable	Panel fixed effects: between	Panel fixed effects: within	Panel fixed effects: between	Panel fixed effects: within	Panel fixed effects: between	Panel fixed effects: within	Panel fixed effects: between	Panel fixed effects: within
Rate of surplus value	-0.19***	-0.179***	-0.209***	-0.178***	-0.186***	-0.144***	-0.169***	-0.189***
Organic composition of productive capital	-0.724***	0.32***	-0.867***	0.296***	-0.885***	0.461***	-0.44***	0.363***
Organic composition of total capital	0.005	0.566***	-0.147	0.475***	0.297	0.869***	-0.24	0.363***
Organic composition of unproductive capital	0.729***	0.246**	0.72***	0.179**	1.182***	0.408***	0.201**	0
Rate of profit on total capital	-0.027***	-0.04***	-0.028***	-0.038***	-0.027***	-0.041***	-0.02***	-0.041***
Rate of profit on productive capital	0.008	-0.062***	0.011	-0.059***	0.025	-0.064***	-0.015***	-0.045***
Net income of unproductive activity over the value added of productive activity	0.131***	0.043***	0.102***	0.031***	0.166***	0.044***	0.036***	-0.002
Ratio of knowledge rents to net income of unproductive activity	0.031***	0.024***						
Capital stock: unproductive to productive ratio	0.449***	-0.006	0.437***	-0.008	0.565***	-0.005	0.048***	-0.012***
Persons engaged: unproductive to productive ratio	0.075***	0.052***	0.054***	0.046***	0.188***	0.1***	0.037***	0.022***
Number of employees: unproductive to productive ratio	0.066***	0.009**	0.047***	-0.007*	0.18***	0.039***	0.032***	-0.015***
Employee compensation: unproductive to productive ratio	0.073***	0.026***	0.041***	0.013***	0.161***	0.071***	0.021*	-0.009***
Employee plus self-employed compensation: unproductive to productive ratio	0.07***	0.032***	0.039***	0.019***	0.136***	0.077***	0.022**	-0.001

Note: Significance levels are 10%(*), 5%(**), 1%(***). Fixed effects include individual effects. Independent variable: log of real GDP per capita in 2015 US dollars. Dependent variable in levels. Regressions include the 42 countries listed in **Table 1** over the 2000-2014 period, excluding Taiwan due to lack of data on real GDP per capita. Persons engaged are employees plus self-employed workers. Variables adjusted for self-employment in productive and unproductive activities. 'Between' and 'within' panel estimators weighted by country shares of global value added.

Thank you

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