# Rates of return on capital across the world: are they converging?

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This article estimates levels and identifies trends in the profitability of capital in a broad sample of developed, developing and post-communist transition economies making up over 80% of global output. The underlying distributional and efficiency determinants of profitability are considered in the Marxian analytical framework. For the period of 1995–2007 leading to the Great Recession, our estimates indicate a trend towards convergence of national profit rates largely driven by the convergence of profitability in developing and transition economies. During this period, the level of profit rates in all groups of countries experienced growth with the global capital-weighted rate of profit increasing by approximately 50%. The main contributor to this growth in all groups of countries was the increase in average productivity of capital, measured by output-capital ratio. In developed and transition economies, the increase in profit shares of national income and the decline in the relative price of capital goods also contributed to profitability growth. In the same period for developing countries, profit shares and relative prices were relatively stable.

*Key Words:* Profit rate, Capital productivity, National income distribution, Convergence *JEL Classifications:* E11, E25, P24

# 1. Introduction

The 'labour-share squeeze' of the 1980s, 1990s and 2000s has created favourable conditions for the long-term increase in the profitability of capital. A large number of studies done in both mainstream and heterodox tradition (Duca, 1997; Glyn, 1997; Poterba, 1998; Wolff, 2003; European Central Bank, 2004; Duménil and Levy, 2011; Cette *et al.*, 2011, Katsimi *et al.*, 2012; Basu and Vasudevan, 2013) confirm the increase of profit rates in most developed countries between the early 1980s and the start of the global recession of 2008–9. However much less is known about the levels and trends of the return on capital (ROC) in developing and post-communist, transition economies.

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This article seeks to address this omission by providing estimates of recent ROC trends and levels for all countries where sufficient data are available. We also estimate the aggregate 'global' return on capital. Our sample includes 25 highly developed countries (HDCs), 29 less developed countries (LDCs) and 23 transition economy countries (TECs). During the 1995–2007 study period, their combined GDP made up between 83% and 89% of the world's total. This period is used due to data availability and to include post-communist countries, most of which transitioned to market capitalism in the 1990s.

The level of aggregate profitability is one of the central issues in the studies of economic growth and capital accumulation. Through its link to the division of national income into profit and labour shares, the average ROC reflects the balance of distributional relations. At the same time through the connection to the output-capital ratio, it also reflects the technological level and efficiency of production (Marx, 1867 [1967]; Kaldor, 1956, 1963; Robinson, 1962; Kalecki, 1971; Weisskopf, 1979; Poterba, 1998, Wolff, 2003; Mohun, 2009; Duménil and Levy, 2011; Basu and Vasudevan, 2013).

Economists starting with Adam Smith and David Ricardo posited that competition between producers should lead to equalisation of profit rates (Smith, 1776 [1976]; Ricardo, 1817 [1975]). Marxian analysis has developed these insights in its theory of competition. In it, intra- and inter-industry capital mobility constantly modify prices of production, leading to the convergence of average profit rates (Marx, 1967; Duménil and Levy, 1987, 2002, 2011; Vaona, 2011, 2012). Applied to the global economy, this theory would predict that accelerated accumulation of capital in fast-growing developing countries (emerging market economies) and massive increase in international capital flows should have resulted in a trend towards convergence of the ROC across countries. More specifically, in developed countries, net capital outflows and relatively slower investment ought to have led to higher returns to capital. In developing economies, net capital *inflows* and fast growth of domestic investment should have increased competition amongst capital owners, implying a decline of returns to capital. However, most of the existing studies of capital profitability in less developed economies (Bigsten, 2000; Banerjee and Duflo, 2005; Izyumov and Alterman, 2005; Bai et al., 2006; Lu and Gao, 2009; Udry and Anagol, 2006; Marquetti et al., 2010; Jetin, 2012) report ROC there to be significantly higher than in developed countries.

Whilst aligning closely with Marxian approach, our article is an empirical investigation of a general principle of profit rate equalisation that is also accepted in the neoclassical tradition. The neoclassical approach posits profitability equalisation as a part of equilibrium in the framework of perfect competition. In the Marxian literature, it is viewed more as a tendency.

Marxian theory's focus on profit rate and its role in capitalist accumulation has generated a detailed analysis of profitability equalisation (see, for example, Shaikh, 1980; Glick and Ehrbar, 1988; Duménil and Lévy, 2002, 2011; Vaona, 2011, 2012). Some of the recent Marxian literature has differentiated between the convergence and the gravitation of profit rates with the former referring to gradual movement of previously different profit rates towards some common average and the latter describing fluctuation of profit rates around some common value (Vaona, 2011, 2012). In our study, we focus on the convergence of profit rates. The novelty of this approach is in examining whether profitability equalisation, typically tested in intra- and inter-industry context, can also be detected in the cross-country comparison of macroeconomic profit rates.

Whilst empirical investigation of national profit rates and their possible convergence is the main goal of this study, our other goal is to evaluate ROC trends in the groups of countries and in the world economy as a whole. Using the standard decomposition of the ROC into its distributional and technology-efficiency factors, we also analyse

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the key drivers of profitability: profit shares, capital efficiency and relative prices. To preview our main results, we detect a trend towards cross-country convergence of profit rates, determined primarily by the convergence of profit rates in developing and transition economies. However this convergence is far from complete as average ROC in developing countries still remains significantly higher than in the rest of the world. Over the period of study, the average ROC increased in all three groups of countries. In LDCs, it was driven almost exclusively by the secular growth of capital productivity, whereas in HDCs and TECs, profit shares growth and the decline in the relative price of capital goods also contributed to the ROC increase.

The article is divided into five sections. Following this introduction, Section 2 discusses methodological and data issues. Section 3 presents estimates of profit rates, profit shares, output-capital ratios and price-related determinants of ROC. In Section 4, we analyse the convergence of national profit rates and estimate the aggregate 'global' ROC. Section 5 concludes.

## 2. Methodological and data issues

Define the average national rate of return on capital as:

$$ROC = \Pi / K_n, \tag{1}$$

where  $\Pi$  is profits and  $K_n$  is the measure of capital stock, all expressed in current prices. Following standard decomposition of ROC (Weisskopf, 1979; Moseley, 1988; Poterba, 1998; Duménil and Levy, 2002, 2011; Wolff, 2003; Caselli and Feyrer, 2007; Ferreira, 2011), it can be presented as:

$$\operatorname{ROC} = \left( \Pi / Y_n \right) \left( Y_n / K_n \right) = S_K^{\star} \left( Y / K \right)^{\star} \left( P_Y / P_K \right)$$
(2)

where  $Y_n$  is total nominal GDP,  $S_K$  is the share of capital incomes or profits in GDP, Y/K is the output-capital ratio measured in constant prices and  $P_Y/P_K$  is the relative price of capital measured as a ratio of the GDP price deflator to the index of investment-goods prices. The price multiplier term indicates how expensive components of capital are compared with all other goods and services when measured in local prices.

Based on eq. (2) we can interpret national ROC as a product of distributional factors reflected by profit shares  $S_{K}$ , technology and efficiency factors measured by the output-capital ratio Y/K and pricing factors reflected by the  $P_{V}/P_{K}$  ratio.

All variables used in the estimation of ROC (profits, output, capital stock) are for a national economy as a whole, including both public and private sectors. From a Marxian perspective, the main argument for using the 'whole economy' approach is that in a capitalist economy, public sector firms serve to maintain the dominant mode of production and therefore are capitalist in nature. As such, their assets and profits should be counted in the national rate of profit. For example, transportation and communication networks of a country can be publicly owned and operated and may report low or no profits. However, existence of these firms clearly contributes to private sector profitability. That said, it is also true that compared to their privately owned peers, public firms have a weaker incentive to maximise profitability. Therefore one can hypothesise that, other things being equal, a country with larger public sector should have a lower national rate of profit. Similarly, privatisation generally should

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bring about an increase in the overall rate of profit. Recent studies, done on the level of individual firms or industries, provide some support for the latter argument (see, for example, Meggison and Netter, 2001; Kikeri and Nellis, 2004; Azamat *et al.*, 2012).<sup>1</sup>

#### 2.1 Data for profit shares

Data for the computation of profit shares are derived using the United Nations National Accounts Statistics (UN-NAS, 2012). In this database, gross national income of countries is reported as the sum of the following components: compensation of employees (including benefits) paid by corporate and government-owned enterprises ( $W_{CG}$ ), gross operating surplus (gross profits) of these enterprises ( $\Pi_{CG}$ ), gross value added of private unincorporated enterprises ( $VA_{UE}$ ) and indirect taxes corrected for subsidies on production and imports ( $T_{ind}$ ):

$$Y = W_{\rm CG} + \Pi_{\rm CG} + VA_{\rm UE} + T_{\rm ind}$$
(3)

Whilst the first two components of the GDP,  $\Pi_{CG}$  and  $W_{CG}$ , qualify as profits and labour income respectively, the third,  $VA_{UE}$ , is a combination of both. The output of the unincorporated enterprises (UEs) is a relatively small part of the GDP in HDCs but can be very large in LDCs and TECs, making up to 50% of GDP.

Based on eq. (3), one can compute the total of profit-type incomes as a sum of  $\Pi_{CG}$ and profits in the UE sector. However profits and labour income in the UE sector are not reported as separate items by the UN or other international agencies. In some studies, the UE output is allocated between profits and labour incomes using a specific ratio, such as one-third profits and two-thirds wages (Johnson, 1954; Poterba, 1998; Krueger, 1999; Guscina, 2006; Jayadev, 2007). In our estimates, we use the more detailed approach developed by Gollin (2002) and often used in studies of national income distribution (Bai *et al.*, 2006; Caselli and Feyrer, 2007; Valentinyi and Herrendorf, 2008; Zuleta, 2008; Jetin, 2012). This method assumes that UE output is divided between capital and labour incomes in the same proportion as in the corporate sector. Although still arbitrary, this method has the advantage of providing country-specific anchors. Thus for actual computation of profit shares, we use the following formula:

$$S_{K} = (\Pi_{CG} + \Pi_{UE}) / (Y - T_{ind}) = \Pi_{CG} / (Y - VA_{UE} - T_{ind})$$

$$\tag{4}$$

where  $\Pi_{UE}$  stands for (the unknown) profits of UE sector.

Estimates of capital shares based on eq. (4) are possible only if one knows the output of the non-corporate sector of the economy,  $VA_{UE}$ . However some countries do not report UE output and count it as a part of gross operating surplus. For this reason, the sample of countries included in our investigation (77) contains either countries that directly provided data on UE sector output (core sample of 57 countries) or countries for which it can be estimated.

<sup>&</sup>lt;sup>1</sup> Estimating the impact of privatisation on profitability in a global cross-country context is an interesting research question. However, separation of the public and private sector's capital and profits is a challenging task even for developed countries with high-quality statistics. In developing and transition economies, this task is further complicated by poor data and lack of transparency. For a number of these countries, estimation of profits, for example, is possible for all of the economy but not for the business sector (Gollin, 2002; Karabarbounis and Neiman, 2014).

#### 2.2 Data for output and capital stock

The second component of ROC estimation formula (2), the capital-productivity variable (Y/K), is the inverse of the capital-output ratio. In the numerator, we use GDP at purchasing power parity (2005 PPP\$) from the World Bank database. To estimate K, we follow the standard perpetual-inventory method based on data for annual investment (Fraumeni, 1997; Katz and Herman, 1997; Larson *et al.*, 2000; Bohm *et al.*, 2002; World Bank, 2006). The value of fixed capital in year t is estimated as:

$$K_{t} = K_{0} \left( 1 - \alpha \right)^{t} + \sum_{n=0}^{t-1} I_{t-n} \left( 1 - \alpha \right)^{n}$$
(5)

where  $K_t$  is the capital stock in year t,  $K_0$  is the initial capital stock,  $I_{t-n}$  is the fixed investment in year t - n;  $\alpha$  is the depreciation rate.  $K_t$ ,  $K_0$ ,  $I_{t-n}$  are all measured in constant PPP dollars.

Investment data are derived from the World Bank (2012). The original data expressed in 2005 PPP\$ are adjusted by the price index ratio of investment goods to GDP taken from Penn World Tables (PWT 7.1, 2012). To estimate the initial capital stock  $K_0$ , we follow standard Harberger (1978) methodology. This approach generates a value of the initial capital stock based on investment, GDP growth rates and depreciation. For this study, the initial year is 1990 and real GDP growth rates and investment spending are averaged between 1990 and 2000. The depreciation rate is assumed to be 6%.

#### 2.3 Data for the relative price of capital

The third component of the ROC estimation in eq. (2) is the price ratio  $(P_Y/P_K)$  that reflects the relative price of investment goods. Including this ratio in the ROC calculation accounts for differences in the relative price of capital and other GDP components measured in local currency. We include this variable because prices for capital goods in many developing countries are reported to be significantly higher than for other goods and services (Eaton and Kortum, 2001; Hsieh and Klenow, 2007). In nations where this is true, the ROC computed in local currency units would be lower (Caselli and Feyrer, 2007; Mello, 2009).

The data for  $P_Y/P_K$  are taken from the PWT 7.1 (2012) and adjusted for the relative price of investment in the USA following Restuccia and Uruttia (2001, pp. 118–20) and Karabarbounis and Neiman (2014, pp. 77–8). The adjustment consists of dividing the PWT relative price of investment in each country by the PWT relative price of investment in the USA and multiplying this ratio by the ratio of the GDP price deflator to the investment price deflator for the USA.<sup>2</sup> The corrected  $P_Y/P_K$  ratio reflects the relative price of investment measured for each country in its domestic prices.

Aggregate indicators for ROC, profit shares and capital productivity are estimated in both unweighted and weighted form. Profit shares are weighted by GDP, whilst ROC, capital productivity and  $P_Y/P_K$  ratios are weighted by the capital stock. Thus the aggregate global weighted ROC is estimated as:

<sup>&</sup>lt;sup>2</sup> The latter ratio is taken from the US Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts series available at http://www.bea.gov.

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$$\operatorname{ROC}_{t} = \sum_{i=1}^{N} \operatorname{ROC}_{it} \star K_{it} / \sum_{i=1}^{N} K_{it}$$
(6)

Here ROC<sub>t</sub> is the aggregate global ROC in year t, ROC<sub>it</sub> is the ROC for country i in year t and  $K_{it}$  is the capital stock of country i in year t measured in PPP dollars.

#### 3. Return on capital: trends and levels

## 3.1 Trends and levels in ROC

Figures 1 and 2 and Tables 1–3 present data for trends and levels of ROC for developed, developing and transition economy countries between 1995 and 2007. The data indicate a consistent increase of average capital-stock-weighted ROC throughout the period for all groups. For HDCs, the average ROC increases from 0.090 to 0.135 or by 50%. For LDCs, the increase is from 0.148 to 0.205, or by 39%. The increase in ROC is largest in TECs: from 0.095 to 0.172, or by 81% (see Fig. 1).<sup>3</sup>

The relatively slower growth of profit rates in the LDCs compared to HDCs conforms to the profit rate convergence theory and indicates gradual narrowing of profitability gap between developed and developing countries. However, the rapid ROC increase in the TECs, many of which could be considered relatively capital-poor prior to the mid-1990s, does not fit the theory well. The reasons behind particularly fast growth of ROC in post-communist countries deserve a separate investigation.

For the profit rates averaged across the sample period, results largely confirm expectations. The capital-weighted ROC is highest in the LDCs (0.175). In HDCs and TECs, it is much lower at 0.109 and 0.120, respectively. The pattern for unweighted measures of ROC is similar: 0.181 in LDCs versus 0.128 in HDCs and 0.108 in



Fig. 1. Return on capital (weighted by capital stock) for three groups of countries, 1995–2007

<sup>3</sup> National accounting standards and data-collection techniques in TECs and LDCs are not as reliable as in HDCs. However this should not be a reason for not trying to estimate ROC in countries that represent almost half of global GDP. This problem is partially ameliorated in our study by using the UN and World Bank data where national account statistics are compiled using unified accounting methods.



Fig. 2. Return on capital and GDP per capita (averages of 1995-2007)

TECs (see Tables 1–3). More generally, our analysis confirms the inverse relationship between the ROC and the level of development as measured by GDP per capita. Figure 2 and the regression results in Table 4 confirm a statistically significant inverse relationship between ROC and GDP per capita.

## 3.2 Distributional, efficiency and price-related determinants of ROC

Decomposition of ROC into its distributional (capital-income shares), capital efficiency (Y/K) and price-related  $(P_Y/P_K)$  determinants shows the primary reasons behind ROC differences across countries. In both LDCs and TECs, average profit shares are substantially higher than in HDC economies. For the whole period, the level of GDP-weighted average profit share in LDC (0.538) and in TEC (0.495) are 40–60% higher than in HDC (0.340). The LDCs also have highest values for capital productivity: 0.404 versus 0.342 in HDCs and 0.331 in TECs (see Tables 1–3). Thus the higher capital profitability in LDCs is attributed to both higher profit shares and higher capital productivity. However in TECs, higher profit shares are offset by lower capital productivity and by the high relative price of investment goods. The average  $P_Y/P_K$  ratio in TECs, weighted by capital-stock, is 0.715. In contrast, in HDCs and LDCs, the average  $P_Y/P_K$  ratios are 0.943 and 0.815, respectively, indicating price levels for investment goods that are closer to price level of other GDP components.

The decomposition of ROC into profit share, capital efficiency, and pricing components helps explain ROC trends (see Figures 3–5). For all groups of countries, the growth in capital productivity was the main driver of ROC increases during the period. In HDCs, it accounted for 68% of the overall increase in ROC, with the profit share increase and price changes contributing about 16% each (based on data presented in Figs 3–5). In LDCs, increases in capital productivity account for more for more than 100% (107%) of the ROC increase, helping offset the impact of modest declines in profit share and  $P_Y/P_K$  levels. In TECs, the capital productivity increase is responsible

Highly developed countries	Rate of return	Profit share	Capital productivity	$P_y/P_k$ Ratio	Real GDP per capita in 2005 PPP\$
Australia	0.123	0.358	0.395	0.868	29,877.7
Austria	0.098	0.347	0.326	0.862	31,559.8
Belgium	0.101	0.356	0.290	0.978	30,200.7
Canada	0.147	0.378	0.431	0.897	32,207.1
Cyprus	0.157	0.442	0.362	0.951	22,778.2
Denmark	0.115	0.308	0.380	0.970	31,420.0
Finland	0.175	0.413	0.425	0.995	27,542.2
France	0.118	0.348	0.375	0.902	28,028.4
Germany	0.094	0.345	0.305	0.886	30,184.1
Greece	0.170	0.478	0.363	0.902	21,433.7
Hong Kong	0.107	0.423	0.239	1.051	31,456.9
Ireland	0.250	0.501	0.518	0.986	33,096.4
Israel	0.116	0.329	0.363	0.971	22,432.2
Italy	0.137	0.432	0.318	0.998	27,415.1
Japan	0.083	0.384	0.226	0.947	29,053.9
Korea	0.106	0.439	0.242	0.984	19,737.6
Netherlands	0.143	0.394	0.428	0.836	33,161.8
New Zealand	0.163	0.461	0.465	0.758	23,025.0
Norway	0.159	0.432	0.370	0.985	44,214.3
Portugal	0.085	0.349	0.257	0.951	20,474.6
Spain	0.096	0.347	0.315	0.881	25,087.4
Sweden	0.120	0.317	0.475	0.796	29,423.4
Switzerland	0.070	0.298	0.242	0.965	34,484.6
UK	0.149	0.343	0.518	0.840	29,487.7
USA	0.114	0.287	0.407	0.979	39,309.2
Average	0.128	0.380	0.361	0.926	29,083.7
Standard deviation	0.039	0.058	0.086	0.071	5,732.5
Average of weighted	0.109	0.340	0.342	0.943	-
Standard deviation of weighted	0.014	0.010	0.029	0.025	

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**Table 1.** Return on capital, profit shares, output-capital ratios and  $P_Y/P_K$  ratios for highly developed countries, average values for 1995–2007

*Sources:* World Development Indicators (World Bank, 2012); Penn World Table, 7.1 (PWT, 2012); authors' calculations.

for most (80%) of the ROC increase, with profit shares and pricing factors contributing approximately 10% each.

## 4. The 'global' rate of return and the convergence of ROC

If national borders were removed, what would be the average rate of return on capital in the global economy? The 'global' ROC is a useful variable as it provides a certain unified measure of the performance of 'collective' global capital. From the Marxian perspective, this indicator reflects both the technical efficiency of the global capitalist economy and the correlation of forces between capital and labour owners across the world.<sup>4</sup>

<sup>4</sup> Not coincidentally, estimates of related measures such as multi-country and global labour shares can be found in the recent literature (se,e for example, Rodriguez and Jayadev, 2010; Karabarbounis and Neiman, 2014).

Less developed countries	Rate of return	Profit share	Capital productivity	$P_y/P_k$ ratio	Real GDP per capita in 2005 PPP\$
Argentina	0.173	0.563	0.373	0.832	10,355.0
Bolivia	0.260	0.593	0.755	0.583	3,620.2
Botswana	0.227	0.727	0.259	1.235	9,946.4
Brazil	0.218	0.524	0.425	0.984	8,112.9
Burkina Faso	0.230	0.626	0.489	0.790	899.9
Cameroon	0.219	0.690	0.467	0.709	1,870.9
Chile	0.216	0.534	0.430	0.930	10,923.2
Columbia	0.138	0.509	0.348	0.772	6,979.2
Costa Rica	0.133	0.336	0.463	0.855	8,311.2
Cote d'Ivoire	0.229	0.497	1.042	0.510	1,765.2
Egypt	0.246	0.548	0.656	0.665	4,162.7
Guatemala	0.245	0.548	0.533	0.826	3,954.1
Honduras	0.097	0.394	0.300	0.789	3,026.6
India	0.186	0.532	0.473	0.712	1,850.1
Iran	0.160	0.647	0.352	0.705	8,114.4
Jamaica	0.076	0.333	0.262	0.856	6,815.6
Kenya	0.174	0.397	0.655	0.662	1,323.0
Mexico	0.146	0.572	0.343	0.739	11,501.4
Morocco	0.151	0.500	0.295	0.994	3,156.1
Namibia	0.176	0.418	0.394	1.061	4,740.7
Niger	0.170	0.421	0.545	0.744	618.5
Panama	0.193	0.558	0.385	0.865	8,367.1
Philippines	0.204	0.596	0.434	0.788	2,813.4
Senegal	0.273	0.660	0.463	0.910	1,544.8
South Africa	0.128	0.340	0.395	0.941	8,018.5
Sri Lanka	0.077	0.256	0.398	0.733	3,100.5
Tunisia	0.130	0.455	0.290	0.985	6,312.8
Uruguay	0.200	0.468	0.441	0.999	9,421.8
Venezuela	0.160	0.582	0.393	0.701	9,779.6
Average	0.181	0.511	0.450	0.823	5,565.7
Standard deviation	0.052	0.115	0.163	0.154	3,456.1
Average of weighted	0.175	0.538	0.404	0.815	
Standard deviation of weighted	0.016	0.013	0.050	0.031	

**Table 2.** Return on capital, profit shares, output-capital ratios and  $P_y/P_k$  ratios for less developed countries, average values for 1995–2007

Sources: World Development Indicators (World Bank, 2012); Penn World Tables, 7.1 (PWT, 2012); authors' calculations.

The trends and levels for the capital-weighted and unweighted averages of global ROC are presented in Fig. 6 and Table 5. They show a clear upwards pattern reflecting the increases in profitability established for the three country groups. Over the whole period, the capital-weighted global ROC increases from 0.097 to 0.152, or by 57%, whilst the unweighted ROC rises from 0.105 to 0.169, or by 61%. The average level of capital-weighted ROC for the sample period, 0.122, is about 11% lower than the unweighted ROC (0.137), confirming that capital-rich economies generally have a lower level of ROC.

Decomposition of the global ROC into profit share, capital efficiency and pricing determinants confirms the results obtained for country groups (see Fig. 7). In particular, the increase in the global (capital-weighted) ROC is primarily boosted by increases

Transition economy countries	Rate of return	Profit share	Capital productivity	$P_y/P_k$ ratio	Real GDP per capita in 2005 PPP\$
Armenia	0.082	0.531	0.265	0.584	2,940.4
Azerbaijan	0.136	0.679	0.323	0.568	3,306.5
Belarus	0.070	0.389	0.344	0.531	6,572.7
Bulgaria	0.208	0.550	0.568	0.619	8,039.8
China	0.143	0.566	0.328	0.771	3,120.7
Croatia	0.128	0.391	0.382	0.865	13,190.3
Czech Republic	0.112	0.446	0.353	0.708	18,061.2
Estonia	0.104	0.434	0.353	0.656	12,694.0
Georgia	0.092	0.633	0.222	0.552	2,858.6
Hungary	0.111	0.380	0.407	0.713	14,477.9
Kazakhstan	0.098	0.476	0.285	0.709	6,585.7
Kyrgyz Republic	0.037	0.301	0.269	0.437	1,553.6
Latvia	0.143	0.432	0.513	0.636	9,957.5
Lithuania	0.080	0.478	0.279	0.574	11,118.4
Moldova	0.034	0.424	0.160	0.524	1,972.5
Mongolia	0.192	0.569	0.382	0.892	2,442.4
Poland	0.158	0.383	0.570	0.723	12,043.2
Romania	0.140	0.477	0.398	0.744	8,054.2
Russian Federation	0.070	0.369	0.329	0.618	9,667.3
Slovak Republic	0.119	0.427	0.417	0.662	13,988.6
Slovenia	0.102	0.320	0.350	0.905	20,541.3
Tajikistan	0.069	0.624	0.261	0.381	1,159.2
Ukraine	0.058	0.414	0.260	0.533	4,479.4
Average	0.108	0.465	0.349	0.648	8,209.80
Standard Deviation	0.045	0.101	0.102	0.135	5,587.56
Average of Weighted	0.120	0.495	0.331	0.715	
Standard DEVIATION OF Weighted	0.025	0.022	0.055	0.014	

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**Table 3.** Return on capital, profit shares, output-capital ratios and  $P_Y/P_K$  ratios for transition economy countries, average values for 1995–2007

Sources: World Development Indicators (World Bank, 2012); Penn World Tables, 7.1 (PWT, 2012); authors' calculations.

Table 4. Return on capital and GDP per capita

	Dependent variable: rates of return	Dependent variable: rates of return			
	Country average of 1995–2007	All countries; all years			
Constant GDP per capita Sample size <i>R</i> -squared	0.153*** (15.89) -0.0000086*(-1.63) 77 0.02	0.147*** (47.81) -0.00000065***(-3.97) 898 0.02			

*Notes:* The figures in parentheses are t values. **\*\*\***, **\*\***, **\*** indicate significance at the 1%, 5%, and 10% respectively.

Sources: World Development Indicators (World Bank, 2012); Penn World Tables, 7.1 (PWT, 2012); authors' calculations.



Fig. 3. Decomposition of return on capital into profit share, capital productivity and  $P_Y/P_K$  ratio in highly developed countries, 1995–2007 (1995 = 100) \*All variables are weighted as described in the text.

in capital productivity. Between 1995 and 2007, the global output-capital ratio increased by 39%, accounting for almost three-fourths of the global ROC growth. In the meantime, the global GDP-weighted profit share increased by 11%, contributing about onefifth of the global ROC growth. The 5% decline in the relative prices of capital during this period contributed close to one-tenth of the overall growth of the global profit rate.

To investigate the degree of convergence of national ROC, we had to decide which measure is more relevant for estimation of gaps in the ROC. Is it the change in the absolute gaps, or the relative difference in ROC amongst countries? We think both measures are valid. However in studying ROC convergence, the focus of our investigation, a normalised measure of dispersion—the coefficient of variation—is preferable. The advantage of such measure is that it does not depend on the average level of ROC and allows testing for the long-term convergence trends.

Figure 8 shows the coefficients of variation ( $\delta$ ) of ROC for each of the three country groups and for all countries. Between 1995 and 2007, the  $\delta$  for all countries trends downward, decreasing from 0.53 to 0.38, or by 27%. The overall convergence of ROC is primarily the result of ROC convergence in LDCs and TECs. In both of these groups, the variation of national ROC was quite large at the beginning of the period but declined significantly by its end (see Fig. 8). In the TECs, the  $\delta$  declined consistently between 1995 and 2005—from 0.56 to 0.35—but experienced a sharp increase in 2006 and 2007 (to 0.52) mostly due to the sharp ROC increase in one country, Azerbaijan. Excluding Azerbaijan, the  $\delta$  for the TECs is 0.36 for both 2006 and 2007. In HDCs, dispersion of national ROC was small but convergence was not present—here the level of  $\delta$  essentially stayed the same: 0.26 in 1995 versus 0.25 in 2007. Even though there is a convergence trend for profit rates in the LDCs and TECs, they remain more dispersed in these countries compared to the developed economies.

Looking at the determinants of ROC, it is clear that the main reason behind ROC convergence across countries is the convergence of capital productivity. During the study period, the  $\delta$  for capital productivity decreased by one half: from 0.47 to 0.24. At the same time, the  $\delta$  level for profit shares and relative price ratios showed no sign of decline. (See Appendix Figures 1–3).



Fig. 4. Decomposition of return on capital into profit share, capital productivity and  $P_Y/P_K$  ratio in less developed countries, 1995–2007 (1995 = 100) \*All variables are weighted as described in the text.



**Fig. 5.** Decomposition of return on capital into profit share, capital productivity and  $P_Y/P_K$  ratio in transition economy countries, 1995–2007 (1995 = 100)

In sum, our results largely support the Marxian profit rate convergence theory as applied to the global economy: average profitability of capital does converge as international capital flows increase. However the differences between the profit rates in richer and poorer countries remain too wide and persistent to speak of complete convergence.

## 5. Conclusions

This study estimated recent trends and levels in the average national profit rates for a broad sample of highly developed, developing and transition economies. Over the 1995–2007 period, profitability of capital in all groups of countries experienced substantial growth with the global capital-weighted average ROC increasing by approximately



Fig. 6. 'Global' return on capital: unweighted and weighted by capital stock, 1995-2007

Table 5. 'Global' return on capital, unweighted and capital stock weighted, 1995-2007

	Rate of return	Profit share	Capital productivity	$P_y/P_k$ ratio	Sample size
Average (unweighted)	0.137	0.447	0.386	0.804	898
Average (capital stock weighted)	0.122	0.399	0.354	0.888	898
Standard deviation (unweighted)	0.058	0.112	0.129	0.169	898

Sources: World Development Indicators (World Bank, 2012; Penn World Tables, 7.1 (PWT, 2012); authors' calculations.

50%. The main contributor to this growth in all groups of countries was the increase in average productivity of capital, measured by output-capital ratio. In developed and transition economies, the increase of profit shares in national income and the decline in the relative price of capital goods also contributed to profitability growth. In developing countries, profit shares and relative prices were relatively stable.

Considering levels of ROC, its decomposition into profit shares, capital efficiency and relative capital price determinants indicates that the higher ROC in developing countries is explained by higher levels of profit shares and higher capital efficiency compared to developed economies. The relatively low level of ROC in transition economies is explained by the fact that the high average profit share level there is largely offset by low capital efficiency and the relatively high prices for capital.

Throughout the study period, national ROC in developing and transition economies demonstrated a trend towards convergence, reflected by the decline of the coefficient of variation. Although ROC in developed economies did not show similar patterns, the overall dispersion of national ROC for all countries decreased. The principal driver of profitability convergence was the convergence in output-capital ratios possibly resulting from faster dissemination of technology in the environment of globalisation. N.-T. Chou, A. Izyumov and J. Vahaly



Fig. 7. Decomposition of the 'global' return on capital into profit share, capital productivity and  $P_{Y'}$  $P_{K}$  ratios, 1995–2007 (1995 = 100)\*

\*All variables are weighted as described in the text.



Fig. 8. Coefficient of variations of ROC for HDCs, LDCs, TECs and all countries, 1995-2007

Our results generally support the predictions of both Marxian and neoclassical theories: different pace of capital accumulation and increasing openness to foreign investment facilitate convergence of national rates of return on capital. Further research should look into the mechanism of profit equalisation, including relative role of domestic versus international investment, differences in human capital and production technology as well as institutional, social and political factors affecting profitability.

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# Appendix



**Appendix Fig. 1.** Coefficient of variations of profit shares for HDCs, LDCs, TECs and all countries, 1995–2007



**Appendix Fig. 2.** Coefficient of variations of Y/K ratios for HDCs, LDCs, TECs and all countries, 1995–2007



**Appendix Fig. 3.** Coefficient of variations of  $P_Y/P_K$  ratios for HDCs, LDCs, TECs and all countries, 1995–2007