ECONOMIC RECORD

THE ECONOMIC SOCIETY OF AUSTRALIA

ECONOMIC RECORD, VOL. 100, NO. 328, MARCH, 2024, 101–116

International Differences in Profitability*

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We examine the global distribution of company profitability over the 30 years from 1989 to 2018 focusing on the international dimension. We find the international component of profitability differences first declines and then rises. Regression analysis of time-series data shows that transitory shocks to international profitability differences mostly dissipate over a few years, although there is evidence of persistent profitability differences for many countries. Dividing the sample to accommodate a structural break, the rate of dissipation declines between 1989–2002 and 2003–2018 subperiods. The extent of persistent differences also declines, suggesting convergence of international differences in profitability may have reached its limit.

I Introduction

Globalisation in the form of increased trade in goods, rising foreign direct investment and increased international migration has increased the linkages between economies over recent decades. Yet, each country has its own factor endowments, market structures and institutional arrangements. In these circumstances, the extent to which national borders insulate the profitability of domestic companies is an empirical question. We examine company profitability across the globe over recent decades using data from Worldscope, which covers data on thousands of companies. We are particularly interested in the extent of differences in profitability across countries and the degree to which these differences persist over time.

Recent studies have identified rising company profitability across the world, especially in advanced economies, which is attributed to increasing market power in either the country's product markets (De Loecker & Eeckhout, 2018; Diez *et al.*, 2018) or the labour markets (Mertens, 2022). Heterogeneity in profitability across companies is also identified as contributing to an increase in average profitability over time, with rising market shares of highly profitable superstar companies pushing up average profitability even when the markups of individual companies remain constant (Van Reenen, 2018; Autor *et al.*, 2020). Yet, none of these studies focuses explicitly on the international dimension of company profitability.

Profitability varies across companies due to many company-specific factors, such as innovation success, growth strategy and accounting procedures, as well as due to factors that are common to all companies in an industry or country. We separate the international dimension of company profitability by decomposing the variation in company profitability into cross-country, cross-industry and residual (company-specific) variation. With the decomposition, cross-industry variance accounts for around 16 per cent of total variance in 1989, cross-country variation accounts for approximately half that

* We thank the two anonymous reviewers for their helpful comments and suggestions. Any remaining errors or omissions are our responsibility. The authors have no known conflict of interest. Open access publishing facilitated by Curtin University, as part of the Wiley - Curtin University agreement via the Council of Australian University Librarians.

JEL classifications: F16, L11, L16

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doi: 10.1111/1475-4932.12769

amount and company-specific factors account for the remaining variance. Both cross-country and cross-industry differences in average profitability decline relatively until the early 2000s, but then recover to almost beginning levels by the end of our sample period.

International differences in economic performance are generally viewed as only gradually diminishing over time, with some differences never eroding. A substantial empirical literature examines the tendency of *per capita* incomes to converge on the leader and shows incomes of many, but not all, countries slowly converging on the USA after controlling for differences in education, capital intensity and other factors (Dowrick & Ngyuen, 1989; Islam, 2003; Johnson & Papageorgiou, 2020). An emerging literature also looks at the convergence of wage rates across countries towards the global mean, showing a general convergence of wages over many years but with many countries having elements of difference that are persistent (Egger & Pfaffermayr, 2004; Parteka & Wolszczak-Derlacz, 2015; Zhou & Bloch, 2019).

We extend the examination of convergence in economic performance across countries to differences in company profitability. We estimate the rate of adjustment in the cross-country component of differences in profitability and examine whether there are persistent elements in the differences. Time-series modelling indicates most country-specific profitability differences are transitory shocks as opposed to persistent elements. Over the full sample period the estimated half-life of these shocks is approximately 2 years, with the half-life increasing from approximately 1 year over the 1989–2002 subperiod to approximately 3 years over the 2003–2018 subperiod. Evidence of persistent elements in profitability differences is found, but the number of countries with persistent elements declines between subperiods.

International linkages and their impact on profitability are discussed in Section II. In Section III, global variation in company profitability is decomposed into cross-country, cross-industry and residual components. Section IV develops a model of dynamics of international differences in profitability, which is then applied empirically to identify transitory shocks and persistent elements and to estimate the rate at which the impact of transitory shocks declines over time. Section V concludes with a summary of our results and discussion of their implications.

II International Linkages and Profitability

Globalisation has enhanced linkages among national markets over a long period of time, driven substantially by technological change. Improvements in transportation and communication have opened possibilities for cheaper and speedier international movement of goods and services as well as people and finance (O'Rourke & Williamson, 1999). There has also been a general, although uneven, movement towards the lessening of policy-imposed barriers to this movement, especially in the period after World War II, at least until recently.

Still, companies generally face substantial obstacles in expanding their operations across national borders, especially if the expansion involves more than the export of goods to foreign customers. Countries generally have restrictions on the operation of foreign companies within their borders. Migration of labour is also generally heavily restricted. Nonetheless, barriers to international trade have been lowered through multinational trading rules administered by the World Trade Organisation and free-trade agreements among smaller groups of countries, most notably the European Union.

Samuelson (1948) derives the factor-price-equalisation theorem in which free trade in goods without transaction costs is sufficient to equalise wages and returns to capital across countries. The movement of goods responds to differences across countries in prices, which suggests increased trade narrows the differences in these prices and in the factor prices that determine costs of production. If capital and labour also flow across national borders in response to differences in returns and wages, so much the better for equalisation of profitability. However, things are rarely that simple.

There are long and variable lags in adjustment, especially with foreign investment and migration, so the timing of the initiating difference and the resulting adjustment rarely align. In addition, there are diverse indirect effects of the adjustments, which generally are inter-related given the initiating differences are often correlated (such as when there are changes in exchange rates and interest rates). Finally, the impact of international movements on domestic outcomes is difficult to detect, especially in large countries, because trade, foreign investment and migration represent only small percentages of domestic output, capital accumulation and population growth, respectively.

Detecting the impact of international linkages on profitability is particularly problematic, due to heterogeneity in company performance, even for companies operating in the same country and industry. Differences in productivity performance are particularly notable (Syverson, 2011). High-performing companies, such as Apple, Facebook and Microsoft from the USA, Toyota from Japan, Samsung from South Korea or Lenovo from China, further enhance their profitability through spreading operations across the globe (Melitz & Redding, 2014).

While some companies enhance their profitability through exporting and foreign direct investment, imports have long been seen as having a depressive effect on profitability of domestic producers of import-competing products (Bloch, 2001). Fieler and Harrison (2020) suggest domestic companies may be able to escape the profit-depressing effects of import competition through product differentiation. In addition, domestic producer profitability may gain from positive productivity impacts on domestic companies from importing intermediate goods (Okafor *et al*., 2017; Okafor, 2021) as well as from the demonstration effects of foreign direct investment (Demena & van Bergejik, 2017; Li & Tanna, 2019).

International flows of capital in the form of foreign direct investment and portfolio investments in stocks and bonds seek out opportunities for higher returns abroad than in domestic markets. Frictions associated with institutional barriers and risk of default impede this flow (Portes & Rey, 2005; Stulz, 2005). However, Caselli and Feyrer (2007) estimate the marginal product of capital across a wide sample of countries using data on capital income from national income accounts and find only small differences across countries, with tentative evidence the differences are shrinking over time. Nonetheless, recent studies suggest both average profitability and the dispersion of profitability have been increasing within countries (De Loecker & Eeckhout, 2018; Diez *et al*., 2018; Van Reenen, 2018).

Due to the multiple and sometimes conflicting influences of enhanced international linkages on company profitability, the direction of impact is theoretically ambiguous. In the next section, we empirically examine the global distribution of company profitability to determine how the distribution is changing with the enhanced international linkages of globalisation. In the following section, we develop a model of convergence of profitability across countries and use it to estimate the transitory and persistent components of international profitability differences along with the rate at which transitory components dissipate over time.

III Competition and the Distribution of Profitability around the World

Profitability varies across companies for a variety of reasons. There are temporary company-specific shocks from local demand and supply conditions as well as longer lasting impacts from the company's sustained competitive advantages (Porter, 1985). Companies operating in different industries also experience different average profitability due to short-term demand and cost fluctuations as well as structural conditions including industry concentration. Profitability is also impacted by the country in which a company is domiciled due to national institutional arrangements, such as taxation, and national economic conditions that affect demand and costs.

Traditionally, studies of differences in industry profitability have concentrated on linking these differences to market structure, hypothesising that more concentrated industry sales increase profitability (Cowling & Waterson, 1976). A separate, later, literature emphasises competition is a process and focuses on the adjustment of above-average profitability towards average levels (Mueller, 1986). In this section, we examine whether increased international linkages associated with globalisation have impacted on the distribution of company profitability. In Section IV, we examine the impact of globalisation on convergence of company profitability across countries through estimating the adjustment process for international differences in average profitability.

We use the revenue-to-cost ratio as the measure of company profitability in our empirical analysis. Values of the ratio for individual companies are calculated from company accounting data in the Worldscope database provided by Thomson Reuters, the same data source used in recent studies of global profitability by De Loecker and Eeckhout (2018) and Diez *et al*. (2018). The database contains operating data on a large and expanding sample of both publicly traded and private companies.

We calculate the revenue-to-cost ratio as follows:

$$r_{ijk} = Sales_{ijk}/COGS_{ijk}, \qquad (1)$$

where the Sales item from Worldscope is our measure of total revenue, while the cost of goods sold (COGS), item from this database is our measure of the variable cost of production. The revenue-to-cost ratio is also known as the price–cost ratio because dividing both the numerator and denominator of (1) by the quantity of goods sold (or an index of quantity sold for multi-product firms) gives the ratio of price to average variable cost.

The revenue-to-cost ratio is closely related to the gross profit margin,

$$gpm_{ijk} = \left(r_{ijk} - 1\right)/r_{ijk}, \qquad (2)$$

which has long been used as a profitability measure in empirical studies of the influence of market structure on profitability (Martin, 2002, chapters 5 and 6). Under assumptions of profit maximisation and constant average variable cost, *gpm* is equal to the negative inverse of the firm's perceived price elasticity of demand, which is Lerner's (1934) index of monopoly. Cowling and Waterson (1976) use a conjectural variations model of oligopoly to show the price elasticity of demand falls with company market share, so *gpm* is positively related to company market share and industry average value of *gpm* is positively related to the Herfindahl index of industry concentration.

Recent studies of market power in the global economy replace *gpm* with an estimated ratio of price to marginal cost obtained through multiplying the company revenue-to-cost ratio by an estimated elasticity of conjectural variations for its industry (De Loecker & Eeckhout, 2018; Diez *et al*., 2018). The estimated industry elasticity of conjectural variations is the same in all countries. We use the revenue-to-cost ratio rather than the ratio of price to marginal cost in analysing cross-country differences in company profitability because it is simpler and multiplication by a uniform elasticity leaves the country-specific component of profitability unaffected.[1]

Worldscope provides an unbalanced panel of data on the revenue and cost of goods sold for an ever-increasing number of private and public companies. Our sample starts with 2003 companies in 1989 and grows to 26,263 companies in 2018.[2] Using an unbalanced sample may influence the movement over time of the mean and variance of the distribution of values of the revenue-to-cost ratio, as the added companies may differ from the original sample in characteristics that contribute to profitability. Nonetheless, capturing a much greater portion of all operating companies across the world is worthwhile, and the potential biases to measured profitability are noted in the discussion below where relevant.

If globalisation has the impact of strengthening competition by increasing competition between companies in different countries, we could expect a downward movement over time in differences in profitability between companies operating in different countries after controlling for other factors. We start examining these differences by separating variation in the average revenue-to-cost ratio across countries from variation across industries as well as from otherwise unexplained variation associated with company-specific effects. Table 1 shows an analysis of variance (ANOVA) for our sample at the beginning of the sample period in 1989, in the middle of the sample period in 2003 and then at the end of the sample period in 2018.

In Table 1, the 'Sum of squares' column shows the sum of squared variation in the logarithm of the revenue-to-cost ratio attributed to the 'Country' in which a company is headquartered and the variation attributed to the 'Industry' to which the company is classified. Also shown is the 'Model' sum of squares attributed to the two variables together (including the effect of covariation in the variables) and the 'Residual' sum of squares left for company-specific variation. The 'Partial effect' column shows the proportion of total variation attributed to 'Country', 'Industry' and the 'Model' for each sample period, while the '*F*-test' column shows the *F*-statistic and level of

[1] In Table B1, we present results for the average revenue-to-cost ratio in a group of 40 countries at the beginning and end of our sample period for comparison with results shown in Table 1 of De Loecker and Eeckhout (2018). The results are similar despite the different profitability measure, slightly different sample period and some differences in the sample of companies.

[2] Our sample consists of all companies for which there are sales and cost of goods sold data aside from outliers (the top and bottom 1 per cent of the distribution of the ratio of revenue to cost of goods sold), which are eliminated to reduce the influence of measurement error on our results. Details of the number of companies, countries and industries in each year in our sample are presented in Appendix I: Tables A1 and A2.

TABLE 1
Analysis of Variance for Logarithm of Ratio of Revenue to Cost of Goods Sold (ln r), 1989, 2003 and 2018

	Number	Sum of squares	Partial effect	*F*-test
Year =1989, Adjusted R^2 = 0.6104, Number of companies = 2003				
Country	42	17.99	0.0812	4.06†
Industry	32	40.13	0.1647	11.89†
Model	74	338.90	0.6248	43.41†
Residual	1929	203.51		
Year = 2003, Adjusted R^2 = 0.5391, Number of companies = 12,968				
Country	82	172.84	0.0590	9.83†
Industry	32	365.86	0.1166	53.03†
Model	114	3295.29	0.5432	134.08†
Residual	12,855	2771.39		
Year = 2018, Adjusted R^2 = 0.5619, Number of companies = 26,263				
Country	118	506.28	0.0681	16.18†
Industry	32	1203.50	0.1480	141.84†
Model	150	8971.58	0.5644	225.57†
Residual	26,113	6923.99		

Note: †indicates test is significant at the 1 per cent level.

significance for rejecting the hypothesis that the corresponding partial effect is zero.

All partial effects are statistically significant at the 1 per cent level for all sample periods, which provides strong evidence that profitability as measured by the revenue-to-cost ratio varies systematically across both countries and industries. However, there is substantial unexplained variation in the ratio, with the 'Residual' accounting for a large proportion of 'Sum of squares' in each year. Residual variation is associated with company-specific effects, so firm-level heterogeneity not associated with country or industry contributes much of variance in profitability.

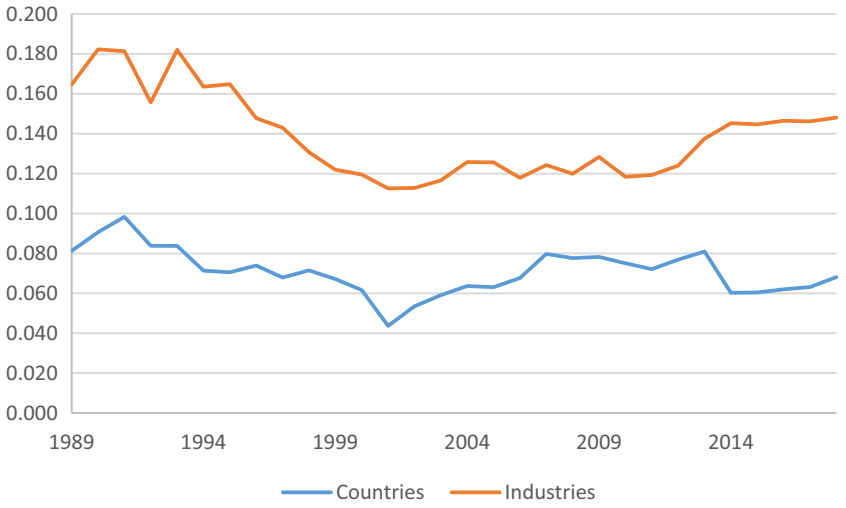
Figure 1 shows the chart of annual values of the partial effect of 'Country' and 'Industry'. Movement in both partial effects is clearly downward until the beginning of the 2000s, at least after an initial increase during the global recession of the early 1990s. Both partial effects then recover, although somewhat unevenly. At the end of period in 2018 the partial effect of 'Country' is 0.0681 compared to 0.0812 in 1989, while the partial effect of 'Industry' is 0.1647 in 1989 and 0.1480 in 2018.

The pattern of falling and then rising partial effects of both 'Country' and 'Industry' suggest a period of convergence in profitability followed by a period of divergence within both categories, although with somewhat different timing and amplitude across the two categories. The recovery in the partial effect of 'Country' is initially stronger but then stabilises and relapses compared to the recovery in the partial effect of 'Industry'.

A common influence on the effect of both country and industry is changing heterogeneity in the sample of firms. The size of the sample grows from 2003 companies in 1989 to 26,323 companies in 2018, which is accompanied by a rise in residual sum of squares divided by degrees of freedom.[3] A rise in company-specific shocks to profitability decreases the share of variation in profitability attributed to 'Industry' as well as the share attributed to 'Country', thereby providing a possible explanation for the apparent convergence. To overcome this issue and provide more direct evidence on convergence, in the next section we examine changes in the country average profitability for all companies within an industry relative to the global average for that industry. For this purpose, we use a restricted sample of countries for which continuous data on average industry profitability are available for at least one industry over the full sample period.

[3] As the number of companies increases, the ratio of residual sum of squares to the degrees of freedom shown in the 'Number' column rises from 0.1072 in 1989 to 0.2178 in 2003 and to 0.2736 in 2018.

FIGURE 1
Partial Effects of 'Country' and 'Industry' on Variance in the Logarithm of Ratio of Revenue to Cost of Goods Sold ($ln\ r_i$), 1989–2018.



Source: Authors' Construction Based on ANOVA Analysis

IV Convergence in International Profitability

Globalisation enhances convergence of economic performance across countries. *Per capita* incomes of many, but not all, countries are found to be slowly converging on income of the USA after controlling for differences in education, capital intensity and other factors (Dowrick & Ngyuen, 1989; Islam, 2003; Johnson & Papageorgiou, 2020). Wage rates across countries are also found to be converging towards the global mean in recent years but with many countries having elements of difference that are persistent (Egger & Pfaffermayr, 2004; Parteka & Wolszczak-Derlacz, 2015; Zhou & Bloch, 2019). In this section, we examine the convergence of company profitability across countries.

At time t, the ratio of revenue to cost of goods sold for a company relative to the global average for the same industry is decomposable into the company's ratio relative to the domestic average ratio multiplied by the country's average ratio relative to the global average ratio:

$$\left(r_{i,j,k}/r_k^*\right)_t = \left(r_{i,j,k}/r_{j,k}^*\right)_t * \left(r_{j,k}^*/r_k^*\right)_t, \qquad (3)$$

where $r_{j,k}^*$ is the average revenue-to-cost ratio of all companies in the kth industry and the jth country and r_k^* is the corresponding average ratio for companies in the same industry across all countries.[4] Studies in the persistence of company profitability literature following Mueller (1986) have focused on the first term on the righthand side in (3), which involves relative profitability only for domestic companies. Our investigation focuses on the last term in (3), the average revenue-to-cost ratio for all domestic companies in an industry relative to the global average ratio for that industry.

The literature on persistence of company profitability following Geroski (1990) links variation in the first term in (3) to factors affecting national competition, whereas variation in the second term reflects international competition. Therefore, our study complements the existing persistence of profitability literature by focusing on the effects of international rather than domestic competition through examining an

[4] A cross-industry component of variation in profitability does not directly appear in (3) because all profitability measures are relative to the mean of the industry to which the company is classified.

algebraically separable component of variation in profitability. Of course, the rising importance of multinational companies implies a degree of overlap in domestic and international competition, but we leave examination of the nature of this overlap for future investigation.

We consider a smooth exponential process of adjustment in the relative profitability of the jth country as given by,

$$\left(r^*_{j,k}/r^*_k\right)_t = \left(r^*_{j,k}/r^*_k\right)_0^{\theta^t} \left(r^*_{j,k}/r^*_k\right)_\infty^{1-\theta^t} \prod_1^t \mu_{j,k,i}^{\theta^{t-i}}, 1>\theta>0, \quad (4)$$

where $\left(r^*_{j,k}/r^*_k\right)_0$ is the relative revenue-to-cost ratio in the initial position, $\left(r^*_{j,k}/r^*_k\right)_\infty$ is the corresponding relative value at the infinite horizon and $\mu_{j,k,t}$ is the shock to average domestic profitability in country j and industry k at time t. The persistent component of relative profitability is given by $\left(r^*_{j,k}/r^*_k\right)_\infty$. The effects of country-specific shocks to profitability and of the initial value of relative profitability are transitory and dissipate over time, although the decline in impact is slow if θ is large.[5]

Differences in profitability fail to erode quickly over time when there are persistent elements to the differences or when the impact of transitory components declines only slowly over time. Values of the persistent element of relative profitability are not directly observable but can be inferred from estimating the adjustment of relative profitability over a subperiod of time. Estimates of θ, which determines the speed of adjustment, are obtained in the process. Our estimating equation for the adjustment of profitability is derived from taking the first difference of the logarithms of both sides of (4) as follows,

$$ln\left(\frac{r^*_{j,k}}{r^*_k}\right)_t - \ln\left(\frac{r^*_{j,k}}{r^*_k}\right)_{t-1} = \left(\theta^{t-1}-\theta^t\right)\left(ln\left(\frac{r^*_{j,k}}{r^*_k}\right)_\infty - ln\left(\frac{r^*_{j,k}}{r^*_k}\right)_0 - \sum_{i=1}^{t-1} ln\mu_{j,k,i}^{\theta^{t-i-1}}\right) + ln\mu_{j,k,t}. \quad (5)$$

Manipulating the righthand side of (5) yields an expression in terms of lagged relative profitability and relative profitability at the infinite horizon along with current country-specific profitability shocks,

$$\Delta\left(lnr^*_{j,k_t}\right) = (1-\theta)\theta^{t-1}\left(ln\left(r^*_{j,k}/r^*_k\right)_\infty - ln\left(\frac{r^*_{j,k}}{r^*_k}\right)_0 - \sum_{i=1}^{t-1} ln\mu_{j,k,i}^{\theta^{t-i-1}}\right) + ln\mu_{j,k,t}$$

$$= (1-\theta)ln\left(r^*_{j,k}/r^*_k\right)_\infty - (1-\theta)\, ln\left(r^*_{j,k}/r^*_k\right)_{t-1} + ln\mu_{j,k,t}. \quad (6)$$

Values of the change in relative profitability and lagged relative profitability in (6) are directly observable, but the disturbance term and the value of relative profitability at the infinite horizon are not. However, the value of relative profitability at the infinite horizon is a persistent element of relative profitability for each country–industry pair. Therefore, the fixed effect associated with a particular country–industry pair provides an estimate of the persistent element of relative profitability for that pair.

Our dataset for estimating regressions in the form of (6) is a balanced panel with observed changes in relative profitability across 42 countries for up to 32 industries over 30 years. Not all of the 42 countries have companies operating in each industry over the full 30-year sample period, in which case the country–industry pair is not included in the panel of data. We assume the rate of adjustment of relative profitability, θ, is uniform across countries and industries but allow each country and industry to have a unique and independent persistent element equal to the value of the dummy variable for that country or industry.[6]

With these assumptions regarding adjustment rates and persistent elements, our estimating equation is in the form,

[5] In the initial period, $t = 0$ and θ^t equals 1. If this occurs before there is exposure to foreign markets, only domestic conditions influence relative profitability. As t grows towards infinity, θ^t becomes increasingly small and current relative profitability depends increasingly on the persistent component and recent shocks.

[6] We assume the country and industry effects are independent to reduce the number of dummy variables used, which implies country-specific persistent effects are uniform across industries and industry-specific persistent effects are uniform across countries.

$$\Delta \ln\left(r^*_{j,k}/r^*_k\right)_t = b_0 ln\left(r^*_{j,k}/r^*_k\right)_{t-1} + \sum_{p=1}^{31} c_p D_p + \sum_{q=1}^{42} d_q D_q + \varepsilon_t, \quad (7)$$

where D_p is the industry dummy denoting industry $p(p = 1, 2, 3, \ldots, 31)$; D_q is the country dummy denoting country $q(q = 1, 2, 3, \ldots, 42)$ and ε_t is an error term corresponding to the shock variable in (6).[7] The coefficients of the country and industry dummy variables are estimates of the persistent element of relative profitability for that country or industry. The coefficient of lagged relative profitability is an estimate of $\theta - 1$, so the restriction on θ in (4) implies $0 > b_0 > -1$. When b_0 is close to -1 (zero), the impact of initial relative profitability and historical transitory shocks to relative profitability quickly (slowly) dissipate.

Each observation of the dependent variable for regressions in the form of (7) is the annual difference in the natural logarithm of the average profitability for all the operating companies in a particular country–industry pair relative to the global average profitability of all country–industry pairs as calculated from the company data in Worldscope. There are 42 countries in the sample and up to 32 industries for each country. A country is included in the sample if it has at least one industry with company data for all 30 years of the sample period. The number of industries ranges from only one industry in Columbia, Indonesia, Luxemburg, Monaco, Peru, Philippines and Taiwan to 30 industries in the United Kingdom and 31 industries in the USA. There are 450 country–industry pairs in our sample with 29 time periods for an overall sample of 13,050 observations, with an average of more than 10 industries per country (the company sample within an industry is unbalanced and generally grows over time).

OLS is used for estimation as (7) is in the form of an error-correction model applied to time-series data in first difference form (Enders, 1995).[8] Estimation is carried out using Stata version 16. Figure 1 shows a sharp decline from 1989 to the early 2000s in the contribution of country-specific profitability variation to overall variation in company profitability across the world, after which the contribution of country-specific variation increases, which suggests a change in the adjustment process for international profitability differences.[9] The presence of a structural break is confirmed using the Chow test, with the year 2003 identified as the structural break year.[10] Therefore, we estimate (7) separately for the years before 2003 and the years from 2003 onwards as well as for the full sample period with results for all three periods presented in Table 2.

We are interested in the rate of adjustment for international differences in profitability. The coefficients of lagged relative profitability listed in the first row of Table 2 show that for the full sample period 28 per cent of the influence of prior year profitability dissipates in 1 year. The corresponding rate for the 1989–2002 subsample is 43 per cent, while for the 2003–2018 subsample it is 15 per cent. These estimates imply the time required for half of the initial condition or a

[7] A constant term and one industry dummy (Industry 32) are omitted from the regressions to avoid perfect multicollinearity in the data matrix for estimation when all country dummy variables are included. Our focus is on cross-country differences in relative profitability, so we desire estimates of the persistent component of relative profitability for each country.

[8] The functional form of our regressions differs from those applied in studies of persistence in company profitability, which utilise regressions with a lagged dependent variable. We use regressions in the form of an error-correction mechanism to avoid bias associated with the use of lagged dependent variables.

[9] The collapse of the dot.com bubble and the early stages of domestic political reactions against globalisation may be contributing factors. World trade grew by at least 3 per cent in every year from 1989 and 2000 with an annual average rate of over 6 per cent, and then was virtually constant in 2001 after the dot.com bubble. Growth between 2002 and 2018 was at an annual average rate of slightly over 3 per cent, with a sharp drop in trade in 2009 and quick recovery after the global financial crisis (data from World Trade Organisation, 'world_trade_growth.xlsx', accessed 31 August 2023).

[10] To test for a structural break, we add a dummy variable indicating pre- and post-break and its interaction with the logarithm of previous-period relative profitability to (7). We experiment with structural breaks in various years and find that the R^2 statistic is largest when the structural break is in the year 2003, when the F-test for non-zero values is statistically significant at 1 per cent level for both the break dummy variable and its interaction with the logarithm of previous-period relative profitability.

historical shock to relative profitability to unwind is approximately 2 years for the full period, approximately 1 year for the 1989–2002 subsample and approximately 3 years for the 2003–2018 subsample. The adjustment process for shocks to international profitability differences slows substantially from the first subsample to the second.

The estimated coefficients of the country dummy variables in Table 2 are interpreted as estimates of the persistent element in the relative profitability for that country. A positive (negative) estimated coefficient indicates the profitability for that country is predicted to indefinitely stay above (below) the world average profitability. The *F*-statistics in Table 2 all support rejection of the null hypotheses that all country dummy variable coefficients equal zero. Therefore, there is clear evidence of persistent elements in international profitability differences for the full sample period and for both subsamples.

The *F*-statistics in Table 2 show clear evidence of persistence in profitability differences across both industries and countries. Our particular interest is in persistence in profitability for countries, so each country with a dummy coefficient that is statistically significant at the 1 per cent or 5 per cent level has results listed in a row in Table 2. The value of the country coefficient is shown for all periods for comparison, even if not significant that period. Most countries (29 of 42) have a statistically significant coefficient in at least one of the periods. The bulk of the reported statistically significant coefficients are negative, 18 for the full period, 19 for the 2003–2018 subsample and four for the 1989–2002 subsample. Interestingly, none of the estimated coefficients for the USA (the largest economy and the one with most industries included in the dataset) is statistically significant at the 5 per cent level.

The decline in the number of significant negative coefficients and emergence of a few (three) positive significant coefficients over the subsample periods suggest that even persistent elements in international profitability differences are subject to eventual erosion. Fewer statistically significant coefficients of either sign in the 2003–2018 subsample than in the 1989–2003 subsample are consistent with the overall decline over time in country-specific share of variation in company profitability across the world as shown in Table 1 and Figure 1, especially given the evidence from Table 2 of slowing in the rate of adjustment to transitory shocks between the 1989–2002 and 2003–2018 subperiods.

In a model with exponential decay of past influences, such as in (4), the impact of initial conditions and historical shocks never fully disappear. However, with an estimated half-life of 2 years, 75 per cent of the impact is gone in 4 years and almost 95 per cent in 8 years. Even with a half-life of 3 years, 75 per cent of the impact is gone in 6 years and almost 95 per cent in 12 years. Therefore, our estimates of the adjustment rate of relative profitability suggest the vast bulk of the influence of initial conditions or historical shocks to cross-country profitability differences dissipates within a decade.

The international component of relative company profitability is separate from the domestic component in (3). Yet, it is interesting to compare our results to those from prior studies of company profitability that deal with the domestic component. Studies of persistence in company profitability for individual countries generally estimate the average annual rate of dissipation of transitory shocks to profitability to be around 50 per cent (Geroski & Mueller, 1990; Cable & Mueller, 2008). Similar rates of dissipation are found in a recent study by Desai *et al*. (2020, table 4, p. 555) from regressions with panel data for a large sample of companies from 33 countries using fixed effects for industry and country as well as a range of control variables. Therefore, our estimated rate of dissipation of the international component of differences in average company profitability is somewhat lower than that generally found for the domestic component of variation in profitability, at least for our full sample period of 1989–2018 and for latest subperiod of 2003–2018. Arguably, even in the era of globalisation, trade and investment barriers associated with national borders slow dissipation of the international profitability differences below that of domestic differences.

Positive persistent elements of profitability in the literature on persistence of company profitability for a company or an industry are interpreted as indicating sustained competitive advantage or a lack of competition. Our estimates of persistent elements of average profitability for all companies in all industries within a country have different interpretation. Institutional differences, such as different tax rates or accounting rules, as well as the structure and regulation of competition are likely causes, especially as we use the revenue-to-cost ratio as our profit measure rather than a rate of return on investment. Our finding of a decline in statistically significant coefficients for country dummy variables between the 1989–2002

TABLE 2
Convergence of Profitability Differences

Dependent variable: $\Delta \ln\left(r^*_{j,k}/r^*_k\right)_t$	Growth of relative profitability (1989–2018)	Growth of relative profitability (1989–2002)	Growth of relative profitability (2003–2018)
$ln\left(r_{j,k}/r^*_k\right)_{t-1}$	−0.276** (0.006)	−0.428** (0.010)	−0.149** (0.006)
42 country dummies are included in the regression and here we report those that are statistically significant at the 5 per cent level at least in one of the regressions			
Australia	−0.006 (0.014)	−0.066* (0.026)	−0.010 (0.014)
Belgium	−0.042** (0.015)	−0.152** (0.027)	0.009 (0.015)
Canada	−0.020 (0.013)	−0.076** (0.024)	0.005 (0.13)
China	−0.068** (0.019)	−0.105** (0.034)	−0.039* (0.019)
Columbia	−0.138** (0.041)	−0.179** (0.073)	−0.091* (0.041)
Denmark	−0.021 (0.015)	−0.076** (0.026)	0.006 (0.015)
Finland	−0.025 (0.014)	−0.068** (0.024)	0.002 (0.014)
France	−0.040** (0.012)	−0.129** (0.022)	−0.010 (0.012)
Germany	−0.027** (0.012)	−0.084** (0.022)	0.004 (0.012)
Greece	−0.032 (0.019)	−0.088** (0.034)	−0.005 (0.019)
Hong Kong	−0.040** (0.013)	−0.080** (0.024)	−0.018 (0.013)
India	−0.054 (0.029)	−0.131* (0.052)	−0.011 (0.029)
Ireland	0.067** (0.019)	0.023 (0.033)	0.066** (0.019)
Italy	0.070** (0.015)	0.017 (0.028)	0.068**(0.015)
Japan	−0.034** (0.012)	−0.074** (0.022)	−0.011 (0.012)
Korea (South)	−0.050** (0.013)	−0.094** (0.023)	−0.022 (0.013)
Luxembourg	−0.006 (0.040)	−0.165* (0.72)	0.073 (0.040)
Malaysia	−0.040** (0.013)	−0.090** (0.025)	−0.014 (0.014)
Monaco	−0.113** (0.038)	−0.129 (0.067)	−0.076* (0.038)
Netherlands	−0.001 (0.014)	−0.050* (0.024)	0.016 (0.013)
New Zealand	−0.018 (0.019)	−0.136** (0.34)	0.019 (0.019)
Philippines	0.081* (0.041)	−0.012 (0.77)	0.102 (0.041)
Portugal	−0.057* (0.018)	−0.103* (0.032)	−0.029 (0.018)
Singapore	−0.052** (0.014)	−0.119** (0.025)	−0.019 (0.014)
South Africa	−0.042** (0.016)	−0.121** (0.029)	−0.004 (0.016)
Spain	−0.040** (0.014)	−0.102** (0.026)	−0.003 (0.019)
Sweden	−0.029* (0.015)	−0.090** (0.026)	0.002 (0.015)
Switzerland	0.024 (0.013)	−0.005 (0.023)	0.028* (0.013)
Turkey	−0.049** (0.019)	−0.017 (0.033)	−0.045* (0.019)
F-statistic for all country dummies equal zero	5.97**	4.54**	2.89**
F-statistic for all industry dummies equal zero	4.19**	4.81**	2.47**
Number of observations	13,050	5850	7200
R^2	0.152	0.246	0.078

Source: Authors' estimation.
Notes: Standard errors in parentheses, * indicates coefficient is statistically significant at the 5 per cent level and ** at the 1 per cent level.

subsample and the 2003–2018 subsample is consistent with an impact from greater harmonisation of institutional arrangements as well as greater competition in the process of globalisation. However, the simultaneous slowing in the rate of adjustment to transitory shocks bodes ill for continuation of such impacts.

Interestingly, international competition in capital markets appears more intense than the corresponding competition in labour markets, when the intensity of competition is indicated by a faster rate of adjustment for profitability differences than for wage differences. Our estimated adjustment rates for international differences in profitability are substantially faster than the estimated adjustment rates for international differences in wage rates found in Egger and Pfaffermayr (2004), Parteka and Wolszczak-Derlacz (2015) or Zhou and Bloch (2019). The estimated annual rate of dissipation of wage differences in these studies is between 1 and 5 per cent, which compares to rates of dissipation of profitability differences in Table 2 of between 15 per cent and 43 per cent. The slower rate of adjustment of wage rates than profitability is not surprising given the more stringent restrictions on immigration and other labour movements than on the flow of capital over national borders.

As a robustness check on whether the persistence of international differences in profitability is sensitive to the degree of economic integration or the type of product, we divide the full sample of country–industry pairs into subsamples. The first division is between countries in the European Union (EU) and all other countries. The second division is between industries providing goods and those providing services. Neither division has much impact on the estimation results. In particular, the estimated adjustment rate for transitory shocks for each subsample is very similar to those in Table 2, whether for the full sample period of 1989–2018 or for the subsamples from 1989 to 2002 and from 2003 to 2018.[11]

As a further robustness check, we limit the sample of firms used in calculating average profit rates for country–industry pairs to only those firms for which continuous data are available from 1989 to 2018. This excludes many firms, especially in the latter years when the Worldscope database sample of firms expands substantially, but removes possible bias due to changing characteristics of the firm sample. Regressions estimated on data for the remaining country–industry pairs have substantially lower explanatory power than corresponding regressions in Table 2. The estimated coefficients of the lagged relative profitability variable are still statistically significant at the 1 per cent level for the full-sample period and for the two subperiods, but their magnitude is substantially smaller in all periods implying a slower rate of convergence in profitability differences across countries.[12] The same pattern over time as in Table 2 is found with the rate of convergence for profitability falling between the 1989–2002 and the 2003–2018 subperiods. There are very few estimated coefficients of country dummy variables that are statistically significant at the 5 per cent level in the results for the full period or any subperiod, which suggests at least some of the decline in statistically significant coefficients across subperiods in Table 2 may be due to the greater sample of firm data used in later years and the resulting decline in sampling variance in the relative profitability measure.[13]

[11] For example, the estimated coefficient of lagged relative profitability for the full period in the EU subsample is −0.274 *versus* a coefficient of −0.295 for the non-EU subsample, with both estimates statistically significant at the 1 per cent level. Likewise, the estimated coefficient of lagged profit differential for the full period in service industries is −0.227 *versus* a coefficient of −0.312 for the non-service industries, with both estimates statistically significant at the 1 per cent level. Full details of the subsample estimates are available from the authors on request.

[12] The estimated coefficient of lagged relative profitability for the full period is −0.111, in the 1989–2002 subperiod is −0.180 and in the 2003–2018 subperiod is −0.081. The corresponding values for the adjusted R^2 statistics are as follows: full sample equals 0.054, 1989–2002 subperiod equals 0.0922 and 2003–2018 subperiod equals 0.0395.

[13] The pattern of reduced explanatory power, smaller estimated coefficients for lagged profitability and fewer statistically significant estimated coefficients of country dummy variables is consistent with reducing the number of country–industry pairs in the sample from 450 to 417 and reducing the number of firms used in calculating the average relative profitability for each remaining country–industry pair. A smaller sample of observations generally lowers explanatory power of regressions, and the reduced number of firms used in calculating average values for each observation of lagged relative profitability means observations of the variable have higher measurement error, which tends to bias the estimated coefficient of the variable towards zero. Full details of the subsample estimates are available from the authors on request.

V Conclusions

Rising average company profitability across the globe has been identified as contributing to rising income inequality. Concurrently, increased trade, investment and migration have enhanced global competition by increasing integration of national economies. Our research aims to contribute to understanding the global trends in profitability, particularly by disentangling international and domestic components of differences in profitability across companies.

First, we decompose the global variance in company revenue-to-cost ratios into cross-country, cross-industry and company-specific (residual) components. In Table 2 and Figure 1, we find the cross-country component is the smallest of the components and its relative contribution decreased, at least initially, over the three decades covered by our data. The decline occurred in the period up to 2000, with the relative contribution of the cross-country component falling by approximately one half, while after 2000 the contribution increased back towards the initial level. National borders have become less important to explaining why profitability differs across companies, although the process may have reversed after 2000.

Second, we estimate a dynamic model of the adjustment of international differences in average company profitability to estimate a rate of adjustment to transitory shocks. Over the full sample period, we find 28 per cent of the gap in relative profitability closes in each year, so it takes approximately 2 years to close half of any initial gap. When we allow for a structural break in the relationship, we find the annual adjustment rate falls sharply from 43 per cent for the period 1989–2002 to 15 per cent for the period 2003–2018. The time taken to close half of any transitory gap in relative profitability increases from approximately 1 to 3 years.[14]

Third, we use estimated coefficients of the country dummy variables from the dynamic adjustment model to identify countries where there is evidence of a persistent element of profitability difference. These estimated coefficients are statistically significant as a group, providing evidence of persistent elements in international profitability differences. The majority of countries have negative and statistically significant dummy coefficients for the full sample period and the 1989–2002 subsample. In contrast, only 7 of 42 countries have statistically significant coefficients for the 2003–2018 subsample, and these are roughly balanced between negative and positive values. Fewer persistent elements are consistent with greater harmonisation of institutional arrangements in areas such as taxation and accounting rules as well as with enhanced competition across national borders.

Overall, our results suggest convergence in average profitability across countries may have passed its peak. Reductions in the cross-country component of variance in profitability shown in the first half of the sample period shown in Table 1 and Figure 1 have been partially reversed in the second half. While the number of countries with evidence of persistent divergence of profitability from the global mean falls between the 1989–2002 and 2003–2018 subperiods, this may be a lagged effect of adjustments during the first subperiod. Slowing of the rate of adjustment to transitory international profitability differences in the second subperiod bodes ill for further convergence in international profitability differences.

Adverse domestic political reaction to globalisation has led to increased interference in the free flow of goods, capital and people across international borders. Compounded by the disruption to trade and migration due to COVID after our sample period, the prospects for further convergence are dim. The less than 5 per cent share of global variation in company profitability across world associated with country-specific variation that was achieved in 2001 may well turn out to have been the limit to convergence of international profitability differences.

Data availability

All data used in the article are publicly available through Worldscope by Thomson Reuters.

Supporting Information

Additional Supporting Information may be found in the online version of this article:

Figure S1. Total number of firms in the firm-level sample (1989–2018).

[14] The increase in the half-life of transitory shocks provides indirect support for the proposition that impact of globalisation has been slowing, even before political backlash in recent years (Constantinescu *et al*., 2020).

Figure S2. Total number of countries in the firm-level sample (1989–2018).

Figure S3. Number of firms in selected economies in the firm-level sample (1989–2018).

Table S1. Number of firms by industry and year in the sample for Table 1 and Figure 1.

Table S2. Number of observations and countries in each industry in the balanced panel data used to estimate Equation (7).

Table S3. Number of observations and industries in the countries in the balanced panel data used to estimate Equation (7).

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Appendix I
Descriptive Statistics

Appendix II
Comparison with De Loecker and Eeckhout (2018)

Our primary focus is on the international dimension of differences in profitability across companies operating in the same industry. However, given strong recent interest in rising profitability and its macroeconomic impact within countries, we examine the change in our measure of profitability over time in various countries and regions as well as the world. In Table B1, we list the average value of the revenue-to-cost (r) for the world, six regions and each of 40 countries in 2018 along with the change in this ratio since 1989. For

TABLE A1
Statistics of the Firm-Level Sample for Table 1 and Figure 1

Year	Number of companies	Number of countries	Number of industries	Mean value of $r_{i,j,k}$	Standard deviation of $r_{i,j,k}$
1989	2003	43	32	1.56	0.866
1990	2333	44	32	1.55	0.853
1991	2882	45	32	1.58	0.965
1992	3227	49	32	1.56	0.809
1993	3530	50	32	1.59	0.906
1994	3985	51	32	1.59	0.860
1995	4558	53	32	1.61	0.913
1996	5087	54	32	1.63	0.983
1997	5522	54	32	1.65	1.00
1998	6380	59	32	1.67	1.01
1999	7742	60	32	1.70	1.03
2000	8907	64	32	1.76	1.13
2001	10,455	70	32	1.74	1.13
2002	11,872	77	32	1.75	1.13
2003	12,969	83	32	1.75	1.13
2004	13,958	83	32	1.77	1.19
2005	16,429	114	32	1.77	1.22
2006	18,895	113	32	1.75	1.21
2007	19,055	115	32	1.75	1.21
2008	19,919	116	32	1.75	1.25
2009	20,791	115	32	1.74	1.19
2010	21,561	117	32	1.76	1.20
2011	22,441	118	32	1.76	1.22
2012	23,331	119	32	1.78	1.26
2013	24,278	121	32	1.83	1.31
2014	25,251	121	32	1.84	1.33
2015	25,936	121	32	1.85	1.33
2016	26,412	121	32	1.87	1.35
2017	26,482	121	32	1.88	1.35
2018	26,263	119	32	1.89	1.36
Average	14,082	86	32	1.72	1.12

ease of comparison, Table B1 has the same country and region structure as Table 1 in De Loecker and Eeckhout (2018, p. 7).

Table B1 reveals a strong rise in company profitability across the world, with the global average ratio of revenue to cost rising by slightly more than one-third between 1989 and 2018. The average value of the ratio is rising in all regions, with the growth in Europe about equal to the global average. Oceania, North America and Africa experience the strongest growth, while South America and Asia have the slowest growth. There is substantial variation in growth rates across countries within each of the regions. For example, several European countries more than double the ratio of revenue to cost between 1989 and 2018, while Portugal experiences a small decline.

Increases in the average revenue-to-cost ratio shown in Table B1 parallel those for the markup in Table 1 of De Loecker and Eeckhout (2018). They find the global average markup rises by approximately one-third over the period from 1980 to 2016, which is approximately the growth we find for the revenue-to-variable ratio cost over the period 1989–2018. Our ranking across regions and countries in terms of the size of the rise in profitability diverges in detail from that of De Loecker and Eeckhout, but most regions and countries with relatively high increases in Table B1 also experience relatively high (low) increases in Table 1 of De Loecker and Eeckhout.

The ratio of price to marginal cost used by De Loecker and Eeckhout is calculated as follows:

$$u_{ijk} = \Phi_k\left(Sales_{ijk}/COGS_{ijk}\right) = \Phi_k r_{ijk}, \qquad \text{(A1)}$$

where u_{ijk} is the markup for the ith company operating in the jth country and the kth industry, Φ_k is the elasticity of output with respect to an index of variable inputs for the kth industry, $Sales_{ijk}$ is the total revenue for a company, $COGS_{ijk}$ is its variable cost and r_{ijk} is the ratio of revenue to variable cost. Values of Φ_k are estimated from data on sales and cost of variable inputs for all companies within the kth industry to obtain sufficient data points, so a single value applies to all companies in that industry. Therefore, the value of price to marginal cost for any company relative is proportional to the corresponding value for the company's revenue-to-cost ratio, with the proportion being the same for all companies within an industry. Comparisons across countries of profitability within an industry are not affected by multiplication by a uniform value of Φ_k.

TABLE A2
Statistics of the Balanced Panel Data Used in Table 2

Year	Number of observations	Mean value of $r^*_{j,k}$	Standard deviation of $r^*_{j,k}$
1989	450	1.15	0.742
1990	450	1.04	0.425
1991	450	1.07	1.25
1992	450	0.995	0.32
1993	450	0.996	0.311
1994	450	1.021	0.403
1995	450	0.996	0.300
1996	450	0.969	0.318
1997	450	0.966	0.303
1998	450	0.983	0.483
1999	450	0.961	0.428
2000	450	0.983	0.410
2001	450	0.994	0.426
2002	450	1.01	0.403
2003	450	1.00	0.363
2004	450	1.03	0.469
2005	450	1.01	0.366
2006	450	1.03	0.451
2007	450	1.03	0.471
2008	450	1.03	0.449
2009	450	1.01	0.398
2010	450	1.03	0.438
2011	450	1.04	0.464
2012	450	1.06	0.555
2013	450	1.09	0.675
2014	450	1.08	0.711
2015	450	1.08	0.660
2016	450	1.07	0.651
2017	450	1.07	0.630
2018	450	1.04	0.477
Average	450	1.03	0.492

TABLE B1
Revenue to Cost of Goods Sold Ratio, (r), in Various Economies, 2018 Value and Change from 1989

	2018	Change†		2018	Change†
Global average	1.84	+0.47			
Europe	1.89	+0.47	Asia	1.57	+0.30
1 Italy	4.34	2.77	1 South Korea	1.72	0.55
2 Ireland	3.64	2.08	2 Japan	1.56	0.40
3 Germany	3.6	2.03	3 China	1.57	0.32
4 Switzerland	3.33	1.68	4 India	1.45	0.27
5 Finland	3.23	1.58	5 Pakistan	1.51	0.27
6 Netherlands	2.91	1.53	6 Indonesia	1.65	0.1
7 Denmark	2.9	1.47	7 Hong Kong	1.48	0.06
8 Austria	3.43	1.46	8 Thailand	1.46	−0.11
9 United Kingdom	3.1	1.46	9 Turkey	1.42	−0.11
10 Sweden	2.85	1.44	10 Malaysia	1.54	−0.32
11 Greece	2.64	0.99	11 Taiwan	1.37	−0.54
12 Spain	2.49	0.87	12 Philippines	1.9	−0.58
13 Norway	*3.58*	*0.82*	*Oceania*	2.07	+0.94
14 Belgium	1.88	0.69	1 Australia	2.15	1.0
15 France	1.88	0.42	2 New Zealand	1.54	0.42
16 Portugal	1.3	−0.042	South America	1.90	+0.15
North America	2.17	+0.63	1 Argentina	1.84	0.56
1 Canada	2.01	0.92	2 Colombia	1.88	0.49
2 USA	2.19	0.62	3 Venezuela	1.65	0.33
3 Mexico	1.81	0.19	4 Brazil	1.91	0.17
Africa	1.71	+0.54	5 Chile	1.7	−0.39
1 South Africa	1.72	0.55	6 Peru	1.7	−0.82

Source: Authors' calculation using company data in Worldscope.
Notes: Countries in each region are ranked by their change in revenue-to-cost ratio. The Region and Global averages are for all countries in that geographical area, not just those reported in the table. †Difference between 2018 and 1989 values of *r*. For Venezuela, we record its average value of *r* in 1994 and 2017 because data before 1994 and post 2017 are missing. For Pakistan, we record its average value in 1990 and 2018 because data before 1990 are missing.