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Inequality, poverty, and resilience to economic shrinking

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Abstract

Purpose – With the recognition that generating economic growth is not the same as sustaining it, the challenge to catch-up and growth literature is discerning between these processes. Recent research suggests that the decline in the frequency of "shrinking" episodes is more important for long-term development than higher growth rates. By using a framework centred around social capabilities, this study aims to investigate the effects of income inequality and poverty on economic shrinking frequency, as opposed to previous literature that has exclusively had a growth focus. The aim is to investigate how and why some societies might be more resilient to economic shrinking.

Design/methodology/approach – The research is a quantitative study, and the authors build a longitudinal data set including 23 developing countries throughout 42 years to test the paper's purpose. This study uses country and period fixed-effects specifications as well as cross-sectional graphical representations to investigate the relationship between proxies of economic inclusivity and the frequency of shrinking episodes.

Findings – The authors demonstrate that while inclusive societies are more resilient to shrinking overall, it is changes in poverty levels, but not changes in income inequality, that appear to be correlated with economic shrinking frequency. Inequality, while still an important element to explain countries' growth potential as an initial condition, does not seem to make the sample more resilient to shrinking. The authors conclude that the mechanisms in which poverty and inequality are correlated with the catch-up process must run through different channels. Ultimately, processes that explain growth may intersect but not always overlap with the ones that explain resilience to shrinking.

Originality/value – The need for inclusive growth in long-term development has been championed for decades, yet inclusion has seldom been explored from the shrinking perspective. Though poverty reduction is already an important mainstream political objective, this paper differentiates itself by providing an alternate viewpoint of why this is important. Income inequality could have more of an economic growth limiting effect, while poverty reduction could be required to build resilience to economic shrinking. Developing countries will need both growth and resilience to shrinking, to catch-up with higher-income economies, which policymakers might need to balance carefully.

Keywords Economic development, Income inequality, Poverty, Shrinking, Volatility, Social capabilities, Resilience

Paper type Research paper

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1. Introduction

How can societies become more resilient to economic shrinking? The vast majority of literature on economic catch-up dynamics has focused on the growth imperative. However, research by Broadberry and Wallis (2017) introduced the concept of economic "shrinking" as an alternative focus when understanding the determinants of long-term economic performance. Shrinking is when a country's output per capita is less compared to the preceding period [1], usually measured per year, as is the case in this study. Economic shrinking manifests itself in two ways: in the frequency of episodes and the magnitude of rates. When it comes to developing countries' prospects for catching up with more prosperous countries, the issue is not that they do not experience growth episodes; it is that such episodes are unsustained as they are frequently interrupted by shrinking episodes (Broadberry and Wallis, 2017; Andersson, 2018). Moreover, it has even been hypothesised that successful long-term economic development has primarily been due to economies, at a certain moment, beginning to experience a decline in the frequency of economic shrinking (Broadberry and Wallis, 2017; Andersson, 2018). Shrinking magnitude, on the other hand, is thought to be more related to how a country can handle short-term shocks rather than systemic developmental weaknesses (Andersson, 2018). As such, past research is ill-placed to explain how an economy internally might build *resilience to economic shrinking*.

In parallel to these developments, a large body of literature has argued for the importance of "inclusive growth" or "shared prosperity" for long-term development (see Ianchovichina and Lundström, 2009; World Bank, 2020). The burgeoning research on economic shrinking also suggests that inclusive societies are more resilient. However, less attention has been devoted to what and how particular aspects of inclusiveness are associated with the frequency of economic shrinking over time. This study investigates two central features of inclusiveness – income inequality and poverty – and discusses how these characteristics relate to patterns of shrinking in the developing world.

Income inequality *within* countries and absolute poverty are increasing in many places globally, with 60% of the global population still below the $4.16 (purchasing power parity [PPP]) per day poverty line (Jayadev *et al.*, 2015). Moreover, rising inequality is fuelling growing societal dissatisfaction and destabilising democracies (United Nations, 2020). Still, inequality trends are not all bad news. Global relative income inequality *between* countries has been declining steadily for the past three decades as Gini coefficients have been falling in East Asia, Sub-Saharan Africa and Latin American countries (Gradin *et al.*, 2021).

Similarly, global poverty trends show some success, albeit a mixed one. At the World Bank's extreme poverty line benchmark of $1.25 (2005 PPP) per day, the world has seen substantial poverty reduction over the past 40 years, with the most dramatic changes felt in the East Asia and Pacific region (Jayadev *et al.*, 2015). Poverty reduction in Latin America has also seen success though Sub-Saharan Africa has experienced little decline. However, this measure has come under increased criticism with developing nations often setting themselves far higher poverty benchmarks (Sharma, 2018; Roser, 2021). Considering these higher and perhaps more realistic measures of poverty, the world has seen only small reductions in global poverty levels. By using the higher measure of $4.16 (2005 PPP) per day, for example, 80% of the Sub-Saharan Africa population would still be considered poor (Jayadev *et al.*, 2015).

Mixed success in achieving both poverty and inequality reduction could serve as a call for more growth. Countries need to produce higher growth rates to eliminate such developmental hurdles, yet many countries have already made the journey from lower- to middle-income countries. However, between 1951 and 2016, the major difference in economic performance between Asia, Latin America and Sub-Saharan Africa was a lower frequency

of economic shrinking rather than comparatively higher growth rates in years of positive growth (Andersson, 2018). By giving Sub-Saharan Africa the shrinking frequency pattern of Asia over this period, Andersson's (2018) counterfactual simulation resulted in Sub-Saharan Africa having a GDP per capita more than three times higher in 2016 than this measure in reality. Furthermore, poorer countries experience higher shrinking frequencies on average, whereas average growth and shrinking magnitude rates do not fluctuate considerably in the long run. Table 1 shows the average shrinking frequencies for 183 countries between 1964 and 2018, split across GDP per capita quintiles, Q1 representing the poorest countries and Q5 the richest. Table 1 shows the average shrinking magnitudes and growth rates for the same countries and period, suggesting that these rates are relatively comparable though shrinking magnitude is slightly higher for poorer countries. Interestingly, it is only the poorest of countries that have lower average growth rates than shrinking magnitude, further suggesting that growth alone is not the panacea for developmental success.

Understanding and exploring the dynamics of how an economy might build *resilience to economic shrinking* episodes can give fresh insight into the development process. Simply focusing on how to increase growth rates potentially misses the other side of the coin when it comes to long-term development and societal prosperity. As a concept, *resilience* is used in many disciplinary contexts and can be defined in a variety of ways without any clear consensus (Martin, 2012; Béné *et al.*, 2014). In this study, resilience expresses the ability of an economy to *absorb* or dodge a disturbance that can lead to shrinking, as well as containing the flexibility to *adapt* to changing circumstances, enabling the economy to reduce the risk of experience subsequent shrinking. Inspired by the social capability approach developed by Abramovitz (1995), we argue that economic inclusion – measured by both inequality and poverty indexes – can be understood as a social capability that decreases the chance of a country to experience episodes of economic shrinking. An economic shrinking episode in this paper is measured annually and thus defined as a dummy for negative output from the preceding year. While this focus does not capture shrinking magnitudes, we believe that it is an appropriate measure for investigation as shrinking frequency arguably takes logical precedent over magnitude. Should a country build resilience to shrinking frequency, then concerns for magnitude are effectively "solved". Furthermore, shrinking frequency is hypothesised to be more related to a country's systemic weaknesses rather than short-term shock response, and the *social capabilities* framework used in this study was developed specifically with this in mind.

This study builds a longitudinal data set including 23 developing countries throughout 42 years [2] to test the extent to which poverty and inequality can explain countries' economic resilience, proxied by a rolling shrinking ratio. Our findings suggest that all measures of inclusiveness are correlated with lower shrinking frequency rates, yet it is the *changes* in poverty – under many different thresholds – which correlate with countries'

Table 1.
Average growth and shrinking magnitude and frequency, by year per quintile for 183 countries between 1964 and 2018 (based on GDP per capita)

	Q1 (%)	Q2 (%)	Q3 (%)	Q4 (%)	Q5 (%)
Frequency of shrinking episodes	28	23	19	17	14
Magnitude of shrinking	−5.9	−5.6	−5.2	−5.0	−4.1
Magnitude of growth	5.64	6.40	6.48	6.30	4.84

Notes: Quintiles were made in relation to the country with the highest GDP per capita every year. Interpretation = 28% means that, on average, Q1 countries concentrated 28% of shrinking episodes every year. Period = 1964–2018
Source: Authors' calculations based on Penn World Table 10.0 (Feenstra *et al.*, 2015)

resilience building. Inequality, while still an important element to explain countries' growth potential as an initial condition, does not seem to make our sample more resilient to shrinking. We conclude that the mechanisms in which poverty and inequality are correlated with the catch-up process must run through different channels. Ultimately, processes that explain growth may intersect but not always overlap with the ones that explain resilience to shrinking.

The rest of this article is as follows: Section 2 discusses previous literature on convergence, building to the relatively novel concept of economic shrinking before presenting the *social capabilities* theoretical framework. Section 3 highlights the regional inequality and poverty trends over the past 50 years before discussing previous studies highlighting their relationships with development. Sections 4 and 5 outline the data and empirical strategy, respectively, used in this study. Section 6 presents and analyses the article's main results. Section 7 concludes with the observation that the processes that govern growth and resilience to shrinking are different but may overlap and, as such, poverty eradication is perhaps of greater importance for building resilience to shrinking episodes.

2. Literature review and the analytical framework

Most of the post-Second World War era is defined by economic divergence, and catch-up is seldomly observed (Collier, 2007; Rodrik, 2011; Milanovic, 2016). The convergence hypothesis in growth theory proposes that developing economies tend to grow faster, per capita, than developed economies due to the law of diminishing returns to investment. Developing economies can also adopt existing technologies without the pressures and costs associated with innovation, with the developed nations subject to different mechanics by being at the forefront of the technological frontier. Pritchett (1997), in his now-famous essay "Divergence, big time", noted the disadvantages for developing countries that such "backwardness" has resulted. He acknowledges the notable exceptions of some East Asian economies, commonly referred to as the Asian Tigers, but highlights how surprisingly few researchers have tried to tackle the economic volatility and negative growth rate phenomenon (Pritchett, 2000).

Economic volatility has since received more attention but has mainly been viewed through a growth lens, with much of the literature focused on the variations of growth rates. Output volatility has been documented to be higher in lesser developed nations and causes fragilities that negatively impact growth rates. The reasons for the fragile and increased cyclical nature of output in some developing countries have been diverse, though they have focused on the lack of export diversification and poor institutional environments (Calderon and Yeyati, 2009).

Broadberry and Wallis (2017) investigate economic volatility by examining the long-run economic performance of selected European countries by defining a measurement of economic performance that includes instances of growth episodes and growth rates alongside shrinking episodes and shrink rates. They determined that economic performance was primarily improved by decreases in the magnitude and frequency of shrinking episodes rather than any increases in growth rates. By taking into account the role of shrinking, they also find that increases in economic performance over the long run are also associated with a general decline in both shrinking frequency and short-term economic growth rates. Moreover, they go on to hypothesise institutional change to be the key reason for such shrinking reductions.

Economic development can thus be thought of in terms of both the growth and shrinking episodes that economies might face. Andersson (2018) added his perspective to the argument of Broadberry and Wallis (2017) by analysing the economic performance of a select group of Sub-Saharan Africa, Latin American and Asian countries from 1951 to 2016.

His conclusions concurred that the success of Asian countries has been primarily driven by their resilience to economic shrinking, as opposed to the often exclusively considered high growth rates.

With regard to the frequency of shrinking episodes, Figure 1 shows the total shrinking frequencies per year for this study's sample countries. Immediately noticeable is the general early volatility, which steadily fell over the given period. In 1982, the highest measure of 74% of the sample countries experiencing a shrinking episode, yet this was 0% nearly two decades later, in 2004, 2005 and 2007. Between 1974 and 1990, the average yearly shrinking episode frequency was 37%. This had fallen to 29% from 1990 to 2000, and still further to 12% from 2000 to 2015. Moreover, Figure 1 presents the relative weighting that each region contributed to the total shrinking period. In line with conjectures by Andersson (2018), East Asian economies have had a relatively strong resilience to shrinking over the entire period, with their most frequent shrinking years stemming from the 1998 Asian Financial Crisis and the 2009 Great Recession. On the other hand, both Latin American and Sub-Saharan Africa countries experienced frequent bouts of shrinking episodes. Even in the more resilient post-2000 period, the majority of shrinking episodes are still found in these two regions.

Returning briefly to the theory of economic convergence; the theoretical "advantages of backwardness" may be present, but the ability for countries to take full advantage of them may not be. Developing Gerschenkron's (1962) classic work further, Abramovitz (1986, 1995) introduced his concept of "social capability" in that an economy's potential to converge is stronger if technologically backward but socially advanced. The premise is that while new technology might be there for adoption, the actual process of adoption might be reliant on societal factors that inhibit such developments. For example, low skill levels might make certain technologies too difficult to use *en masse*. Some structural and institutional environments would thus need to be in place for developing countries to

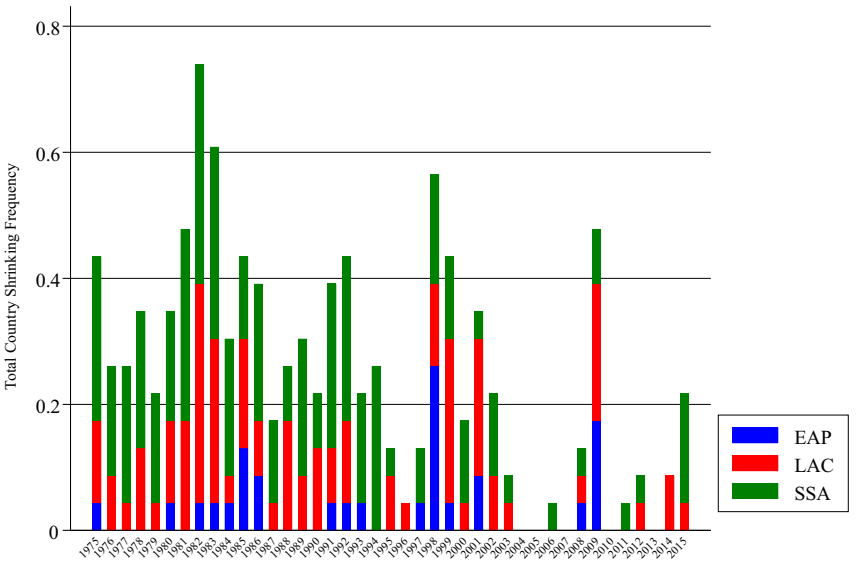


Figure 1.
Sample total shrinking frequency by year and the regional contributions

Source: Authors' calculations based on Penn World Table 10.0 (Feenstra *et al*., 2015)

successfully exploit new technologies and move up their respective technological ladders (Abramovitz, 1995). As such, it is through this framework that Andersson and Palacio (2017) and Andersson (2018) developed a *social capabilities* theory in building resilience to economic shrinking. They present five broad categories that encompass the social and institutional aspects considered important to the development process: *inclusion*, structural *transformation*, state *autonomy*, state *accountability* and *social stability* and conflict resolution.

Inclusion refers to the access to economic opportunities and their distribution so that the population at large can broadly participate and reap the benefits of economic activity (Andersson, 2018). Growth episodes that are pro-poor are more likely to be sustained (Pritchett and Werker, 2012), with higher inequality and poverty also tending to limit resource allocation with underutilised human capital and productive capacities. The beneficial entities of inclusiveness and equity pertain to society at large, for example, when it comes to general well-being and a levelled playing field of opportunities, increasing trust, sense of fairness and a stronger social contract (Wilkinson and Pickett, 2010; Ferreira and Peragine, 2015). With regard to resilience building specifically, Andersson and Andersson (2019) found that a key detriment to sustainable growth patterns in Côte d'Ivoire and Senegal between 1930 and 1980 was the lack of broad-based economic participation.

Structural *transformation* of an economy has traditionally been seen as a vital part of any growth process, both economic and social. An agricultural transformation is seen as a key determinant of structural change as this can release labour and capital to higher productivity sectors while helping to support sustainable growth patterns (Andersson, 2018). Transformation also indicates a greater diversification and complexity in what an economy can produce giving less global market vulnerabilities through, for example, price or demand slumps (Hausmann *et al.*, 2013). On the other hand, Indonesia, between 1950 and 2015, was able to generate strong pro-poor growth and substantially reduce poverty through farmer investment that increased production and food security (Andersson *et al.*, 2021a). However, faced with capital and labour constraints, industrialisation led to the formation of powerful special interest groups, which only changed after the emergence of democracy (Andersson *et al.*, 2021a). Furthermore, Andersson and Andersson (2019) showed that strong agricultural growth in Côte d'Ivoire and Senegal was not enough to drive long-term development, and societal transformation lagged behind (Andersson and Andersson, 2019). Both of these examples highlight how developments in one social capability alone would not be enough to sustain development patterns.

The aspect of state *autonomy* is the ability of the central government to keep vested interests in check. This capability ensures states are insulated from outside influence and, as such, are likely to credibly represent a consensual and exemplary government for promoting general development policies (Andersson, 2018). For Indonesia, Andersson *et al.* (2021a) interestingly showed how the initial phases of industrialization, in some sense, required a "worsening" of *autonomy* to address inclusion and transformation capabilities, which later on became detrimental and was only effectively addressed with the fall of the Suharto regime.

The *accountability* capability is the ability of the state to provide quality governance and public goods provisions; in essence, the legitimacy of the governing among the governed (Andersson, 2018). For example, under-taxing and tax evasion are common features of lower-income countries, which can restrain virtuous cycles of development through constrained fiscal space and limited investment. Broadly speaking, the Latin American region has managed to build an increased resilience to economic shrinking through

democratic and liberal economic transitions, though this was aided by favourable terms of trade since the 2000s (Andersson *et al.*, 2022).

The final social capability under this theoretical framework is that of *social stability* and conflict resolution. The ability of countries to peacefully resolve conflict within their respective societies has been seen as a key aspect of the long-term development process. Here, the state is seen to play an integral part by providing such institutions as law and order and encouraging "good" business environments (North *et al.*, 2009; Rodrik, 2000). The potential destructive nature of conflict is an obvious impediment to development, but a state can also be fiscally constrained by needing to commit more resources to conflict resolution rather than other investments.

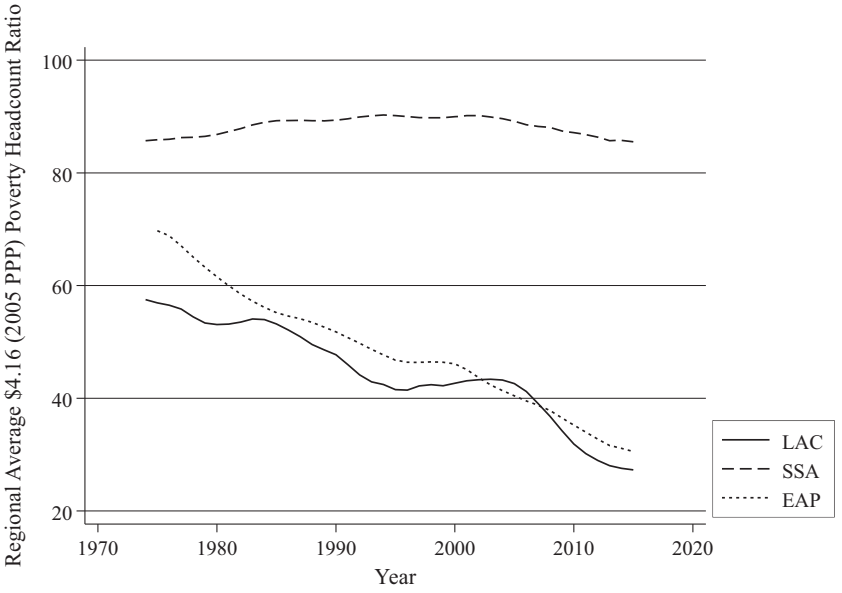
Combined, the framework suggests that advancing these social capabilities will increase the ability of an economy to absorb or circumvent both internal and external disturbances that would otherwise increase the risk of an economy to shrink. As such, the capabilities generate resilience to economic shrinking. Andersson *et al.* (2021b) built and investigated a *social capabilities* index for 26 developing economies between 1964 and 2018. They found strong support for the notion that the more advanced the capabilities, the greater the resilience to shrinking in severity, frequency and recovery. Moreover, Axelsson and Martins (2023) argue that Indonesia's capabilities, when compared with Brazil, are only more advanced due to Brazil starting its development journey earlier. Indonesia's seemingly greater resilience to shrinking is due to it having *relatively* more advanced capabilities while also suggesting there is an ideal timing for developing capabilities (Axelsson and Martins, 2023).

3. Inclusive economic development

The *inclusion* aspect of the theoretical framework is the focal point emphasising more equal access to economic opportunities and broad-based participation. A steady decline in poverty rates over the past decades in East Asian and Latin American countries gives hope that economic development has been more broadly shared in these regions. Figure 2 shows the $4.16 (2005 PPP) per day poverty headcount for the three regions under investigation. Stagnant levels can be seen in Sub-Saharan Africa, with the regional average beginning and ending the period with around 85% of the population below this line. This contrasts sharply with the East Asian region, whose regional poverty headcount average declined from around 70% to 30%, and Latin America, whose regional average declined from around 57% to 27%. While the overall decline was sharper in East Asia, Latin America can be said to have made monumental progress over the past decades, particularly in light of their relatively higher economic shrinking frequencies.

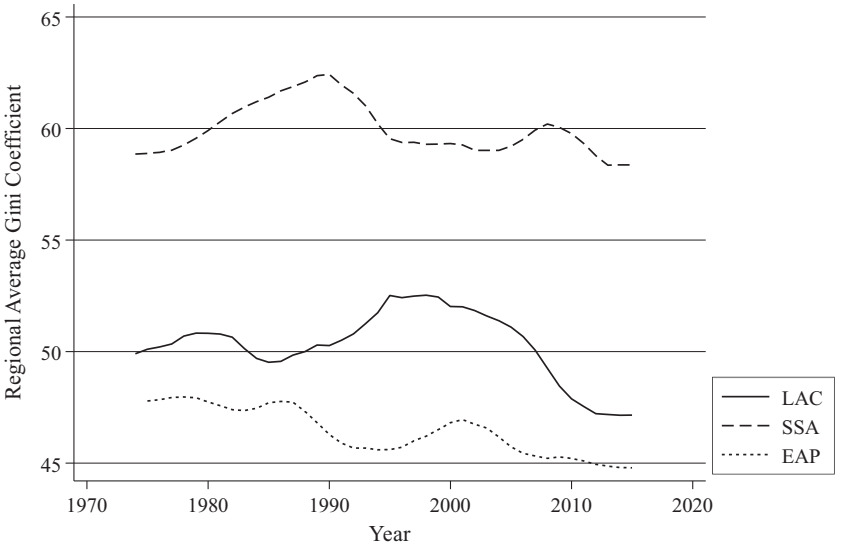
Income inequality trends over time are shown in Figure 3, and following reasoning by Milanovic (2016), wave patterns in each region can be observed. Both the East Asian and Latin American regions ended the period with their regional Gini coefficient averages lower than when they started. East Asia's Gini declined from 48 to 45, while Latin America's Gini declined from 50 to 47. Sub-Saharan Africa's Gini, on the other hand, remained stagnant at around 0.58. Therefore, Sub-Saharan Africa and Latin America begin and end the study period with higher levels of income inequality than the East Asian region. In this way, they can be said to be less egalitarian than their East Asian counterparts, with Sub-Saharan Africa's income inequality perhaps being too high initially, limiting the regions' ability to reduce inequality in the first instance (Adams, 2004; Fosu, 2017).

Previous research has found that the more unstable outlooks of volatile developing economy environments follow close associations with increased poverty and income inequality, with causality likely flowing in both directions. For example, Gavin and Hausmann (1998) find that the terms of trade for Latin American countries were largely



Source: Authors' calculations based on Global Consumption and Income Project (Lahoti *et al*., 2016)

Figure 2.
Average $4.16 (2005 PPP) per day poverty headcount ratio trends by region



Source: Authors' calculations based on Global Consumption and Income Project (Lahoti *et al*., 2016)

Figure 3.
Average Gini coefficient trends by region

exogenous to domestic market macroeconomic developments, implying output volatility causally limited long-term growth rates by a full percentage point per year in their sample. Moreover, they show that real GDP volatility was the only macroeconomic variable in their study that explained income inequality, even proposing it accounts for around a quarter of the sizeable inequality differences between Latin American countries and their higher-income industrialised counterparts. The relatively affluent in society can handle transitory shocks better through higher savings and better access to formal and informal channels of financial support, whereas an unemployment spell for the poor can be a mechanism of intergenerational poverty transfer.

These associations are unsurprising as Ravallion (2012) argues that higher levels of poverty limit economic growth with the potential to form a consumption trap, limiting the poverty-reducing aspects of growth in the first instance. Such a relationship could be inferred from Figure 2 for Sub-Saharan Africa, for example. Human capital accumulation is also vulnerable to volatility through poverty. Ferguson *et al.* (2007) note that higher levels of poverty disadvantage individuals' educational outcomes, with the outcomes being influenced by the depth, duration and timing of poverty instances. For example, the poor may need to take children out of school, which relatively disadvantages them further against higher-income families. Furthermore, economic volatility also increases the volatility of poverty itself, which, in turn, is consistently associated with increased overall poverty rates (Gnangnon, 2021). In this regard, Dabla-Norris *et al.* (2015) show that more sustainable growth patterns are mostly poor and middle-class-driven through several economic and social dynamics. For example, education has been one of the most important drivers of increasing higher income shares for poorer households, with educational access also lifting the poverty elasticity of economic growth and economic growth itself (Dabla-Norris *et al.*, 2015). Increased financial inclusion, rather than simply capital deepening, also can play an important role by encouraging innovation and growth by giving poorer entrepreneurs the credit access they need to progress their ideas (Doering, 2016).

The potential negative effects of income inequality and poverty become evident on economic growth but, as of yet, are left unexplored from the shrinking perspective. Huang *et al.* (2015) find that income inequality is significantly and positively associated with higher economic volatility, but the significance disappears when growth rates are negative. Such a study touches on the magnitude of shrinking rates, without explicitly stating as much, but misses the frequency of shrinking perspective. Thus, their study only considers short-term shock dynamics with income inequality and does not consider poverty aspects at all. The novelty of shrinking, therefore, offers a new way of measuring and analysing vulnerabilities, particularly shrinking frequency as a measure of long-term patterns. While an egalitarian and inclusive society is more likely to demonstrate greater resilience to economic shrinking, the effect of changes in income inequality and poverty on economic shrinking frequency has yet to be explored.

4. Data

This study uses annual time series data for 23 countries across three distinct geographical regions from 1974 to 2015. The *social capabilities*, that are theorised to help build resilience to economic shrinking, are *inclusion*, *transformation*, state *autonomy*, state *accountability* and social *stability* (Andersson, 2018). No ideal measures of these capabilities exist and, following Palacio (2018), Andersson (2018), Andersson and Andersson (2019), Andersson *et al.* (2021) and Axelsson and Martins (2023), well-known proxy measures are used. As measures of *inclusion*, poverty headcount ratios, Gini coefficients and Palma ratios are taken from the Global Consumption and Income Project with measures of output from the PWT 10.0.

Measures of *accountability* are taken from the PWT 10.0, human capital index and World Development Indicators, under 5's mortality rate, with the *autonomy* proxy, inflation, also taken from the WDI. Following de Vries *et al.* (2021), *transformation* measures were taken from the GGDC's Economic Transformation database with historic measures extrapolated backwards using growth rates from the 10-sector database [3].

The Global Consumption and Income Project (GCIP) standardises the Gini coefficient and Palma ratio for all countries to be income-based, and the main poverty measure used in this study is the poverty headcount ratio $4.16 (USD) (2005 PPP). This line is set by the US Thrifty Food Plan as the minimum cost to achieve a nutritious diet in the USA. As this measure is by PPP, it can be used as an international measure for a food poverty line (Jayadev *et al.*, 2015). Alternative poverty lines are considered as robustness checks.

To arrive at a measure of economic shrinking consistent for time series analysis, an economic shrinking dummy variable was introduced with a value of 1, if the GDP per capita growth rate was negative, and 0 if the rate was positive. This was then transformed into a non-binary measurement by a cumulative moving average per country over the period in question. This measure represents our major dependent variable, named here as the *Shrinking Frequency Ratio*. As the cumulative rolling average of equally weighted yearly observations was taken, the *Shrinking Frequency Ratio* can be conceptualised as the percentage of shrinking vs non-shrinking years over a given period. This is formally expressed by:

$$\textit{Shrinking Frequency Ratio}_{\ell} = \frac{1}{\ell} \sum_{i=\mathcal{T}-\ell+1}^{\mathcal{T}} SD_i \tag{1}$$

where SD denotes the shrinking dummy, subscript i denoting individual countries and subscript ℓ and $\mathcal{T}$ denoting current temporal size and total observations, respectively.

While the *Shrinking Frequency Ratio* enables time series analysis, it notably does not take into account shrinking magnitude rates. While this measure does not capture shrinking magnitudes, we believe that it is an appropriate measure for investigation for three reasons. Firstly, shrinking frequency arguably takes logical precedent over magnitude, as should a country build resilience to shrinking frequency, then the magnitude becomes a moot point. That is not to say that shrinking magnitude is not important, only that it shifts considerations towards depth of crisis and recovery, which cannot be covered in this study alone. Secondly, shrinking frequency is hypothesised to be more related to a country's systemic weaknesses rather than short-term shock response. The *social capabilities* framework used in this study was developed with this in mind. Thirdly, previous studies have investigated income inequality with negative growth rates before (Huang *et al.*, 2015), yet shrinking frequency studies are lacking and provide a complimentary perspective.

4.1 Descriptive statistics

Table 2 below presents the summary descriptive statistics for all the variables used in this study. The mean frequency of economic shrinking for this sample is 0.303, meaning that the combined country shrinking frequency was 30% for the period under consideration. A relatively high standard deviation of 0.201 indicates a wide range of variance of this value, which is weighted much more in favour of Sub-Saharan Africa and Latin American countries. This measure very crudely suggests that developing countries between 1974 and 2015 only experienced positive economic growth roughly 2/3rds of the time. The Gini coefficient maintains a low standard deviation, but the Palma ratio and poverty line measures also experience high standard deviations. The Palma ratio is used to address a

Variable	Obs	Mean	SD	Minimum	Maximum
Shrinking frequency ratio	943	0.303	0.201	0	0.895
Extreme shrinking frequency ratio	943	0.082	0.119	0	0.684
GDP per capita (log)	966	8.646	1.007	6.488	11.234
Gini coefficient (log)	966	3.959	0.162	3.404	4.342
Palma ratio (log)	966	1.446	0.528	0.093	3.132
$1.25 poverty line	966	24.342	26.093	0	93.607
$2.50 poverty line	966	46.186	32.538	0	99.046
$4.16 poverty line	966	62.853	30.3	0	99.953
Agriculture VA (log)	966	12.19	3.192	4.621	20.03
Agriculture emp. %	966	44.273	25.672	0.376	92.266
Industry VA (log)	966	13.346	3.154	7.812	21.359
Industry emp. %	966	19.811	10.252	2.22	42.203
Services VA (log)	966	13.444	3.084	7.529	21.391
Services emp. %	966	35.916	17.153	4.352	69.65
Inflation	947	63.079	277.1	−0.842	2,887.305
Human capital ratio	966	2.044	0.543	1.023	3.594
Under 5's mortality rate	966	79.253	66.908	2.733	304.233

Table 2. Summary descriptive statistics

Source: Authors' calculations based on data sources listed in Appendix 2

common critique that the Gini coefficient is over-sensitive to the middle of the income distribution and under-sensitivity to changes at the top of the income distribution. Both the Gini coefficient and Palma ratio are logarithm transformed to help account for any non-linearity and wide variance to aid analysis.

5. Empirical strategy

Although both panel-data and cross-sectional models are common in income inequality and poverty studies, panel models are generally more appropriate, with cross-sectional parameter estimates more likely to face omitted-variables bias (Forbes, 2000; Konya and Mouratidis, 2006). Ultimately, this study uses country and period fixed-effects specifications to account for such unobservable characteristics as much as possible.

The *Shrinking Frequency Ratio* shall act as the dependent variable, with explanatory independent variables following. However, to arrive at the final specification pooled ordinary least squared (OLS) regressions are necessarily first estimated using a stepwise method. As such, an initial OLS model specification can be expressed as:

$$\begin{aligned} Shrinking\,Frequency\,Ratio_{i,t} = {} & \beta_0 + \beta_1 Inclusion_{i,t} + \beta_2 lnGDP_{i,t} \\ & + \beta_3 Transformation_{i,t} + \beta_4 Autonomy_{i,t} \\ & + \beta_5 Accountability_{i,t} + \mu_i + \theta_t + \varepsilon_{i,t} \end{aligned} \tag{2}$$

In this specification, μ and θ denote the time-invariant and time-variant components, respectively, with ε denoting the regression error term. Subscript i denotes individual countries, representing the spatial aspect captured by differing economies. Subscript t denotes the time dimension of the study, measured in years. Five-year moving averages for the independent variables were used. This strategy is used to dynamically capture the changing trends by eliminating the need for arbitrarily lagged variables. The logarithmic

transformation of GDP per capita is also included to account for different country income levels, making results more comparable.

Model [2] represents regression numbers 1 through 4 in the Results section, with each subsequent estimate introducing a new *social capability* into the model. One problem with OLS specification is that there is a significant possibility of the independent variables also being correlated with country-specific factors or the error term, which can introduce omitted variable bias. To control for any potentially idiosyncratic confounding factors, a Hausman test was performed to establish the suitability of a fixed- or random-effects model for the final regression. The null hypothesis was rejected, indicating that a fixed-effects model would be more appropriate. This, along with the moving-average method, has the advantage of smoothing longitudinal data, helping to account for any omitted variable bias in the time-invariant component. Thus, Model [3] represents regression 5 estimate results and can be written as:

$$\begin{aligned} Shrinking\,Frequency\,Ratio_{i,t} = {} & \alpha_i + \beta_1 Inclusion_{i,t} + \beta_2 lnGDP_{i,t} \\ & + \beta_3 Transformation_{i,t} + \beta_4 Autonomy_{i,t} \\ & + \beta_5 Accountability_{i,t} + \theta_t + \varepsilon_{i,t} \end{aligned} \tag{3}$$

Here, α denotes the intercept concerning the individual countries now present in the fixed-effects model without the time-invariant component. Another consideration is around period fixed-effects; thus, a Wald test was run against including year fixed-effects. The null hypothesis was rejected, indicating that such a control should be included in the final fixed-effects models. The Model [4] for regression 6 of the Results section can thus be specified without the μ time-invariant and θ time-variant components:

$$\begin{aligned} Shrinking\,Frequency\,Ratio_{i,t} = {} & \alpha_i + \beta_1 Inclusion_{i,t} + \beta_2 lnGDP_{i,t} \\ & + \beta_3 Transformation_{i,t} + \beta_4 Autonomy_{i,t} \\ & + \beta_5 Accountability_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{4}$$

One potential problem with fixed-effects methodology is it can have a "flattening out" effect on variables that change little over time. The chief variables under investigation, the Gini coefficient, Palma ratio and poverty headcount, have been known to exhibit such characteristics. It is for this reason that the stepwise OLS models are included in the regression output tables to allow for cross-comparisons.

One final model that is of interest is the pooled effect of interacting geographic regional dummies with the main independent variables of interest, i.e. *inclusion*. This is to gauge the different effects that each region may experience considering previous "clustering" observations while holding all other variables constant. This specification follows on from the fixed-effect method of equation (4), including testing, and can be expressed as:

$$\begin{aligned} Shrinking\,Frequency\,Ratio_{i,t} = {} & \alpha_i + \beta_1 \chi_{i,t} + \beta_2 Inclusion_{i,t}\chi_{i,t} + \beta_3 lnGDP_{i,t} \\ & + \beta_4 Transformation_{i,t} + \beta_5 Autonomy_{i,t} \\ & + \beta_6 Accountability_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{5}$$

In Model [5], χ donates the categorical interaction term for the different geographic regions. This model represents the most complete and comprehensive specification used in this study. Also, it is important to highlight the interpretation of these regional interactions. The

effect of the *inclusion* variable for the geographic regional dummy would then be given by the sum of $\beta_1 + \beta_2$, while the effect of the baseline region would be given as β_2 only of Model [5].

Common with panel data is the presence of serial autocorrelation, which was an expected issue as using moving averages across time series can create temporal autocorrelation. When present, serial autocorrelation can lead to the overly optimistic significance of regressors due to the standard errors of the estimates being too low. As such, a Lagrange-multiplier test was used to confirm the presence of serial autocorrelation in all models, as the null hypothesis was rejected. The Breusch–Pagan and Cook–Weisberg test for heteroskedasticity was also performed on all models. All models rejected the null hypothesis, indicating the presence of heteroskedasticity of the error term. Therefore, all estimations apply Huber and White's estimators clustering the standard errors to correct for autocorrelation and homoscedastic error terms.

A final consideration is needed around cross-sectional dependence, also known as spatial correlation, which is a potentially common issue in macroeconomic panels with relatively long time series, i.e. over 20- or 30-year periods (Torres-Reyna, 2007). Cross-sectional dependence can enter panels through unobserved but correlated factors, leading to biased standard errors (Hoechle, 2007). The Pesaran test was used for the fixed-effects models, and the null hypothesis was rejected. Thus, final fixed-effects specifications are presented with Driscoll and Kraay standard errors to correct for cross-sectional dependence, heteroskedasticity and autocorrelation.

Even with this empirical strategy, it is recognised that the issue of reverse causality still persists. Fixed-effects methodology, robust standard errors and moving averages are attempts to help mitigate this point as much as possible. It is, however, not fully accounted for, and reverse causality is not only possible but also probable. A lack of shrinking episodes leading to reductions in poverty or income inequality is just as plausible as the other way around or at least that causality would flow in both directions. As such, the logarithm of GDP per capita is included, alongside other social capabilities proxies, to try and account for potentially differing growth rates in between shrinking episodes by capturing country income levels. Alongside country-fixed effects, year fixed-effects are also included as a means of accounting for simultaneous shocks with the goal of trying to isolate the shrinking frequency and inclusion associations as much as possible. As this study represents, to the best of our knowledge, the first exploration of income inequality and poverty from a shrinking frequency perspective, endogeneity is a recognised limitation that must be kept in mind when interpretating the results.

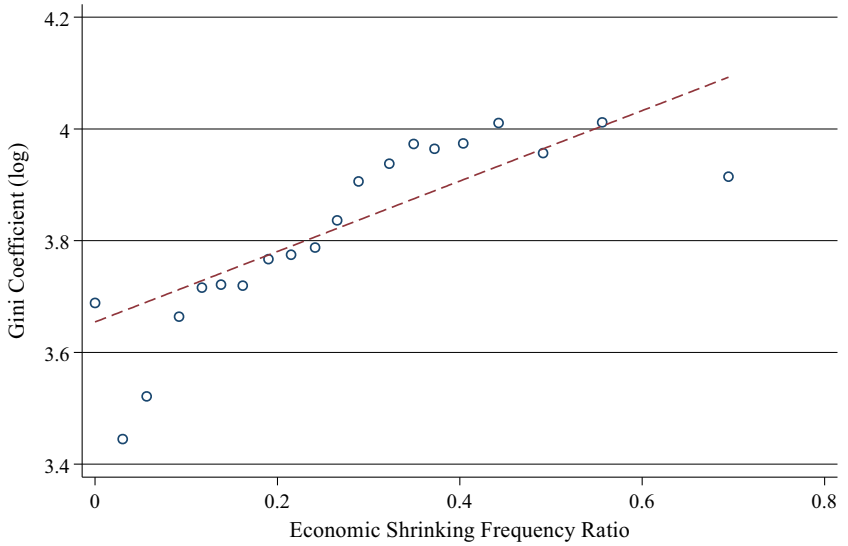
6. Results

Previous argumentations suggest that more equal and less poverty-stricken economies should tend to shrink less often than societies with unequal income distribution and a high incidence of poverty. However, it is less clear whether there are continuous associations between inequality and poverty on the one hand and shrinking episodes on the other.

Below are the main empirical results presented using the shrinking frequency ratio as the dependent variable. All estimation results produced F-tests >0.000, rejecting the null hypothesis and indicating that every model holds some explanatory power. Within-group R^2 is reported for each model, which consistently improves with each subsequent specification.

6.1 Income inequality

An initial investigation of a potential relationship between the Gini coefficient and the shrinking frequency ratio is shown in Figure 4. Using a binscatter graph, a clear positive



Sources: Authors' calculations based on Global Consumption and Income Project (Lahoti *et al*., 2016) and Penn World Table 10.0 (Feenstra *et al*., 2015)

Figure 4.
Economic shrinking frequency ratio vs Gini coefficient logarithm for 155 countries between 1964 and 2015

trend can be observed between the two variables for 155 countries between 1964 and 2015, confirming indeed that having more equal income distributions is associated with lower shrinking frequencies on average. Interestingly, Appendix 3 presents the graph results only for our sample countries using all observations, and the same results are found alongside a geographical region "clustering".

When it comes to our sample countries, Table 3 shows the Gini coefficient results, which maintain a statistically negative relationship throughout the different specifications. In some respects, this is the opposite relationship that was expected, with the statistically negative relationships contrasting intuitively with the relationships observed in Figure 4. These indicate that an increase in the Gini coefficient is associated with a decrease in the *Shrinking Frequency Ratio*. The final pooled Model (6) gives a Gini coefficient output of −0.205 and is statistically significant at a 1% confidence interval. This suggests a 1% increase in the Gini coefficient is associated with a 0.205% decrease in the frequency of economic shrinking, holding all other variables constant. Notably, the Gini only shows statistical significance with period fixed-effects methodology.

Table 4 presents the effects of the Gini coefficient when interacted with a geographic region dummy variable while holding all other variables constant. Immediately noticeable is the disappearance of statistical significance, except for Sub-Saharan Africa at a 10% confidence interval. Interestingly, the statistically negative relationships present in the pooled analysis are reflected across all regions and are consistent across different model specifications. Moreover, these results suggest that it is the Latin America and Sub-Saharan Africa regions that are the key drivers of the pooled estimations. In summary, an increase in the Gini coefficient is statistically significant and associated with a decrease in the frequency of economic shrinking for a pooled regression analysis. However, once this

Table 3.
Economic shrinking frequency ratio with Gini coefficient, 1974–2015

	Dependent variable: shrinking frequency ratio					
	(1)	(2)	(3)	(4)	(5)	(6)
Gini coefficient (log)	−0.113 (0.168)	−0.147 (0.153)	−0.151 (0.156)	−0.0796 (0.149)	−0.0661 (0.0446)	*−0.205**** (0.0617)
GDP per capita (log)	*−0.0681** (0.0357)	*−0.124*** (0.0507)	*−0.126**** (0.0474)	*−0.161**** (0.0432)	−0.00153 (0.0747)	*0.190**** (0.0472)
Agriculture VA (log)		*−0.0504** (0.0299)	*−0.0504** (0.0291)	−0.0340 (0.0233)	*−0.0719**** (0.0203)	*−0.113**** (0.0148)
Agriculture emp. %		*−0.00423*** (0.00175)	*−0.00436*** (0.00172)	−0.00172 (0.00186)	*0.0292**** (0.00491)	*0.0508**** (0.00715)
Industry VA (log)		0.0560 (0.0512)	0.0798 (0.0492)	*0.118*** (0.0497)	−0.0248 (0.0488)	*−0.0879**** (0.0321)
Industry emp. %		−0.00395 (0.00350)	−0.00410 (0.00322)	−0.000750 (0.00297)	*0.0314**** (0.00492)	*0.0553**** (0.00801)
Services VA (log)		−0.0479 (0.0540)	−0.0622 (0.0531)	*−0.124*** (0.0583)	*−0.123**** (0.0148)	*−0.209**** (0.0201)
Services emp. %		–	–	–	*0.0311**** (0.00524)	*0.0491**** (0.00728)
Inflation			*8.38e-05**** (1.71e-05)	*9.45e-05**** (1.97e-05)	*9.52e-05**** (2.24e-05)	*6.84e-05**** (1.93e-05)
Human capital ratio				*0.166**** (0.0478)	*0.211**** (0.0241)	−0.0358 (0.0272)
Under 5's mortality rate				0.000185 (0.000564)	−0.000591 (0.000443)	−8.28e-05 (0.000334)
Fixed-effects					x	x
Period fixed-effects						x
Observations	943	943	926	926	926	926
Country clusters	23	23	23	23	23	23
Within R-squared	0.0412	0.119	0.178	0.218	0.244	0.423

Notes: Robust standard errors in parentheses. ***$p < 0.01$; **$p < 0.05$ and *$p < 0.1$
Source: Authors' calculations based on data sources listed in Appendix 2

relationship is investigated by interacting different regional effects, the statistical significance effectively disappears.

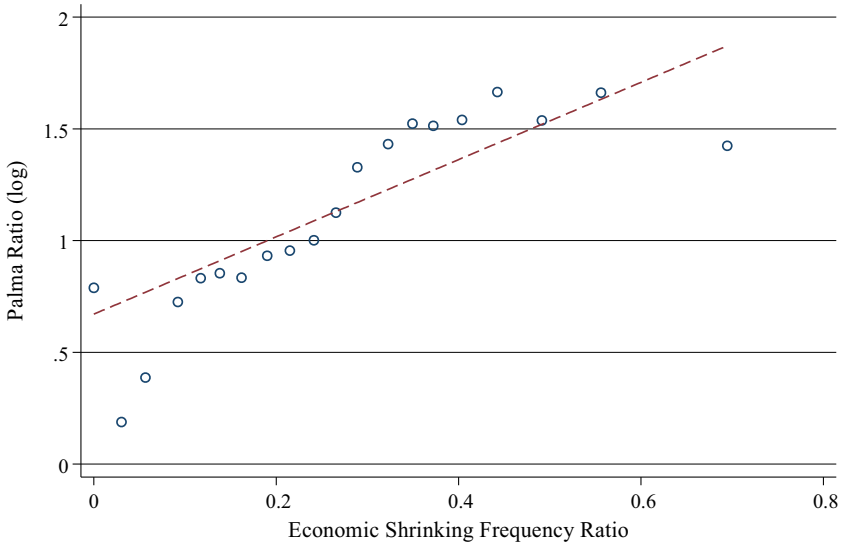
The Palma ratio and shrinking frequency ratio for 155 countries between 1964 and 2015 are shown in Figure 5. Even with this alternate measure of the income distribution, a similar relationship between the Palma ratio and the frequency of economic shrinking is observed. The pattern and geographic clustering still appear present as well when using all observations for our regression sample countries, see Appendix 4.

Table 5 highlights the Palma ratio estimation results for our sample, and these maintain a statistically negative relationship throughout the different model

	Dependent variable: shrinking frequency ratio		
	(4)	(5)	(6)
Gini coefficient (log)			
East Asia (baseline)	−0.0709 (0.154)	−0.0169 (0.0507)	−0.0570 (0.0764)
Latin America	−0.130 (0.215)	−0.116 (0.124)	−0.229 (0.156)
Sub-Saharan Africa	0.0692 (0.395)	−0.00281 (0.128)	*−0.173** (0.0963)
Fixed-effects		x	x
Period fixed-effects			x
Observations	926	926	926
Country clusters	23	23	23
Within R-squared	0.216	0.245	0.425

Notes: Robust standard errors in parentheses. ***$p < 0.01$; **$p < 0.05$ and *$p < 0.1$
Source: Authors' calculations based on data sources listed in Appendix 2

Table 4. Economic shrinking frequency ratio with Gini coefficient and region interactions, 1974–2015



Sources: Authors' calculations based on Global Consumption and Income Project (Lahoti *et al.*, 2016) and Penn World Table 10.0 (Feenstra *et al.*, 2015)

Figure 5. Economic shrinking frequency ratio vs Palma ratio logarithm for 155 countries between 1964 and 2015

Table 5.
Economic shrinking frequency ratio with Palma ratio, 1974–2015

	Dependent variable: shrinking frequency ratio					
	(1)	(2)	(3)	(4)	(5)	(6)
Palma ratio (log)	−0.00526 (0.0596)	−0.0241 (0.0505)	−0.0251 (0.0509)	−0.00545 (0.0517)	−0.00606 (0.0170)	*−0.0590**** (0.0170)
GDP per capita (log)	*−0.0633** (0.0352)	*−0.123*** (0.0490)	*−0.125**** (0.0458)	*−0.161**** (0.0427)	0.00191 (0.0744)	*0.199**** (0.0469)
Agriculture VA (log)		*−0.0520** (0.0308)	*−0.0522** (0.0300)	−0.0348 (0.0236)	*−0.0737**** (0.0209)	*−0.117**** (0.0155)
Agriculture emp. %		*−0.00416*** (0.00178)	*−0.00430*** (0.00176)	−0.00150 (0.00187)	*0.0268**** (0.00387)	*0.0440**** (0.00544)
Industry VA (log)		0.0592 (0.0539)	0.0831 (0.0517)	*0.121*** (0.0514)	−0.0257 (0.0485)	*−0.0901*** (0.0335)
Industry emp. %		−0.00390 (0.00358)	−0.00407 (0.00330)	−0.000567 (0.00296)	*0.0290**** (0.00389)	*0.0488**** (0.00637)
Services VA (log)		−0.0474 (0.0569)	−0.0622 (0.0561)	*−0.125*** (0.0598)	*−0.124**** (0.0146)	*−0.214**** (0.0190)
Services emp. %		–	–	–	*0.0286**** (0.00424)	*0.0424**** (0.00565)
Inflation			*8.36e-05**** (1.67e-05)	*9.50e-05**** (1.95e-05)	*9.56e-05**** (2.27e-05)	*6.78e-05**** (1.96e-05)
Human capital ratio				*0.172**** (0.0503)	*0.218**** (0.0246)	−0.0337 (0.0252)
Under 5's mortality rate				0.000178 (0.000572)	−0.000617 (0.000447)	−9.92e-05 (0.000347)
Fixed-effects					x	x
Period fixed-effects						x
Observations	943	943	926	926	926	926
Country clusters	23	23	23	23	23	23
Within R-squared	0.0340	0.112	0.170	0.214	0.243	0.421

Notes: Robust standard errors in parentheses. ***$p < 0.01$; **$p < 0.05$ and *$p < 0.1$
Source: Authors' calculations based on data sources listed in Appendix 2

specifications, reflecting the Gini coefficient results. Similar to the Gini, the Palma ratio also becomes statistically significant with period fixed-effects at a 1% confidence interval. However, the coefficient magnitude is significantly lower than previous Gini coefficient estimates, with an output of −0.0590. Thus, the estimation results suggest that a 1% increase in the Palma ratio is associated with a 0.059% decrease in the frequency of shrinking episodes.

Interacted with geographic region dummies, the Palma ratio allows us to explore these differences further, as presented in Table 6. The estimation results reflect the main Gini coefficient findings with respect to statistical significance, as this disappears across all models. Sub-Saharan Africa appears to be the main driver of the regional trends again; however, East Asia and Latin America coefficients remain relatively stable compared to the pooled results, which did not happen for the Gini coefficient. This is surprising in comparison to the Gini for East Asian, perhaps suggesting the Gini coefficient is an inappropriate measure of income inequality with respect to economic shrinking due to its under-sensitivity to changes at the top of the income distribution. For example, market-orientated reforms, technological change and globalisation have all been drivers of increasing income inequality for East Asia in recent decades as they have increased the gap between labourers and owners of capital (Zhuang *et al.*, 2014). The drivers of income inequality have also been the key drivers of growth rates, which could be why the East Asian region coefficient displays a more consistent relationship with the shrinking frequency ratio using the Palma ratio. In this way, income inequality could be driven by capital accumulation, suggesting that income inequality is more related to growth dynamics instead of building resilience to economic shrinking.

When taken altogether, these results are suggestive that more equal countries, in terms of income distribution, shrink less often than their more unequal counterparts. However, *changes* in the measures of income inequality are not highly correlated with the frequency of economic shrinking. Such a relationship is not entirely unexpected, as previous studies have produced mixed results when focused on economic growth (Li and Zou, 1998; Forbes, 2000; Birdsall, 2006; Easterly, 2006; Assa, 2012). These results are also in line with findings from Huang *et al.* (2015), who found income inequality was not a significant factor with negative growth rates. As their study was focused on US States, however, our results are still noteworthy because developed and developing countries are often said to exhibit different growth and development dynamics. Therefore, it is suggested here that changes in income

	Dependent variable: shrinking frequency ratio		
	(4)	(5)	(6)
Palma ratio (log)			
East Asia (baseline)	−0.0391 (0.0610)	−0.0196 (0.0329)	−0.0526 (0.0446)
Latin America	0.0230 (0.0797)	0.0236 (0.0634)	0.000922 (0.0724)
Sub-Saharan Africa	0.0362 (0.109)	0.0113 (0.0450)	−0.0131 (0.0513)
Fixed-effects		x	x
Period fixed-effects			x
Observations	926	926	926
Country clusters	23	23	23
Within R-squared	0.212	0.243	0.421

Notes: Robust standard errors in parentheses. ***$p < 0.01$; **$p < 0.05$ and *$p < 0.1$
Source: Authors' calculations based on data sources listed in Appendix 2

Table 6. Economic shrinking frequency ratio with Palma ratio and region interactions, 1974–2015

inequality seem more related to growth dynamics or perhaps initial conditions for economic shrinking rather than resilience building *per se*.

6.2 Poverty

Finally, Figure 6 shows the $4.16 (2005 PPP) per day poverty headcount and the shrinking frequency ratio for 155 countries between 1964 and 2015. Unsurprisingly, these results are in line with the income inequality patterns, strongly suggesting that more inclusive societies tend to have lower economic shrinking frequencies. Our sample economies continue to be clustered regionally, see Appendix 5, though this measure appears to have a much wider variance, especially for East Asian economies. The same trends are also observed for the $1.25 (2005 PPP) and $2.50 (2005 PPP) per day poverty headcount measures; see also Appendix 6 and 7.

Continuing with our sample countries, Table 7 presents the estimation results for the $4.16 (2005 PPP) per day poverty headcount ratio independent variable. In contrast to the income inequality variables, measures of poverty are not statistically significant at the pooled level. However, in general, the estimation results consistently produce statistically positive relationships with the shrinking frequency ratio, as would have been expected. This is suggestive that poverty reduction could be a more relevant measure of building resilience to economic shrinking. However, there is a weak economic effect from the pooled results as the final fixed-effects Model (6) produces an output of 0.000221 that is not statistically significant. While this may seem to not be a large economic effect, it is worth remembering the scale of the poverty headcount. Model (6) indicates that a 1% increase in the $4.16 (2005 PPP) per day poverty headcount ratio is associated with a 0.02% increase in the frequency of economic shrinking.

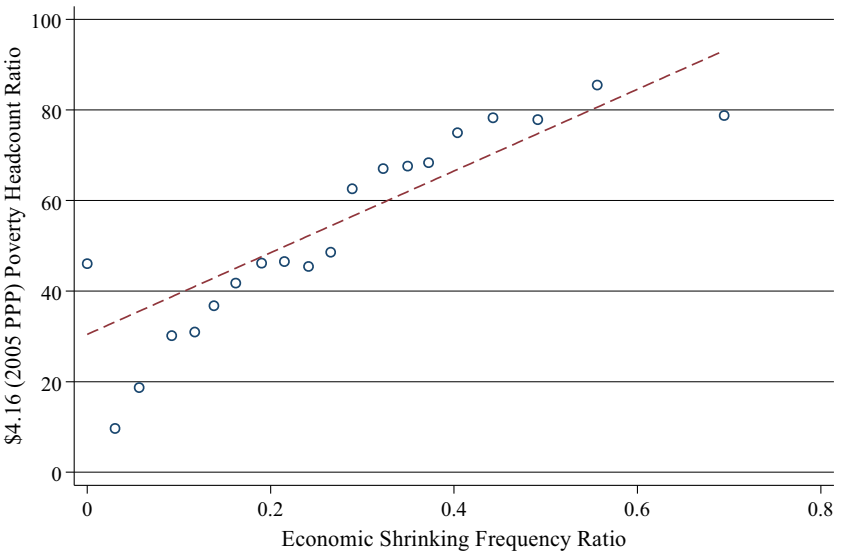


Figure 6.
Economic shrinking frequency ratio vs $4.16 (2005 PPP) per day poverty headcount ratio for 155 countries between 1964 and 2015

Sources: Authors' calculations based on Global Consumption and Income Project (Lahoti *et al*., 2016) and Penn World Table 10.0 (Feenstra *et al*., 2015)

Table 7.
Economic shrinking frequency ratio with $4.16 (2005 PPP) per day poverty headcount ratio, 1974–2015

	Dependent variable: shrinking frequency ratio					
	(1)	(2)	(3)	(4)	(5)	(6)
$4.16 poverty line	8.37e-05 (0.00132)	0.000482 (0.00123)	0.000343 (0.00123)	0.000501 (0.00113)	−8.04e-05 (0.000407)	0.000221 (0.000365)
GDP per capita (log)	−0.0596 (0.0501)	*−0.108** (0.0584)	*−0.114*** (0.0570)	*−0.148**** (0.0559)	0.00124 (0.0754)	*0.188**** (0.0479)
Agriculture VA (log)		−0.0515 (0.0340)	−0.0524 (0.0333)	−0.0318 (0.0265)	*−0.0751**** (0.0215)	*−0.114**** (0.0152)
Agriculture emp. %		*−0.00423*** (0.00187)	*−0.00431*** (0.00179)	−0.00161 (0.00199)	*0.0272**** (0.00392)	*0.0416**** (0.00411)
Industry VA (log)		0.0551 (0.0534)	0.0808 (0.0520)	*0.120*** (0.0525)	−0.0267 (0.0486)	*−0.0818*** (0.0303)
Industry emp. %		−0.00383 (0.00372)	−0.00398 (0.00338)	−0.000512 (0.00297)	*0.0293**** (0.00386)	*0.0459**** (0.00493)
Services VA (log)		−0.0445 (0.0544)	−0.0590 (0.0532)	*−0.129*** (0.0605)	*−0.124**** (0.0149)	*−0.212**** (0.0191)
Services emp. %		–	–	–	*0.0288**** (0.00411)	*0.0395**** (0.00412)
Inflation			*8.29e-05**** (1.69e-05)	*9.42e-05**** (1.96e-05)	*9.58e-05**** (2.28e-05)	*7.07e-05**** (2.08e-05)
Human capital ratio				*0.178**** (0.0467)	*0.221**** (0.0236)	0.0111 (0.0255)
Under 5's mortality rate				0.000192 (0.000588)	−0.000646 (0.000449)	−0.000188 (0.000357)
Fixed-effects					x	x
Period fixed-effects						x
Observations	943	943	926	926	926	926
Country clusters	23	23	23	23	23	23
Within R-squared	0.0329	0.109	0.166	0.215	0.243	0.407

Notes: Robust standard errors in parentheses. ***$p < 0.01$; **$p < 0.05$ and *$p < 0.1$
Source: Authors' calculations based on data sources listed in Appendix 2

Once again, we next investigate the effects of the $4.16 poverty line when interacted with geographic region dummies while holding all other variables constant; Table 8 presents these results. The regional interactions are all statistically significant across different fixed-effects specifications. This suggests that using poverty measures over income inequality measures in research might offer a more important relationship insight with respect to the frequency of economic shrinking. Surprisingly, the East Asia region has a statistically significant but negative economic relationship with the shrinking frequency ratio. One reason could be that East Asian countries started out their post-Second World War development journeys with much more egalitarian societies, in terms of, for instance, income inequality, wealth and human capital (Rodrik, 1995). As such, fewer resources were needed to address inequality concerns, with the lower starting point already endowing a strong *inclusion* social capability. Model (6) indicates that a 1% increase in the $4.16 (2005 PPP) per day poverty headcount ratio is associated with a 0.23% decrease in the frequency of economic shrinking for East Asian economies, a 0.38% increase in the frequency of economic shrinking for Sub-Saharan Africa economies and a 0.03% increase in the frequency of economic shrinking for Latin American economies, holding all other variables constant.

In summary, *changes* in poverty levels seem to have a more significant effect on economic shrinking frequency than changes in income inequality. Marginal increases in the proportion of people below the poverty line seem associated with increased frequency of economic shrinking, although this trend does not hold for the East Asian region. High levels of poverty are observed across some East Asian economies, especially at the start of the period under investigation, and they still experience low frequencies of economic shrinking. This suggests that other *social capabilities* could also be important fundamentals in building resilience to economic shrinking. Importantly, the observed trend-like decline in the poverty headcount ratio across East Asia is not accounted for in our estimates. Poverty reduction may then be the more important factor, compared to changes in income inequality, in building resilience to economic shrinking for developing economies. That said, at the same time, it remains clear that relatively equal societies are less susceptible to economic shrinking.

What is seemingly evident across all estimations is the relatively consistent results across different model specifications, suggesting that the results are robust to different empirical techniques. Furthermore, while the $4.16 (2005 PPP) per day poverty headcount

Table 8.
Economic shrinking frequency ratio with $4.16 (2005 PPP) per day poverty headcount ratio and region interactions, 1974–2015

	Dependent variable: shrinking frequency ratio		
	(4)	(5)	(6)
$4.16 poverty line			
East Asian (baseline)	−0.00206 (0.00157)	*−0.00352**** (0.000562)	*−0.00226**** (0.000603)
Latin America	0.00235 (0.00160)	*0.00310**** (0.000985)	*0.00256**** (0.000880)
Sub-Saharan Africa	*0.00918**** (0.00313)	*0.0106**** (0.00201)	*0.00602**** (0.00163)
Fixed-effects		x	x
Period fixed-effects			x
Observations	926	926	926
Country clusters	23	23	23
Within R-squared	0.279	0.313	0.429

Notes: Robust standard errors in parentheses. ***$p < 0.01$; **$p < 0.05$, *$p < 0.1$
Source: Authors' calculations based on data sources listed in Appendix 2

ratio has been the focus of the main poverty results, the estimations are robust using alternative poverty lines. The same patterns and statistically significant results are obtained using both the $1.25 (2005 PPP) and $2.50 (2005 PPP) poverty headcount measures as alternative independent variables, see Appendix 6 and 7, respectively.

Moreover, the results are also robust when using an alternative measure of economic shrinking as the dependent variable. In their study, Broadberry and Wallis (2017) distinguish between shrinking episodes and extreme shrinking episodes, the latter being identified as three consecutive years of shrinking episodes. Using this alternative definition, an *Extreme Shrinking Frequency Ratio* is created following the same methodology as the *Shrinking Frequency Ratio* but using dummy values of 1 for instances of three-consecutive years of shrinking episodes or 0 otherwise. Using the *Extreme Shrinking Frequency Ratio* dependent variable confirms the main results of the study, as the statistical significance and same patterns are observed. Moreover, the income inequality measures lose their statistical significance at the pooled level, and the $4.16 (2005 PPP) per day poverty headcount estimate is now statistically significant at a 1% confidence interval, see Appendix 8.

Finally, the estimation results are robust to alternative country restrictions and specifications. For example, from the visual inspections in Appendix 3–5, one could argue that Zambia's Palma ratio and shrinking frequency are extreme compared to the average Sub-Saharan Africa region levels. However, essentially, the same results are still obtained with this country's omission. The same argument can also be made for Argentina's $4.16 (2005 PPP) per day poverty headcount and shrinking frequency level as they appear quite different from the Latin American average. Omitting Argentina from the analysis keeps the overall trends the same but also results in a practically fivefold increase in economic effect for the Latin American region, bringing the results for this region more in line with what is observed for Sub-Saharan Africa, though still considerably less, see Appendix 9.

6.3 Discussion

There are strong both empirical and theoretical reasons supporting the notion that inclusive societies and resilience to economic shrinking are associated. This implies that societies where citizens are not denied access to economic opportunities and where resources and public goods are somewhat fairly distributed among the population are more likely to embark upon a long-term successful development process thanks to a relatively low frequency of shrinking. With this as our point of departure, we investigate, as proxies of inclusiveness, what effects changes in income inequality and poverty might have on economic shrinking frequency? We find that changes in overall income inequality do not appear to have a significant and direct effect on building resilience to economic shrinking. Equality in the distribution of income, therefore, seems more important as an initial condition for resilience to shrinking than marginal changes of income inequality.

Poverty reduction, however, produces significant results and could represent a more important measure of *inclusion* with regard to economic shrinking frequency for developing countries. It appears to be a strong factor in Sub-Saharan Africa and a relevant aspect for Latin America as well. Such findings are also in consonance with research from Ravallion (2012), characterising Sub-Saharan Africa economies as being stuck in a "poverty-trap", suggesting that high poverty levels weaken resilience to economic shrinking in the first instance. If poverty reduction also helps to release more entrepreneurs into the workforce (Doering, 2016), then we can easily see how lower levels of poverty can help build resilience to economic shrinking but also stimulate economic growth. Arguably, poverty alleviation has a dual effect as a mechanism on both resilience to shrinking and higher growth rates. Thus, the mechanisms in which poverty and inequality are correlated with the catch-up

process might run through different channels. Notably, East Asia seems to experience the opposite trend than would have been expected, which is perhaps not unusual considering the high variance of poverty in the region. This leads us to ask why East Asian economies might be different in this regard, although such a question would likely strike at the heart of their development success over the past 50 years.

One reason could be that East Asian countries started out their post-Second World War development journeys with much more egalitarian societies in terms of income inequality, wealth and human capital. As such, fewer resources were needed to address inequality concerns, with the lower starting point already endowing a strong *inclusion* social capability. Moreover, following reasoning from Rodrik (1995), this gave the East Asian states a greater ability to distort markets by coordinating and subsidising investment for a substantially higher, yet ultimately manufactured, private return to capital. Inclusive arrangements allowed governments to effectively focus on economic growth by discouraging rent-seeking behaviour, being insulated from pressure groups, and high human capital, giving latent high returns to capital (Rodrik, 1995). Viewed in this way, it was not that creating poverty was good for building resilience to shrinking episodes; it is that poverty was not a hindering factor in some East Asian economies' development stories. It is important to note that the poverty headcount in the region as a whole was reduced from 70% to 30% in half a century. Having more egalitarian societies allowed for participatory, competitive and diversified economies that generated both growth dynamics and resilience to economic shrinking.

While poverty reduction might be the key goal of policymakers, it is worth remembering that it does not operate in a vacuum. Income inequality maintains a close relationship with poverty through the poverty-growth-inequality triangle (Bourguignon, 2004). As such, any economic growth in high-income inequality societies will lead to limited poverty reduction and thus increased susceptibility to shrinking. It is through this lens that income inequality should be considered with policy design, perhaps through redistribution measures, focused on an end goal of poverty eradication. Income inequality thus has a potentially important role to play for building resilience to shrinking episodes, albeit indirectly through its ability to lower poverty outcomes. However, it is important to remember that redistribution efforts tend to be limited by how progressive the tax system is. Furthermore, as wealth is much more concentrated compared to income (Piketty, 2014), perhaps it is the distribution in means of production that helps economies build resilience to shrinking episodes. Thus, one could potentially see how a growing gap between labour and owners of capital in the East Asian region would not only hinder growth rates (Zhuang *et al.*, 2014) but also result in more fragile economies if left unchecked over the long term.

7. Conclusion

With the recognition that generating economic growth is not the same as sustaining it, the challenge to catch-up and growth literature is discerning between these processes. In this paper, we set out to investigate how societies can become more resilient to economic shrinking as a means of sustaining the development journey. The need for inclusive growth in long-term development has been championed for decades, yet inclusion has seldom been explored from the shrinking perspective. Income inequality and poverty, as proxies for economic inclusiveness, are shown to not correlate uniformly to shrinking patterns in the developing world. As such, a stronger *inclusion* social capability is important in any developing process, but seemingly poverty eradication plays a more important role in building resilience to shrinking.

Our findings suggest that marginal changes in income inequality are not correlated with developing country shrinking frequency. Reductions in poverty, on the other hand, appear significantly correlated with shrinking frequency. As such, income inequality perhaps then represents an initial condition for resilience to shrinking. The more egalitarian East Asian

economies displayed consistently lower shrinking frequencies, even in high-poverty societies. Yet, their poverty reduction efforts did not correlate with reduced shrinking frequencies when compared to Latin American and, especially, Sub-Saharan Africa economies. Thus, poverty alleviation can be hypothesised to directly impact resilience to shrinking. Income inequality can then be said to run through indirect channels but also its ability to speed up poverty eradication through the poverty-growth-inequality triangle (Bourguignon, 2004). These findings, coupled with strong empirical and theoretical reasons advocating for inclusive growth, give rise to the notion that processes explaining growth may intersect but not always overlap with processes explaining resilience to shrinking. Therefore, we argue that the mechanisms in which income inequality and poverty are correlated with developing country catch-up processes run through different channels.

The obvious policy implication of this study is the need for greater poverty reductions in developing countries. Though this is already an important mainstream political objective, this paper differentiates itself by providing an alternate reason why. Relying on inclusive growth as the vehicle of long-term development might underplay the importance of building resilience to shrinking alongside growth dynamics. Perhaps then income inequality has more of an economic growth limiting effect, while poverty reduction is required to build resilience to economic shrinking. Developing countries will need both growth and resilience to shrinking to catch up with higher-income economies, which policymakers might need to balance carefully. As such, future research should emphasise the need to uncover the different channels through which poverty and income inequality seem to operate. Both will play important roles in any development process but for seemingly different reasons.

Notes

1. Expressed as $GDPpercapita_{t-1} > GDPpercapita_{t}$.
2. Sample includes: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ethiopia, Ghana, Indonesia, Kenya, Malawi, Malaysia, Mexico, Nigeria, Peru, Philippines, Republic of Korea, Senegal, Singapore, South Africa, Thailand, United Republic of Tanzania and Zambia. See Appendix 1 for list of countries, regions and reasonings.
3. A full and detailed description of data sources and reasonings for chosen variables is found in Appendix 2.

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Appendix 1. Note on countries included in study by region and justification

East Asia and Pacific	Latin America and Caribbean	Sub-Saharan Africa
Indonesia	Argentina	Ethiopia
Malaysia	Bolivia	Ghana
Philippines	Brazil	Kenya
Republic of Korea	Chile	Malawi
Singapore	Colombia	Nigeria
Thailand	Costa Rica	Senegal
	Mexico	South Africa
	Peru	United Republic of Tanzania
		Zambia

Source: Authors' editing

Table A1. List of countries in study by geographic region

East Asia and Pacific: These countries were selected for this study as they represent the majority of economic activity, by GDP size, in the region and a large portion of the total population. Hong Kong and Taiwan were also considered for this group, but data was not available from the same sources, so were not included for data methodologies to remain consistent. The East Asian region, in general, has seen significant developmental success over the past 50 years. Due to this, and a similar starting point compared to the other regions, it is seen as an important case for comparison.

Latin America and the Caribbean: These countries were selected for this study as they represent the majority of economic activity, by GDP size, in the region and a large portion of the total population. Latin America, in general, is considered to have high levels of inequality when compared to the rest of the world. As such, this region was deemed necessary for inclusion in this study.

Sub-Saharan Africa: These countries were selected as they represent a large portion of the total population size relative to their geographic location within the region. Sub-Saharan Africa holds the most heterogenous group of countries in this study, so representations from East, South, West and Central of the continent were included to try to capture as much as the regions dynamics as possible. Sub-Saharan Africa represents one of the regions of the world that are considered to be the most "behind" in terms of development and, as such, could not be ignored when considering a theory behind long-term developmental success.

Appendix 2. Note on data sources and proxy justifications

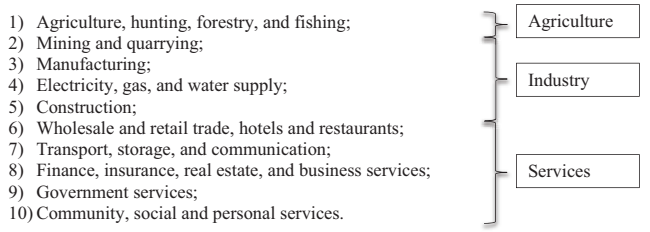
Category	Variable	Source
Economic output	Shrinking frequency ratio Extreme shrinking frequency ratio GDP per capita (log)	Penn World Table 10.0 (Feenstra *et al.*, 2015)
Inclusion	Gini coefficient (income based) (log) Palma ratio (log) Poverty headcount ratio $4.16 (USD) (2005 PPP) Poverty headcount ratio $1.25 (USD) (2005 PPP) Poverty headcount ratio $2.50 (USD) (2005 PPP)	Global Consumption and Income Project (Lahoti *et al.*, 2016)
Transformation	Agriculture gross value-added (log) Agriculture employment percentage Industry gross value-added (log) Industry employment percentage Services gross value-added (log) Services employment percentage	Economic Transformation Database, GGDC/UNU-WIDER, release February 2021 (July 15, 2021 update) (de Vries *et al.*, 2021) The GGDC 10-sector database, 2014 release (Timmer *et al.*, 2015)
Autonomy	Inflation	World Development Indicators (World Bank, 2021a)
Accountability	Human capital index Under 5's mortality rate	PWT 10.0 (Feenstra *et al.*, 2015) World Development Indicators (World Bank, 2021b)

Source: Authors' editing

Table A2. Variable summary and data sources

The Global Consumption and Income Project (GCIP) provides two data sets, income- and consumption-based, and is the source of all inequality and poverty proxy measures used in this study (Lahoti *et al.*, 2016). Gini and Palma's data was drawn from the income-based data set and the poverty data was drawn from the consumption-based data set. Inequality measures, such as the Gini, are often measured by either income or consumption, and these measurement variations are broadly consistent across different regions. For example, most developed and Latin American countries measure the Gini by income, while most Asian and African countries measure the Gini through consumption. The GCIP uses standardised measures for all interested countries across the entire period under observation. This data source thus offers advantages over other sources, such as the SWIID, the WIID or Povcalnet, due to its consistency, comparability and comprehensiveness. However, inequality measures are difficult to collect, especially historically, which potentially points to questionable data quality issues with the project data also currently available in its beta stage. The GCIP uses statistical extrapolation and interpolation techniques to estimate observations for missing survey years using parametric estimations; a full description can be found in Lahoti *et al.* (2016). This is an important point that offers the need for healthy caution when interpreting results. These computational strategies are similar, though the exact methodologies differ, to other inequality databases openly available, such as the SWIID and LIS. There currently exists no database that can be pointed to as the "best" source of data on inequality. The GCIP aims to complement the field by attempting to be as open and transparent with their computation methods and data sources as possible (Ferreira *et al.*, 2015; Lahoti *et al.*, 2016).

The GGDC's Economic Transformation database price year was re-based to keep constant 2005 prices and extrapolated backwards using growth rates from the GGDC's 10-sector database. This is following methodology in line with de Vries *et al.* (2021). Also, economic classifications were agglomerated into overarching sectors following Timmer *et al.* (2014) to keep comparisons consistent.



Source: Authors' recreation from Timmer *et al*. (2014)

Figure A1. GGDC Economic Transformation database and 10-Sector database categories

Note that section (8) is separated into individual categories in the Economic Transformation database. The methodology of considering an overarching service sector accounts for this discrepancy. Moreover, government services (9) historic data is unavailable for a wide array of economies across all three geographic regions under investigation. As such, this data is excluded for all countries to allow for more comparable data. Sector (1) values are used to represent the Agricultural sector, sectors (2)–(5) are combined to represent an overall industry sector and sectors (6)–(10), except for government services (9), are combined to represent an overall services sector. The logarithmic functions of the value-added data are taken to better compare the differences that such a wide array of countries might face in terms of their respective specialisations. The GGDC offers comprehensive, reliable and comparable data sources. One point of note, however, is the database does not account for the informal sector, which may not give an accurate picture of an economy's transformative process and trends. This issue is perhaps more prevalent for Sub-Saharan Africa economies; however, with no reliable way to account for such economic environments, this is a potential problem inherent in this study, and the authors note a healthy caution when interpreting results.

Appendix 3. Shrinking frequency ratio with Gini coefficient (log)

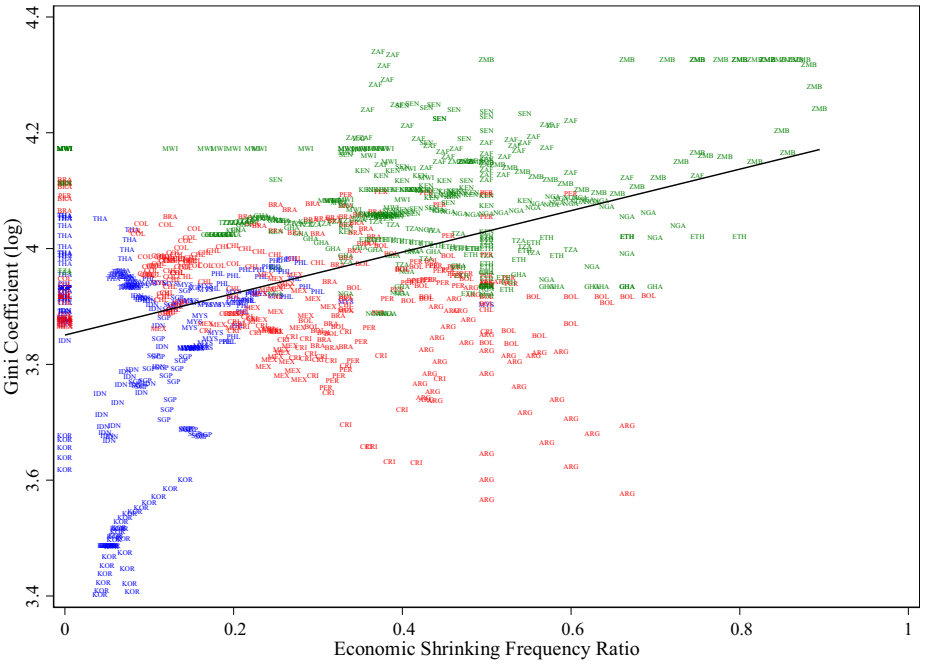
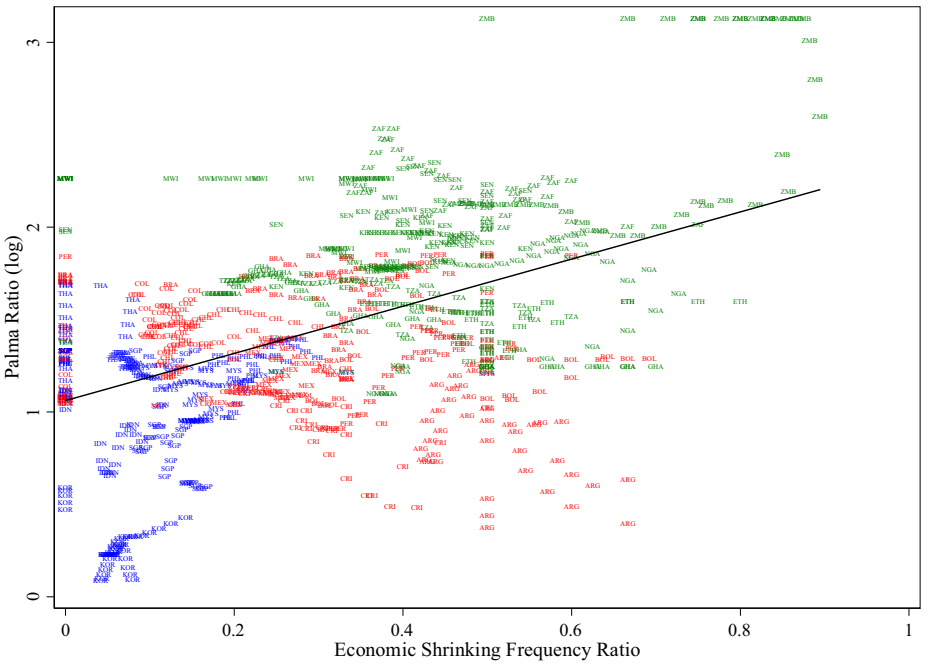


Figure A2.
Economic shrinking frequency ratio vs Gini coefficient logarithm

Sources: Authors' calculations based on Global Consumption and Income Project (Lahoti *et al*., 2016) and Penn World Table 10.0 (Feenstra *et al*., 2015)

Appendix 4. Shrinking frequency ratio with Palma ratio (log)



Sources: Authors' calculations based on Global Consumption and Income Project (Lahoti *et al*., 2016) and Penn World Table 10.0 (Feenstra *et al*., 2015)

Figure A3. Economic shrinking frequency ratio vs Palma ratio logarithm

Appendix 5. Shrinking frequency ratio with $4.16 per day poverty line headcount

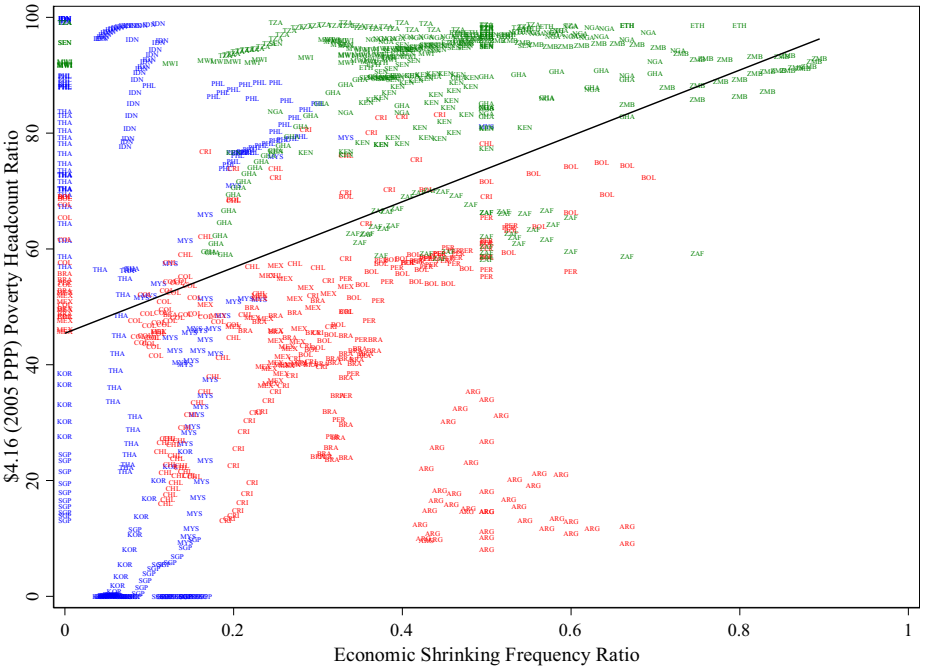


Figure A4.
Economic shrinking frequency ratio vs $4.16 (2005 PPP) per day poverty headcount ratio

Sources: Authors' calculations based on Global Consumption and Income Project (Lahoti *et al*., 2016) and Penn World Table 10.0 (Feenstra *et al*., 2015)

Appendix 6. Shrinking frequency ratio with $1.25 per day poverty line headcount

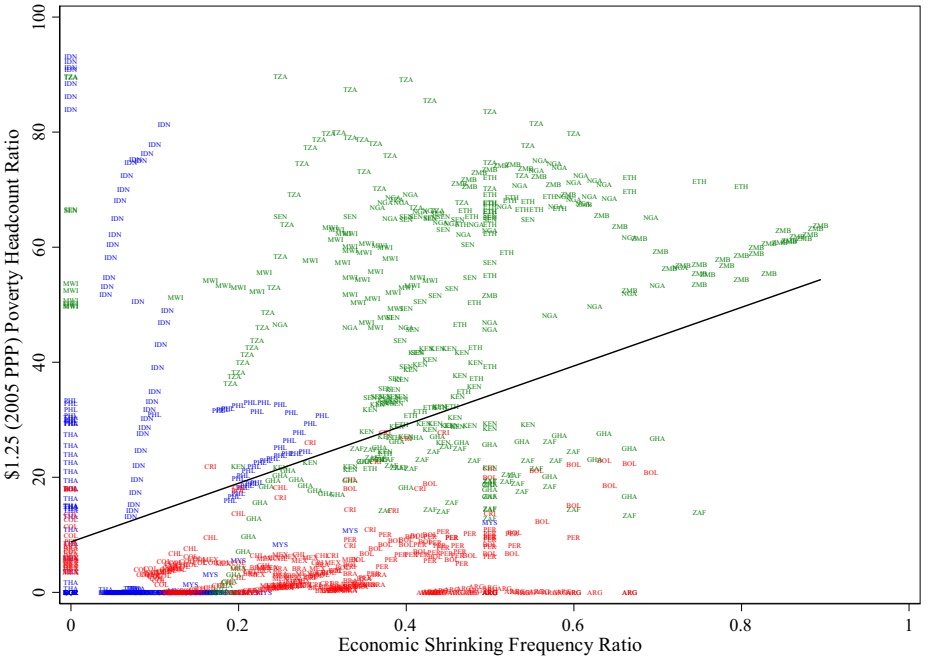


Figure A5. Economic shrinking frequency ratio vs $1.25 (2005 PPP) per day poverty headcount ratio

Sources: Authors' calculations based on Global Consumption and Income Project (Lahoti *et al*., 2016) and Penn World Table 10.0 (Feenstra *et al*., 2015)

Table A3.
Economic shrinking frequency ratio with $1.25 per day poverty line headcount

	Dependent variable: shrinking frequency ratio					
	(1)	(2)	(3)	(4)	(5)	(6)
$1.25 poverty line	0.000563 (0.00120)	0.00104 (0.00132)	0.000790 (0.00137)	0.000338 (0.00156)	−0.000190 (0.000729)	−0.000440 (0.000573)
GDP per capita (log)	−0.0527 (0.0395)	*−0.112**** (0.0435)	*−0.115**** (0.0402)	*−0.159**** (0.0461)	−0.000104 (0.0736)	*0.180**** (0.0497)
Agriculture VA (log)		−0.0431 (0.0295)	−0.0450 (0.0289)	−0.0320 (0.0214)	*−0.0746**** (0.0208)	*−0.118**** (0.0157)
Agriculture emp. %		*−0.00423*** (0.00191)	*−0.00436*** (0.00186)	−0.00178 (0.00196)	*0.0272**** (0.00344)	*0.0434**** (0.00403)
Industry VA (log)		0.0618 (0.0499)	*0.0815** (0.0474)	*0.122*** (0.0498)	−0.0263 (0.0488)	*−0.0842**** (0.0304)
Industry emp. %		−0.00346 (0.00359)	−0.00385 (0.00337)	−0.000870 (0.00287)	*0.0293**** (0.00341)	*0.0475**** (0.00487)
Services VA (log)		−0.0521 (0.0514)	−0.0642 (0.0500)	*−0.123*** (0.0561)	*−0.125**** (0.0148)	*−0.212**** (0.0187)
Services emp. %		–	–	–	*0.0288**** (0.00370)	*0.0411**** (0.00427)
Inflation			*8.36e-05**** (1.58e-05)	*9.44e-05**** (1.87e-05)	*9.58e-05**** (2.27e-05)	*7.15e-05**** (2.07e-05)
Human capital ratio				*0.160**** (0.0575)	*0.224**** (0.0217)	0.0166 (0.0288)
Under 5's mortality rate				0.000177 (0.000656)	−0.000620 (0.000476)	−0.000168 (0.000357)
Fixed-effects					x	x
Period fixed-effects						x
Observations	943	943	926	926	926	926
Country clusters	23	23	23	23	23	23
Within R-squared						

Notes: Robust standard errors in parentheses. ***$p < 0.01$; **$p < 0.05$ and *$p < 0.1$
Source: Authors' calculations based on data sources listed in Appendix 2

	Dependent variable: shrinking frequency ratio		
	(4)	(5)	(6)
$1.25 poverty line			
East Asian (baseline)	*−0.00205*** (0.000823)	*−0.00285**** (0.000423)	*−0.00189**** (0.000334)
Latin America	*0.00461*** (0.00219)	*0.00444*** (0.00185)	*0.00564**** (0.00164)
Sub-Saharan Africa	*0.00457*** (0.00177)	*0.00456**** (0.00115)	*0.00191**** (0.000677)
GDP per capita (log)	−0.149*** (0.0501)	−0.0507 (0.0739)	0.141*** (0.0487)
Agriculture VA (log)	−0.0379 (0.0253)	−0.0782*** (0.0269)	−0.104*** (0.0185)
Agriculture emp. %	−0.00228 (0.00195)	0.0266*** (0.00371)	0.0415*** (0.00433)
Industry VA (log)	0.153*** (0.0497)	0.0278 (0.0533)	−0.0516 (0.0339)
Industry emp. %	−0.00203 (0.00294)	0.0268*** (0.00362)	0.0441*** (0.00493)
Services VA (log)	−0.138*** (0.0443)	−0.131*** (0.0141)	−0.219*** (0.0182)
Services emp. %	–	0.0289*** (0.00392)	0.0402*** (0.00446)
Inflation	9.01e-05*** (1.67e-05)	8.94e-05*** (2.34e-05)	6.04e-05*** (2.10e-05)
Human capital ratio	0.109* (0.0593)	0.176*** (0.0266)	0.0141 (0.0278)
Under 5's mortality rate	−8.36e-05 (0.000664)	−0.000651 (0.000530)	−0.000104 (0.000392)
Fixed-effects		x	x
Period fixed-effects			x
Observations	926	926	926
Country clusters	23	23	23
Within R-squared			

Notes: Robust standard errors in parentheses. ***$p < 0.01$; **$p < 0.05$ and *$p < 0.1$
Source: Authors' calculations based on data sources listed in Appendix 2

Table A4. Economic shrinking frequency ratio with $1.25 per day poverty line headcount and region interactions

Appendix 7. Shrinking frequency ratio with $2.50 per day poverty line headcount

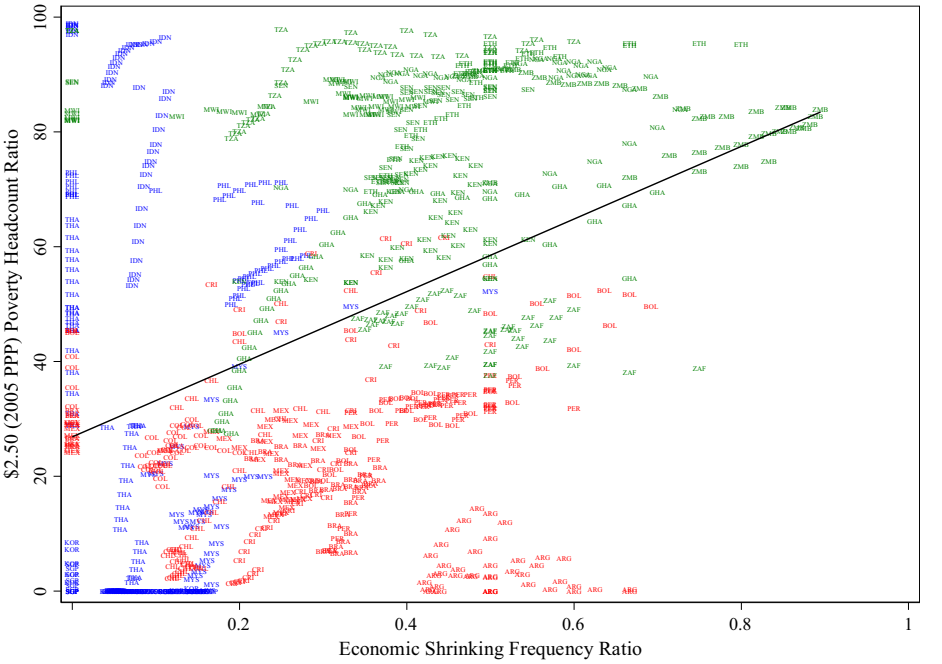


Figure A6.
Economic shrinking frequency ratio vs $1.25 (2005 PPP) per day poverty headcount ratio

Source: Authors' calculations based on Global Consumption and Income Project (Lahoti *et al*., 2016) and Penn World Table 10.0 (Feenstra *et al*., 2015)

Table A5. Economic shrinking frequency ratio with $2.50 per day poverty line headcount

	Dependent variable: shrinking frequency ratio					
	(1)	(2)	(3)	(4)	(5)	(6)
$2.50 poverty line	0.000832 (0.00139)	0.00145 (0.00117)	0.00118 (0.00122)	0.00102 (0.00123)	0.000196 (0.000551)	2.68e-05 (0.000419)
GDP per capita (log)	−0.0437 (0.0447)	*−0.0891** (0.0525)	*−0.0965** (0.0514)	*−0.139**** (0.0534)	0.00439 (0.0739)	*0.185**** (0.0483)
Agriculture VA (log)		−0.0400 (0.0336)	−0.0424 (0.0330)	−0.0257 (0.0253)	*−0.0721**** (0.0198)	*−0.116**** (0.0137)
Agriculture emp. %		*−0.00455*** (0.00190)	*−0.00461*** (0.00182)	−0.00201 (0.00203)	*0.0262**** (0.00343)	*0.0424**** (0.00352)
Industry VA (log)		0.0541 (0.0510)	0.0782 (0.0486)	*0.118*** (0.0502)	−0.0244 (0.0494)	*−0.0835**** (0.0298)
Industry emp. %		−0.00348 (0.00366)	−0.00376 (0.00341)	−0.000535 (0.00300)	*0.0285**** (0.00332)	*0.0467**** (0.00433)
Services VA (log)		−0.0529 (0.0546)	−0.0661 (0.0533)	*−0.129*** (0.0586)	*−0.125**** (0.0141)	*−0.211**** (0.0196)
Services emp. %		–	–	–	*0.0280**** (0.00362)	*0.0402**** (0.00368)
Inflation			*8.19e-05**** (1.60e-05)	*9.31e-05**** (1.88e-05)	*9.53e-05**** (2.25e-05)	*7.12e-05**** (2.05e-05)
Human capital ratio				*0.166**** (0.0497)	*0.220**** (0.0222)	0.00976 (0.0258)
Under 5's mortality rate				0.000195 (0.000572)	−0.000622 (0.000435)	−0.000208 (0.000349)
Fixed-effects					x	x
Period fixed-effects						x
Observations	943	943	926	926	926	926
Country clusters	23	23	23	23	23	23
Within R-squared						

Notes: Robust standard errors in parentheses. ***$p < 0.01$; **$p < 0.05$ and *$p < 0.1$
Source: Authors' calculations based on data sources listed in Appendix 2

Table A6.
Economic shrinking frequency ratio with $2.50 per day poverty line headcount and region interactions

	Dependent variable: shrinking frequency ratio		
	(4)	(5)	(6)
$2.50 poverty line			
East Asian (baseline)	−0.00130 (0.00117)	*−0.00364*** (0.000554)	*−0.00261*** (0.000653)
Latin America	0.00206 (0.00160)	*0.00335*** (0.00114)	*0.00324*** (0.00106)
Sub-Saharan Africa	*0.00576*** (0.00252)	*0.00772*** (0.00150)	*0.00416*** (0.00130)
GDP per capita (log)	−0.126** (0.0527)	−0.00328 (0.0638)	0.161*** (0.0431)
Agriculture VA (log)	−0.0346 (0.0251)	−0.0961*** (0.0244)	−0.119*** (0.0181)
Agriculture emp. %	−0.00191 (0.00205)	0.0289*** (0.00356)	0.0426*** (0.00422)
Industry VA (log)	0.152*** (0.0484)	−0.00148 (0.0457)	−0.0680** (0.0309)
Industry emp. %	−0.00183 (0.00347)	0.0280*** (0.00353)	0.0443*** (0.00505)
Services VA (log)	−0.144*** (0.0452)	−0.128*** (0.0121)	−0.207*** (0.0191)
Services emp. %	–	0.0309*** (0.00368)	0.0412*** (0.00419)
Inflation	9.33e-05*** (1.70e-05)	9.13e-05*** (2.34e-05)	6.61e-05*** (2.18e-05)
Human capital ratio	0.101* (0.0611)	0.143*** (0.0225)	−0.00949 (0.0249)
Under 5's mortality rate	−0.000125 (0.000600)	−0.00107** (0.000516)	−0.000469 (0.000389)
Fixed-effects		x	x
Period fixed-effects			x
Observations	926	926	926
Country clusters	23	23	23
Within R-squared			

Notes: Robust standard errors in parentheses. ***$p < 0.01$; **$p < 0.05$ and *$p < 0.1$
Source: Authors' calculations based on data sources listed in Appendix 2

Appendix 8. Extreme shrinking frequency estimations

Table A7. Extreme shrinking frequency estimations

	Dependent variable: extreme shrinking frequency ratio				
	(1)	(2)	(3)	(4)	(5)
Gini coefficient	−0.0423 (0.103)				
Palma ratio		−0.00143 (0.00275)			
$1.25 poverty line			−0.000261 (0.000468)		
$2.50 poverty line				*0.000593** (0.000308)	
$4.16 poverty line					*0.000802**** (0.000220)
GDP per capita (log)	−0.0103 (0.0477)	−0.00385 (0.0486)	−0.0147 (0.0469)	−0.00843 (0.0472)	−0.00173 (0.0472)
Agriculture VA (log)	−0.0139 (0.0118)	−0.0161 (0.0133)	−0.0145 (0.0118)	−0.00615 (0.0128)	−0.00432 (0.0116)
Agriculture emp. %	0.0137*** (0.00251)	0.0140*** (0.00252)	0.0140*** (0.00218)	0.0111*** (0.00226)	0.0100*** (0.00195)
Industry VA (log)	−0.0666** (0.0306)	−0.0688** (0.0324)	−0.0663** (0.0294)	−0.0595** (0.0266)	−0.0587** (0.0277)
Industry emp. %	0.0139*** (0.00254)	0.0143*** (0.00275)	0.0140*** (0.00205)	0.0115*** (0.00216)	0.0102*** (0.00194)
Services VA (log)	−0.0132 (0.0318)	−0.0160 (0.0318)	−0.0141 (0.0328)	−0.0145 (0.0314)	−0.0161 (0.0320)
Services emp. %	0.0150*** (0.00307)	0.0153*** (0.00314)	0.0151*** (0.00250)	0.0126*** (0.00242)	0.0116*** (0.00224)
Inflation	4.14e-05* (2.15e-05)	4.11e-05* (2.11e-05)	4.19e-05* (2.17e-05)	4.05e-05* (2.11e-05)	3.97e-05* (2.14e-05)
Human capital ratio	0.0138 (0.0425)	0.0116 (0.0371)	0.0225 (0.0320)	0.0173 (0.0379)	0.0233 (0.0378)
Under 5's mortality rate	0.000381* (0.000193)	0.000376* (0.000190)	0.000393* (0.000214)	0.000405** (0.000188)	0.000448** (0.000197)
Fixed-effects	x	x	x	x	x
Period fixed-effects	x	x	x	x	x
Observations	926	926	926	926	926
Country clusters	23	23	23	23	23
Within R-squared	0.388	0.388	0.388	0.391	0.394

Notes: Robust standard errors in parentheses. ***$p < 0.01$; **$p < 0.05$ and *$p < 0.1$
Source: Authors' calculations based on data sources listed in Appendix 2

Table A8.
Extreme shrinking frequency estimations with region interactions

	Dependent variable: extreme shrinking frequency ratio				
	(1)	(2)	(3)	(4)	(5)
Gini coefficient:					
East Asian (baseline)	0.0353 (0.0627)				
Latin America	−0.0388 (0.222)				
Sub-Saharan Africa	−0.141 (0.186)				
Palma ratio					
East Asian (baseline)		0.000920 (0.00575)			
Latin America		0.00146 (0.0111)			
Sub-Saharan Africa		−0.00270 (0.00704)			
$1.25 poverty Line:					
East Asian (baseline)			*−0.000711*** (0.000298)		
Latin America			*0.00398**** (0.00145)		
Sub-Saharan Africa			0.000188 (0.000552)		
$2.50 poverty line					
East Asian (baseline)				*−0.000740*** (0.000295)	
Latin America				*0.00201**** (0.000584)	
Sub-Saharan Africa				0.00157 (0.00100)	
$4.16 poverty line					
East Asian (baseline)					*−0.000702*** (0.000274)
Latin America					*0.00166**** (0.000341)
Sub-Saharan Africa					*0.00310*** (0.00140)
GDP per capita (log)	−0.0100 (0.0470)	−0.00337 (0.0491)	−0.0252 (0.0437)	−0.0164 (0.0458)	−0.0173 (0.0466)
Agriculture VA (log)	−0.0157 (0.0140)	−0.0163 (0.0148)	−0.00209 (0.00955)	−0.00470 (0.0122)	−0.000502 (0.0111)
Agriculture emp. %	0.0138*** (0.00241)	0.0141*** (0.00249)	0.0131*** (0.00197)	0.0117*** (0.00248)	0.0102*** (0.00234)
Industry VA (log)	−0.0651** (0.0318)	−0.0676** (0.0313)	−0.0580** (0.0218)	−0.0564** (0.0220)	−0.0567** (0.0254)
Industry emp. %	0.0140*** (0.00240)	0.0144*** (0.00270)	0.0125*** (0.00185)	0.0108*** (0.00230)	0.00928*** (0.00228)
Services VA (log)	−0.0144 (0.0316)	−0.0191 (0.0307)	−0.0221 (0.0329)	−0.0156 (0.0321)	−0.0124 (0.0314)
Services emp. %	0.0151*** (0.00303)	0.0154*** (0.00317)	0.0148*** (0.00237)	0.0136*** (0.00263)	0.0121*** (0.00245)
Inflation	4.12e-05* (2.16e-05)	4.15e-05* (2.19e-05)	3.27e-05 (2.03e-05)	3.60e-05 (2.15e-05)	3.75e-05* (2.18e-05)
Human capital ratio	0.0176 (0.0455)	0.0170 (0.0462)	0.0285 (0.0285)	0.00878 (0.0349)	0.0104 (0.0390)
Under 5's mortality rate	0.000391* (0.000198)	0.000375* (0.000200)	0.000483** (0.000229)	0.000324 (0.000238)	0.000287 (0.000243)
Fixed-effects	x	x	x	x	x
Period fixed-effects	x	x	x	x	x
Observations	926	926	926	926	926
Country clusters	23	23	23	23	23
Within R-squared	0.389	0.389	0.409	0.408	0.413

Notes: Robust standard errors in parentheses. ***$p < 0.01$; **$p < 0.05$ and *$p < 0.1$
Source: Authors' calculations based on data sources listed in Appendix 2

Appendix 9. Restricted sample shrinking frequency estimations

Table A9. Economic shrinking frequency estimations with country restrictions

	Dependent variable: shrinking frequency ratio				
	(1)	(2)	(3)	(4)	(5)
Gini coefficient (log)	*−0.137**** (0.0475)				
Palma ratio (log)		*−0.0518**** (0.0161)			
$1.25 poverty line			3.19e-05 (0.000357)		
$2.50 poverty line				*0.000542** (0.000307)	
$4.16 poverty line					*0.00105*** (0.000449)
GDP per capita (log)	*0.200**** (0.0452)	*0.197**** (0.0438)	*0.214**** (0.0480)	*0.212**** (0.0462)	*0.224**** (0.0464)
Agriculture VA (log)	*−0.127**** (0.0181)	*−0.126**** (0.0179)	*−0.134**** (0.0190)	*−0.126**** (0.0169)	*−0.121**** (0.0167)
Agriculture emp. %	*0.0516**** (0.00629)	*0.0466**** (0.00600)	*0.0472**** (0.00565)	*0.0449**** (0.00497)	*0.0428**** (0.00443)
Industry VA (log)	*−0.0776** (0.0393)	*−0.0762** (0.0407)	*−0.0812*** (0.0382)	*−0.0734** (0.0371)	*−0.0707** (0.0373)
Industry emp. %	*0.0540**** (0.00716)	*0.0491**** (0.00689)	*0.0494**** (0.00656)	*0.0472**** (0.00577)	*0.0448**** (0.00513)
Services VA (log)	*−0.224**** (0.0256)	*−0.222**** (0.0250)	*−0.231**** (0.0257)	*−0.231**** (0.0261)	*−0.234**** (0.0264)
Services emp. %	*0.0494**** (0.00682)	*0.0445**** (0.00656)	*0.0448**** (0.00635)	*0.0428**** (0.00565)	*0.0409**** (0.00513)
Inflation	*7.01e-05**** (1.92e-05)	*6.91e-05**** (1.93e-05)	*7.14e-05**** (1.98e-05)	*7.00e-05**** (1.95e-05)	*6.78e-05**** (1.94e-05)
Human capital ratio	*−0.0517*** (0.0219)	*−0.0527*** (0.0227)	−0.0317 (0.0252)	−0.0318 (0.0232)	−0.0264 (0.0227)
Under 5's mortality rate	−0.000268 (0.000392)	−0.000232 (0.000406)	−0.000383 (0.000402)	−0.000340 (0.000406)	−0.000261 (0.000404)
Fixed-effects	x	x	x	x	x
Period fixed-effects	x	x	x	x	x
Country restrictions	x	x	x	x	x
Observations	844	844	844	844	844
Country clusters	21	21	21	21	21
Within R-squared	0.428	0.430	0.422	0.423	0.426

Notes: Robust standard errors in parentheses. ***$p < 0.01$; **$p < 0.05$ and *$p < 0.1$
Source: Authors' calculations based on data sources listed in Appendix 2

Table A10. Economic shrinking frequency estimations with country restrictions and region interactions

	Dependent variable: extreme shrinking frequency ratio				
	(1)	(2)	(3)	(4)	(5)
Gini coefficient (log):					
East Asia (baseline)	0.0112 (0.0545)				
Latin America	−0.0921 (0.147)				
Sub-Saharan Africa	*−0.385*** (0.0909)				
Palma ratio (log):					
East Asia (baseline)		−0.00918 (0.0288)			
Latin America		0.0212 (0.0640)			
Sub-Saharan Africa		*−0.131*** (0.0270)			
$1.25 Poverty line					
East Asia (baseline)			*−0.00200*** (0.000211)		
Latin America			*0.00710*** (0.00118)		
Sub-Saharan Africa			*0.00296*** (0.000656)		
$2.50 Poverty line:					
East Asia (baseline)				*−0.00281*** (0.000551)	
Latin America				*0.00448*** (0.000770)	
Sub-Saharan Africa				*0.00529*** (0.00124)	
$4.16 Poverty line:					
East Asia (baseline)					*−0.00195*** (0.000682)
Latin America					*0.00343*** (0.000678)
Sub-Saharan Africa					*0.00648*** (0.00159)
GDP per capita (log)	*0.175*** (0.0475)	*0.155*** (0.0446)	*0.147*** (0.0532)	*0.170*** (0.0509)	*0.172*** (0.0455)
Agriculture VA (log)	*−0.129*** (0.0223)	*−0.121*** (0.0236)	*−0.117*** (0.0204)	*−0.124*** (0.0189)	*−0.107*** (0.0166)
Agriculture emp. %	*0.0514*** (0.00650)	*0.0453*** (0.00589)	*0.0440*** (0.00631)	*0.0438*** (0.00720)	*0.0411*** (0.00605)
Industry VA (log)	−0.0596 (0.0457)	−0.0468 (0.0471)	−0.0277 (0.0478)	−0.0467 (0.0435)	−0.0569 (0.0393)
Industry emp. %	*0.0530*** (0.00740)	*0.0468*** (0.00662)	*0.0437*** (0.00696)	*0.0421*** (0.00805)	*0.0403*** (0.00692)
Services VA (log)	*−0.217*** (0.0245)	*−0.222*** (0.0221)	*−0.234*** (0.0279)	*−0.220*** (0.0349)	*−0.217*** (0.0341)
Services emp. %	*0.0493*** (0.00703)	*0.0429*** (0.00651)	*0.0429*** (0.00700)	*0.0429*** (0.00759)	*0.0400*** (0.00636)

(*continued*)

Table A10.

	Dependent variable: extreme shrinking frequency ratio				
	(1)	(2)	(3)	(4)	(5)
Inflation	*6.85e-05**** (1.90e-05)	*6.80e-05**** (1.97e-05)	*5.59e-05**** (1.90e-05)	*6.04e-05**** (1.97e-05)	*6.26e-05**** (2.02e-05)
Human capital ratio	−0.0302 (0.0297)	−0.0213 (0.0312)	*−0.0412*** (0.0203)	*−0.0565*** (0.0232)	*−0.0457** (0.0239)
Under 5's mortality rate	−0.000146 (0.000424)	−3.32e-05 (0.000441)	−0.000313 (0.000432)	−0.000666 (0.000399)	−0.000580 (0.000405)
Fixed-effects	x	x	x	x	x
Period fixed-effects	x	x	x	x	x
Country restrictions	x	x	x	x	x
Observations	844	844	844	844	844
Country clusters	21	21	21	21	21
Within R-squared	0.435	0.444	0.455	0.464	0.459

Notes: Robust standard errors in parentheses. ***$p < 0.01$; **$p < 0.05$ and *$p < 0.1$
Source: Authors' calculations based on data sources listed in Appendix 2