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Development and inequalities: emerging economies and global perspectives - *insights from the XXI Conference of the Italian Association for the Study of Comparative Economic Systems (AISSEC) "Comparative perspectives on economic development and inequalities" (8-9 October, University of Urbino Carlo Bo, online)*

With global progress in trade volume, economic activities, technology development and social capital, the general living standards have been improving continuously and many people in less developed zones have come out of extreme poverty. Income inequality between countries has also improved in the last 25 years, but this is mostly due to strong economic growth in China and other emerging economies in Asia. Income inequality within countries instead has become worse. Today, 71% of the world's population live in countries where inequality has grown. Up to 30% of income inequality is due to inequality within households, and progress in gender equality, for example in the reduction of salary gaps, is uneven across countries and sectors[1].

Inequality is one of the most important subjects of development studies. Economic inequality refers to how economic variables are distributed. Historically, development theory was mostly concerned with growth. Later on, distributional effects were also taken into consideration as it became evident that growth and inequality were closely related. Inclusive growth approaches and redistributional policies were then advocated by development scholars and practitioners to reduce inequality (UNDP, 2013)[2].

Meanwhile, income cannot represent all the well-being of one individual, as the latter also depends on many other factors including climatic conditions, health, education, family status, and even social customs.

The Covid-19 pandemic has evidently aggravated the situation of inequalities in many parts of the world, impacting not only developing but also developed countries. Besides general concerns on public healthcare and economic recovery, other major issues (e.g. the US-China trade war, climate change, technology competition) are also putting great pressure on the global governance, injecting more uncertainty into the future development perspectives. Under this circumstance, it is mostly important for us to take a step back and revaluate the relationship between growth and inequality, to investigate what are the major forces leading to the increasing inequalities of all forms, how and by which means could

[1]https://www.un.org/sites/un2.un.org/files/un75_inequality.pdf
[2]https://www.undp.org/content/dam/undp/library/Poverty%20Reduction/Inclusive%20development/Humanity%20Divided/HumanityDivided_Full-Report.pdf

we rebalance the situation and improve the general living conditions for all. That is why we dedicate this newsletter to the theme of development and inequalities.

Roberto Roson and his co-authors forecast the trends of income distribution in six developing countries, for the period 2011-2050. Through construction of future scenarios and distinguishing 12 household categories and consumption patterns, they find that long run structural change will widen income inequality in all six developing countries under study. The finding is about functional distribution of income, because change in relative values of different factors (land, capital, labour, natural resources), possessed differently by the households, is identified as a primary determinant.

Marcello Signorelli and his co-authors investigate on the evolution of inequality in a large set of countries during the past two decades, using gross national income per capita (GNI in PPP) and Human Development Index (HDI) as measures of inequality. They classify 5 classes of countries according to their average per capita GNI and normalized HDI scores respectively. They assert that the probability of transitioning form one class to another is small, especially when using HDI as the measurement. This implies that there is a significant inertia of inequality and that more calibrated development policies promoting a higher positive mobility in terms of HDI could help attenuate the rising inequality.

Elena Paglialunga and her co-authors analyse a different aspect of global inequalities, focusing on the impact of climate change on economic disparities within countries reflected in the agriculture sector. Working with an original dataset of over 150 countries covering 2003-2017, they find that the emerging and least developed economies are the most vulnerable to the negative impact of climate change (temperature increase and precipitation anomalies), which greatly worsens the income inequality. Moreover, their findings indicate that other key components of economic openness, namely foreign direct investment (FDI) and lack of diversification of functions within global value chains (GVC), could also influence the within-country inequality. The authors emphasized that climate mitigation policies should not further deteriorate the existing inequality.

Modeling Trade and Income Distribution in Six Developing Countries

By Roberto Roson[*]

Introduction

This paper presents an empirical exercise, aimed at investigating the implications on poverty and income distribution of a reference scenario (SSP2) of economic development. Shared Socioeconomic Pathways (SSPs) are scenarios of projected socioeconomic global changes up to 2100, by the International Institute for Applied Systems Analysis (IIASA)[1]. Under the SSP2 "Middle of the road" scenario, the world follows a path in which social, economic and technological trends do not shift markedly from historical patterns; income inequality persists or improves only slowly. It does so by coupling a dynamic general equilibrium model of the global economy, specifically designed to capture structural change dynamics in the medium and long run, with detailed micro data on household income in six countries: Albania, Bolivia, Ethiopia, Malawi, Nicaragua and Vietnam. It also considers an alternative scenario of accelerated international trade integration, with a higher degree of trade openness.

Related literature

There exists a vast literature, which has inquired, from different angles, the nexus between economic development, international trade and poverty (or income distribution). The key questions addressed in the field could be framed in terms of a triangle growth-trade-inequality. For instance: is growth conducive to more trade (or vice versa)? Does higher growth imply more inequality (or vice versa)? Is trade integration bringing about more (or less) inequality?

The main message is that the channels influencing the mutual interrelationships are many and complex (Winters, McCullock and McKay, 2004). Theory provides a strong presumption that trade liberalization will be poverty-alleviating in the long run and on average. At the same time, since trade liberalization tends to increase the opportunities for economic activity, it can very easily increase income inequality while at the same time reducing poverty. Even if trade could contribute to inequality within a country, however, the academic literature has concluded that trade is not the main driver. Nonetheless, adverse effects of import competition appear to be highly geographically concentrated and long-lasting, in developing and developed countries (Pavcnik, 2017).

One major issue in this literature is the possible ambiguity of concepts. When we talk about poverty, for example, are we (perhaps implicitly) referring to income per capita? Or, should we better consider the risk of getting unemployed, which is actually related to market instability (Santos-Paulino, 2012)? Should we focus on the individual or on the household? How to appropriately account for informal markets, self-employment and subsistence consumption?

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[*] Roberto Roson is Associate Professor in Economics at University of Venice Ca' Foscari. This contribution summarizes the content of a paper presented at the XXI AISSEC Conference, with the same title and co-authored with W.Britz, Y.Jafari and O.Nekhay (Britz et al., 2020).

[1] https://iiasa.ac.at/

In the same vein, the concept of higher trade integration is not without equivocalness. The conventional approach is framed in terms of lower trade frictions: tariff and non-tariff barriers, transport, communication and cost margins. As technological progress lowers mobility costs, on one hand, and international agreements lower tariffs and other normative barriers, on the other, the gross volume of international trade would grow over time proportionately more than global GDP (Brahmbhatt, 1998). However, Feenstra (1998) argues that falling tariffs and transportation costs "are only partial explanations, leaving three-fifths of the growth in trade relative to income unexplained" and that "when countries become more similar in size, they import more product varieties from each other". This echoes the modern theory of trade, which stresses the role of economies of scale and product differentiation. The bottom line is that not only the volume of trade matters, but also its nature and composition.

A recent strand of literature has linked trade to knowledge spillovers and endogenous growth, suggesting that this mechanism could bring about trade benefits much larger than what suggested by the conventional theory (Hsu, Riezman, and Wang, 2019). This argument is relevant for income distribution, to the extent that heterogeneous workers sort themselves into different activities, in such a way that more trade produces effects similar to skill-based technological progress (Grossman and Helpman, 2018).

Modeling strategy

We base our exercise on the G-RDEM model for the construction of future scenarios and simulation of structural change (Britz and Roson, 2019). The G-RDEM model extends the standard GTAP model (Hertel and Tsigas, 1997), by adding some key drivers of long-run structural change, namely: (1) variations in household consumption patterns, giving raise to non-linear Engel curves; (2) differentiated sectoral productivity growth; (3) debt accumulation generated by trade imbalances; (4) variable saving rates, influenced by population and income dynamics; (5) time-varying and income dependent industrial input-output parameters.

The G-RDEM model, as the standard GTAP model, normally considers only one representative consumer in each country or region. Here, we instead exploit information from a set of household surveys (Food and Agriculture Organization, 2017), to get 12 distinct household categories, for the six countries considered. We distinguish among male and female headed households, urban and rural, poor (below the poverty level in 2011), middle income (between poverty and the mode of the income distribution), and rich (the rest). To model each household category, we need to define the various sources of income and the specific consumption pattern, in such a way that the data is consistent with aggregated consumption in the GTAP social accounting matrix.

Key findings

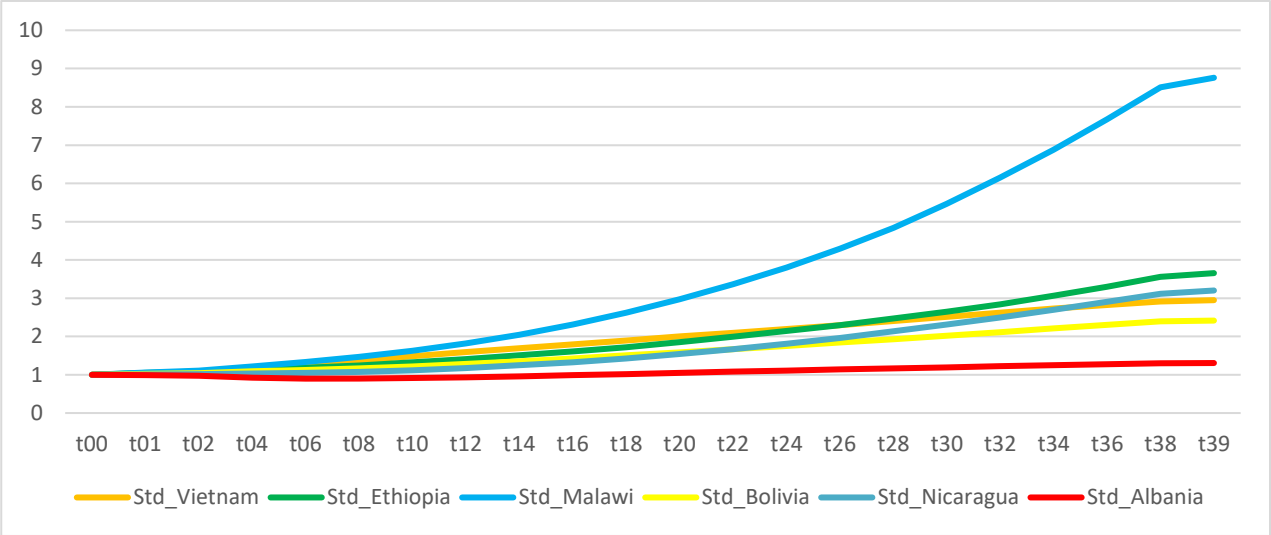
For the assumed baseline scenario SSP2, a data repository is maintained at the International Institute for Applied Systems Analysis (IIASA). From this source, we extract data about national or regional GDP and population, which are therefore taken here as given. Therefore, our G-RDEM model works as a sort of "multiplier of scenario variables", in the sense that it generates a sequence of global general equilibrium states, consistent with information from SSP2, but including details at the level of industrial production, trade flows, consumption patterns, etc. Furthermore, because of the model extension with finer

disaggregation for household classes, we can explore the consequences of the chosen scenario on income distribution.

Growth in real income per capita, over the whole 2011-2050 period, is posited at 134% for Albania, 309% for Bolivia, 480% for Ethiopia, 378% for Malawi, 377% for Nicaragua, and 413% for Vietnam. National population is not assumed to grow very much, except for the two African countries.

We found that income differentials across households (therefore inequality) vary substantially over time. Figure 1 shows how the standard deviation in the distribution of income, normalized to one in the base year 2011 (t00 in Figure 1), increases over time in all countries considered. Malawi stands out as the country experiencing the largest increase in income inequality.

Figure 1. An index of income inequality over time



Source: author's elaboration. In the graphic, axis x is the projection period, from 2011 (t00) to 2050 (t39), and axis y is standard deviation in the distribution of income, normalized to 1 in t00.

Why are we observing higher income inequality? The answer from our model is quite simple. Households get income from the ownership of primary resources: capital, land, labor of different types and natural resources. Those households better off are also those who own larger shares of factors where relative returns grow more. For example, we can imagine that rich households possess large shares of capital and skilled labor. If returns on capital and skilled labor are higher than, say, land and unskilled labor, then they will get relatively richer. We also found that this phenomenon is related to the increased volume of trade.

The structural change simulated in the model has direct consequences on the distribution of income as well. For instance, as the share of services in intermediate and final consumption gets larger, and at the same time productivity in the production of services improves at a slower rate than in other sectors, the relative price of services is bound to increase (the "Solow disease"). Consequently, even the price of those primary factors for which the services are intensive (e.g. skilled labor) will follow. Income distribution would then also vary, because of the diverse ownership shares of primary factors ascribed to the various population groups.

We found that long run structural change widens income inequality in all six developing countries. Accelerated trade integration amplifies the effect further, but most of it is already generated in the baseline SSP2 scenario. A decrease in the relative value of land and an increase in the relative value of natural resources appears among the primary determinants.

We decomposed income differentials in three dimensions. Structural change worsens the income gap between male and female headed households, especially in Albania, but the additional impact of trade is minimal. The effect of structural change is not uniform across countries when income of rural households is contrasted with the one of urban households. However, more trade openness unambiguously gets income disparity larger. Finally, relative poverty generally worsens in the baseline SSP2 scenario (although absolute poverty is likely reduced), and again more trade would widen the gap.

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Cross-Country Inequality: A Markov Chain Approach

By Ivan Belokurov, Olga Demidova and Marcello Signorelli[*]

Introduction

Covid-19 shock is determining significant effects on inequality (e.g. Ghosh, 2020) and the importance of investigating inequality is reinforced by the pandemic. In this contribution some results of a study on the dynamics of inequality in a large set of countries in the past two decades are briefly presented; in our research we consider both the gross national income per capita (GNI in PPP) in 189 countries and the human development index (HDI) in 179 economies as measures of inequality, including both developing and developed countries.

Main results

First of all, we simply investigate beta and sigma convergence in per capita income (GNI 1995-2018). When the dispersion of real per capita income (henceforth, simply "income") across a group of economies falls over time, there is σ-convergence; when the partial correlation between growth in income over time and its initial level is negative, there is β-convergence (i.e. poor economies grow faster than rich ones). Beta convergence is confirmed (with a significant parameter of -0.005) while the dynamic of standard deviations indicates sigma divergence for almost all the period. In order to better study the evolution in national per capita incomes, we divided the 189 countries into 5 classes according to the approach of Quah (1993), based on the per capita GNI for the initial year of 1995: 1) less than 20% (the poorest countries); 2) between 20 and 50%; 3) between 50 and 100%; 4) between 100 and 200%; 5) and higher than 200%. As for the HDI, the indicators were normalized (0-1) and all countries were divided into 5 classes with the following range in normalized HDI scores: 1) 0-0.3; 2) 0.3-0.5; 3) 0.5-0.65; 4) 0.65-0.8; 5) > 0.8.

We calculated the transition probability matrix of countries across classes. The transition probability matrix of a Markov chain gives the probabilities of transitioning from one class to another in a single time unit. We investigated if it is Markov first-order (i.e., if the data in one year significantly depends only on the situation in the previous year) and homogeneous (not statistically changing over time). To verify these properties, we used the test of Bickenbach and Bode (2003).

In the case of per capita GNI, the Markov property of the transition matrix was confirmed, but the homogeneity was not confirmed. Possibly, this was due to the fact that dynamics of the economy has changed after the financial crisis in 2007-2008. Therefore, we decided to use the transition matrix for 2006-2018 that resulted to be Markov first-order and also homogeneous.

This matrix (Table 1) has large values for the diagonal elements, which indicates a high probability of remaining in the same class, namely a low probability of mobility: the probability of moving (up or down) to a neighboring class is already very small as between 0.009 to 0.032, while transition to a class beyond

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the neighboring classes are at zero probability. Shorrock's Index, characterizing the degree of mobility of countries between classes, is equal to 0.0418, indicating a low mobility of countries.

Table 1. Transition probability matrix (GNI) 2006-2018

Group in t-1 period	Group in t period				
	1	2	3	4	5
1	0,97058824	0,02941176	0	0	0
2	0,0212766	0,95390071	0,0248227	0	0
3	0	0,0102459	0,95696721	0,03278689	0
4	0	0	0,02258065	0,96129032	0,01612903
5	0	0	0	0,0097561	0,9902439

Source: authors' elaboration

As for HDI, data were available only since 2000 and we used data for 179 countries. We found confirmation that this matrix is Markov first-order and homogeneous. We calculated transition probability matrix (see table 2) and found that also this matrix has large values for the diagonal elements. And the Shorrock's Index, which characterizes the degree of mobility of countries between classes, is equal to 0.0312, even smaller than in the case of per capita GNI. This tells us that countries are less mobile when changes in HDI are considered, as upgrading from one human development class to another is even more difficult than upgrading in terms of per capita GNI only.

Table 2 - Transition probability matrix (HDI) 2000-2018

Group in t-1 period	Group in t period				
	1	2	3	4	5
1	0,97916667	0,02083333	0	0	0
2	0,01195219	0,98207171	0,0059761	0	0
3	0	0,00153846	0,96461538	0,03384615	0
4	0	0	0,01445087	0,96242775	0,02312139
5	0	0	0	0,0132626	0,9867374

Source: authors' elaboration

Key conclusions and policy implications

Inequality is a persisting phenomenon. The generally positive dynamics evidenced also a significant inertia – especially considering HDI. The results of our analysis strongly suggest the adoption of more appropriate growth policies to improve the upward mobility in terms of per capita GNI, and, more necessarily and importantly, development policies favouring a higher positive mobility in terms of Human Development Index, which point to the importance of education and health policies alongside economic growth promotion.

When the 2020 data become available, it will be interesting to investigate newly, for both per capita GNI and HDI, how the pandemic affected the distribution of countries across the 5 classes and the eventual evolution in the transition probability matrix.

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The climate change-inequality nexus and the role of mediating factors

By Elena Paglialunga, Andrea Coveri and Antonello Zanfei[*]

Introduction

Relatively scanty research exists on the impact of climate change on economic disparities within countries. Accordingly, we explore the links between changes in climate conditions and within-country inequality and stress the relevance of some key structural factors conditioning the ability of the economies to deal with climate events. Two distinctive features of our work are worth mentioning. First, we focus on the agriculture sector, as it is one of the most important channels through which climate change might affect inequality. This emphasis on the agricultural channel highlights that emerging and least developed economies are the most vulnerable to the negative impacts of climate change – even though they have contributed less to climate change itself. Second, we use data on foreign direct investments (FDIs) to assess the role of the economic diversification across global value chain (GVC) activities as an important mediating factor affecting countries' ability to react to climate change-induced inequality.

By combining different data sources, we construct an original dataset covering more than 150 countries, including a large number of Least Developed Countries (LDCs), over the period 2003-2017, that allows us to empirically investigate these relationships.

Exploring the climate change-inequality nexus: the agricultural channel

Climate change affects both between- and within-countries inequality. As regards the 'between' dimension, the uneven distribution of climate damages reflects the different exposure of economic systems to climate-related risks, and their capacity to adapt. Poorer and LDCs are more likely to be negatively affected since they are mostly located at low latitudes where additional climate variability would be particularly harmful, and because of their economic structure (Diffenbaugh & Burke, 2019). It follows that LDCs also have to pay the higher price for adaptation, recovery and redevelopment, while being the least equipped to deal with such changes, due to limited resources (Vallino, 2016).

Recent studies have shown that the effect of climate change on between-country inequality is intertwined with the within-country dimension, as its impacts are heterogeneous across population groups, with poor people being more deeply affected (Hallegatte & Rozenberg, 2017). This suggests the emergence of a vicious cycle, as the most disadvantaged social groups are also the most vulnerable to climate change because of their higher dependence on natural resources, larger exposure to extreme climate conditions and lower adaptive capacity (Angelsen & Dokken, 2018). For example, poorer households often live in marginalized areas, which are more exposed to natural disasters and climate-induced diseases, and, at the same time, might not afford health insurance or lack access to medical facilities (with the most dramatic consequences arising in developing countries) (Castaneda et al., 2018).

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In this context, extant literature suggests that agriculture is among the main channels through which climate change affects poverty and economic inequality, especially in LDCs (Rao et al., 2017). On the one hand, climate change may result in negative effects on the income of farmers, with more pronounced impact on rural income in developing countries (Dell et al., 2014). On the other hand, climate change tends to increase food prices, producing harmful consequences especially in LDCs where the share of households' income dedicated to food consumption is higher (Bandara & Cai, 2014). In addition, climate change may reduce labour productivity and lead to output losses, mainly in the agriculture sector (Day et al., 2019). Accordingly, our analysis of climate change induced inequality will account for the share of population living in rural areas and for the employment in the agricultural sector.

Economic, technological and institutional drivers of inequality and the role of GVCs

Other divers of income disparities must be kept into account when exploring climate change-inequality nexuses.

First, the impact of economic and technological development has received a considerable attention in extant literature on income inequality. Our analysis accounts for these drivers by controlling for different measures such as GDP per capita and its square, industry share of value added, the share of population living in rural areas, and the share of population having access to electricity (Kuznets, 1955; Young, 2013; Castaneda et al., 2018). In addition, the skill- and capital-biased character of technological change makes the latter a crucial determinant of income disparities (Autor et al., 1999) and proxies of it are also included in our investigation. Second, we control for the role of institutions, as they define countries' capability to effectively respond to adverse phenomena (including climate-related extreme events) and to provide social safety nets for different segments of population (Sarkodie & Strezov, 2019). Finally, economic globalization, in terms of both trade and capital account openness, is likely to impact on income distribution by fostering skill-biased technological change and by affecting the bargaining power of labour with respect to capital (Feenstra & Hanson, 1996; Rodrik, 1997). Accordingly, we also account for the modern GVC-driven international fragmentation of production, paying special attention to the role of (inward) FDIs and their dispersion across value chain activities in shaping distributional dynamics (Gereffi et al., 2005; Antràs, 2019). Building on Hartmann et al. (2017) – who show that the economic diversification of the productive structure of a country is a key driver of its pattern of income inequality – we suggest that the functional specialization induced by the rise of GVCs can unfold at the detriment of a more equal distribution of income, while a greater GVC diversification (defined as a higher dispersion of FDIs across value chain activities[1]) may help the process of structural upgrading of receiving economies, with beneficial effects on income distribution.

In addition, we suggest that a higher GVC diversification may play a positive role in increasing the economic resilience of countries by reducing the vulnerability to adverse phenomena (Pike et al., 2010) and making conversion of domestic production easier in case of artificial disasters or climate-induced extreme events. In other terms, we argue that a more balanced participation of economies in GVCs might constitute an alleviating factor of the adverse consequences of climate change on income inequality (Birthal & Hazrana, 2019).

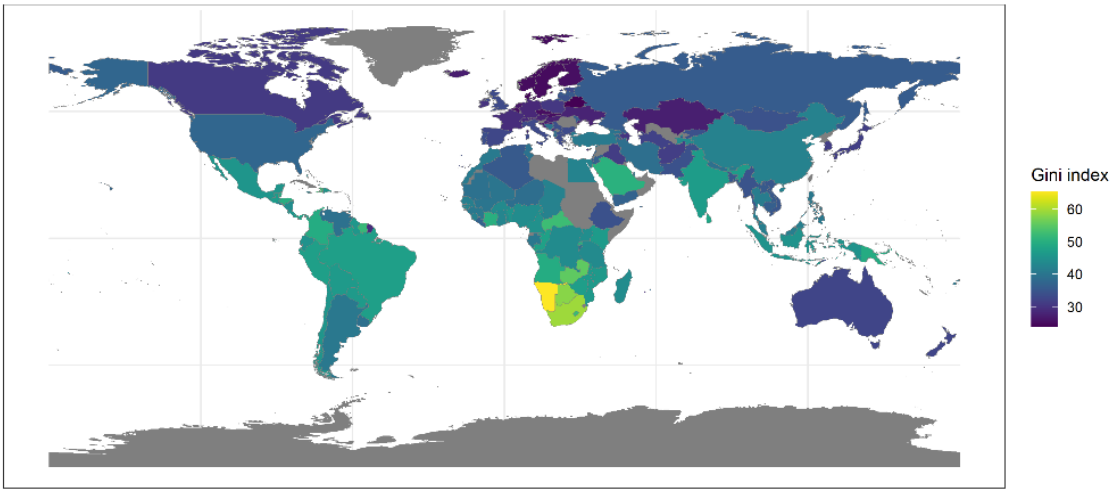
[1] We classify the FDIs activities according to three GVC stages: upstream (e.g. R&D, Design, Education & Training, ICT); production (e.g. Manufacturing, Extraction); downstream (e.g. Business Services, Logistics, Distribution).

Results of the empirical analysis

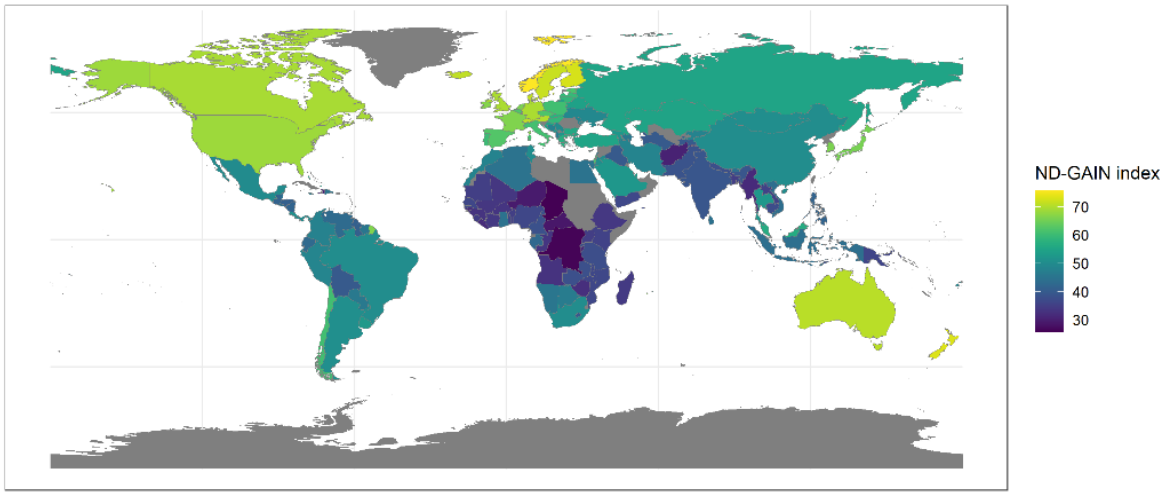
Figure 1 provides a graphical representation comparing the country-average (2003-2017) of income inequality, in terms of Gini index from SWIID database (panel (a)), to the Notre Dame Global Adaptation Initiative (ND-GAIN) index (panel (b)). The ND-GAIN is an indicator of climate vulnerability constructed such that a higher value indicates that a country is less vulnerable to climate change, i.e. the higher the value, the more resilient the country is. By comparing panel (a) and panel (b) in Figure 1, as summarized in panel (c), we observe that countries characterized by higher level of income inequality (larger value of the Gini index) are also the most vulnerable to climate change (lower value of the ND-GAIN index).

Figure 1. Gini index and ND-GAIN index

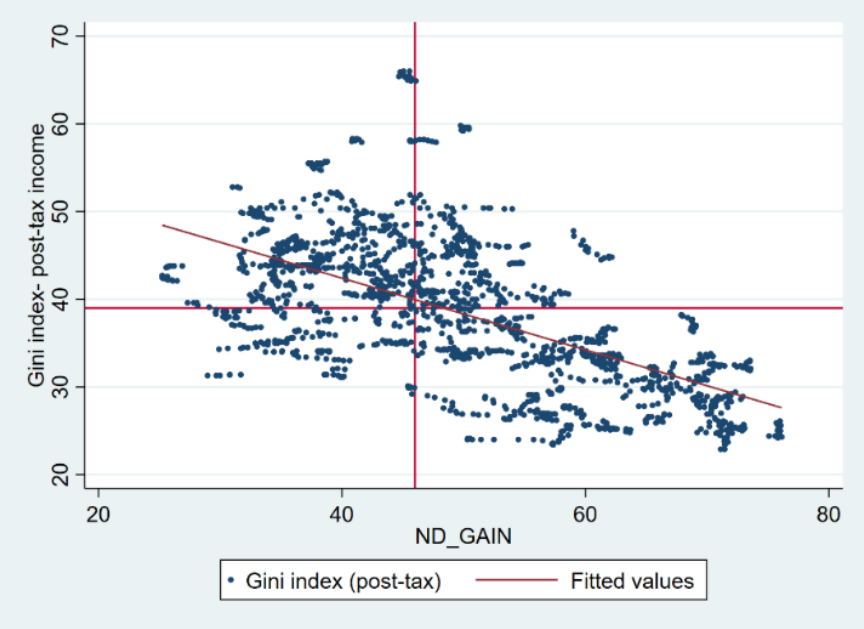
(a)



(b)



(c)



Source: authors' elaboration on SWIID and ND-GAIN data. In graphic (c), axis x and axis y indicate respectively the scorings of ND_GAIN and Gini index of studied countries.

We summarize here the results we obtained using regression techniques to empirically explore the correlation between climate change and inequality illustrated in Figure 1, controlling for different confounders and mediating factors (details are available in Paglialunga, Coveri & Zanfei, 2020). To do so we built our climate variables using monthly data on temperature and precipitation and calculated indicators signaling the existence of a warming trend, of drying/flooding anomalies, and whether a country has been hit by extreme events[2]. We further controlled for the main determinants of economic inequality, country and time fixed effects to identify the impact of climatic variations on within-country income distribution.

Our estimation results show that both temperature increase and precipitation anomalies have a strong and statistically significant effect in worsening income inequality. We also find that the impact of temperature increases on income distribution is stronger in the presence of high shares of population living in rural areas and of workers employed in the primary sector, hence confirming the importance of the agricultural channel through which climate change affects income distribution.

Moreover, we find that opening economies to foreign capital flows might exacerbate inequality in some circumstances, especially when the insertion of countries in GVCs as captured by inward FDIs goes hand in hand with the hyper-specialization in selected GVC functions. Conversely, the diversification across value chain activities of incoming cross-border investment flows – allowing an increasing sophistication and economic complexity of local economies' production structure – emerges as a resilience-enhancing factor which results negatively associated with within-country inequality.

[2] Monthly data on temperature and precipitation has been taken from Climatic Research Unit, University of East Anglia.

Conclusions

According to the IPCC report (IPCC, 2014), catastrophic consequences will be triggered inasmuch as average global temperature will be allowed to exceed 1.5°C – or, at worst, 2°C – pre-industrial levels. The dramatic effects of environmental degradation have already manifested in diverse forms, such as heat extremes, heavy precipitations, droughts, rising sea levels, floods, mudslides, water scarcity and biodiversity losses, with corresponding impacts on health, livelihoods, food security, water supply, and human security (Markandya et al., 2017). As a matter of fact, Eckstein et al. (2018) estimate that the consequences of extreme climate events have amounted to $174 billion (PPP) per year on average from 1998 to 2017 in terms of global economic losses.

Extant evidence also suggests that the impact of climate change is heterogeneous between-countries, with LDCs and poor regions suffering the highest costs. However, few studies have explicitly addressed the impact of climate-related events on within-country inequality, although the latter is the dimension that has deteriorated the most in last decades (Milanovic, 2016).

Based on an original dataset covering more than 150 countries over the period 2003-2017, we have shown that countries characterized by higher level of income inequality (larger value of the Gini index), are also the most vulnerable to climate change (lower value of the ND-GAIN index). Empirical results permit to further explore the climate change-inequality nexuses. Controlling for a large number of determinants of inequality detected by the literature, we find that climate-induced influence on income inequality is stronger in rural areas, which is consistent with higher levels of exposure to climate risks.

We also find that while inward FDIs per se induce a more unequal distribution of income, cross-border investments in most upstream functions of the value chain foster the creation of better-paid jobs and tend to reduce income inequality. Finally, the evidence provided shows that a more even distribution of FDIs across value-adding activities contributes to reduce inequality and alleviate the worsening impact that climate change exerts on income distribution by increasing the economic resilience of countries to external shocks, including environmental-related extreme events.

Given the adverse impact that climate change consequences have on individual income distribution, it is important to stress that the burden of climate mitigation should not fall disproportionally on the poorest segments of population. In other words, climate mitigation policies should be designed in a way that does not determine additional income disparities on top of the dismal effects of climate change.

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