



Environmental Shock Response: its effects

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ABSTRACT: Climate change, an increasing trend in today's world, has more than just physical effects. It has huge economic shocks that threaten decade long consequences that may be impossible to recover from. Integrated Assessment Models (IAMs) don't factor in uncertainty during policy formulation-- an important element, considering the environmental factors and their aftermath can't be predicted. Even with the pandemic, environmental and economic consequences can be seen: Countries with primary trade routes with worst-hit coronavirus countries produce less emissions. However, the 'retaliatory pollution' that follows will not only undo the reduction in environmental pressure but perhaps even heighten it. Increasing pollution affects the economy in many ways-- from depleting workforce productivity (which directly impacts the GDP) to reducing crop yield. The most relevant example would be the wheat crisis of 2022, triggered by India's heatwave and having devastating economic effects. To go deeper into how exactly environmental factors control economic stability, a case study on the Syrian war of 2011 and Sub-Saharan rainfall patterns show how changes in climatic factors have a direct effect on civil conflict. Now, the 'mitigation cost' policy employed by many nations to battle climate change also has a direct impact on the IT market. A recession is predicted in the upcoming years with an IT market crash-- perhaps worse than the Chinese crash of 2015. Tightening monetary policies in response to the pandemic and political instability will add to the probability of an upcoming recession, which is not a good sign with climate change on an ever-growing slope. Long-term reforms customized to every individual country are necessary, even if they contradict inflationary measures taken in response to current crises-- because tax reforms or monetary policies will only offer instant gratification.

KEYWORDS: Climate, Environment, Civil war, Wheat Crisis, economic shock, recession

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I. INTRODUCTION

Environmental shocks refer to the uncertainty experienced by physical and sociocultural changes in the environment. With the development of industrialization and society many factors and events have lead to numerous environmental shocks further affecting the economies. [1]. Researchers discussed not only severe health risks of global warming, but also dangers to a high-functioning and civilized society; however, the latter has lost its significance in literature. Climate change contributes heavily to physical phenomena such as storms, floods and heatwaves but even more so to the more indirect socially mediated effects, such as migration, famine and population dislocation. Physical effects of climate change, by themselves, cannot prove a risk to the economy, but when factored with social effects, it may have decade-long consequences, as the Syrian war of 2011 shows [2]. Unlike Damocles' Sword, we have the opportunity to blunt the edge of the sword hanging over our heads and strengthen the rope by which it hangs. Natural catastrophes are becoming greater in intensity and frequency, which can be attributed to the increasing stock of greenhouse gasses; this results in costlier disaster management and a heavier blow to the economy with longer-lasting repercussions. The aftermath of every disaster finds a decline in consumption and income, which is almost always recovered. However, there may be an event due to which the economy crosses its 'tipping point' and faces a loss in income of at least 25%. A mitigation policy to spend a constant 'abatement expenditure' of at least 0.5%-- and increasing it in proportion to the intensity of the economic shock-- may help the economy recover from its situation, however dire it may be [3].

Integrated Assessment Models (IAMs) usually don't factor in uncertainty while attempting to estimate the damage function on the economy due to environmental factors. Climate change policy modeling should directly include the uncertainty that is ever-present in both the physical and economic systems. Estimating the damage function is most vital for any climate change policy. Usually, a climate change policy is formulated by measuring the total benefits versus the costs, and trying to see what an 'optimal' policy looks like [4]. Climate

conditions have a robust effect on economic productivity, not only growth rate. Most important today: developing the optimal economic policy frame. The question: which model? IAMs are traditional, but quantification of the economic impact of climate change is highly variable. Integrated Assessment models (such as damage functions) vs Fixed effects panel regression model: the latter lessens variability factor. Fixed Effects Panel Regression technique: Focus more on short-term weather shocks than long-term extremes. Adaptation: best solution. Lessens negative impact by 50%. Hot regions face more economic losses as compared to cold regions with rise in temperature. Temperature increase does not alter the long-run growth rate of a country [5]. The pandemic's effect on influential economics such as China, Europe and the USA, caused supply-chain interruptions. Total consumption loss and sectoral spillover is about 4.2% the global GDP. Huge income losses are incurred. In low-wage countries like India and China, primarily through employment loss. Transport and tourism are worst hit sectors; countries reliant on these are suffering and airlines going bankrupt. Of total income losses, 21% are due to loss of international trade. Economic losses due to the pandemic are tied with lessening environmental pressure. Countries with primary trade routes with worst-hit coronavirus countries produce less emissions. World is facing the worst recession, emergency funds are being spent by all governments. Attempting to put a safety net under the economy instead of promoting businesses more likely to grow or to save businesses most affected. Social and environmental consequences of fighting the pandemic are greater than the economic blows-- and that's saying something. COVID-19 is taking place against the backdrop of climate change. Though reduction in carbon emissions during it will make a dent, it is not enough to stop climate change, but will rather undo all the work that has been done with 'retaliatory pollution', as things go back to normal [6].

Aside from affecting human health, air pollution also affects crop yields and ecosystems, creating economic costs as well as 'welfare costs', which are quantified from the suffering humans go through. Air pollution emission rates are predicted to rise due to increased energy demand, leading to higher concentration of particulate matter in the atmosphere. The economic cost of this will rise to 1% of the GDP of a country by 2060. Higher health expenditure due to more illnesses, such as asthma: also indirectly affects labor productivity, adding to economic costs. By 2060, the global air pollution healthcare costs will have reached a steep 176 billion dollars, in contrast to the current 21 billion, also affecting labor productivity. Impacts aging populations most, such as China, with more costs as compared to India, which has a young population. As the shocks increase in intensity, the cheapest solutions will be employed first, resulting in further shocks being handled at higher costs. No 'one' policy to apply globally; a policy must be formulated based on each country's unique environmental setup [7] [8]

II. WHEAT CRISIS

Though climate change has always been omnipresent, its impact on the year 2022 will go down in history, especially for India. Global warming results in more frequent and intense 'heat waves', adding to India's already burning hot climate. They are caused by low rainfall, which was the case in 2022 in India; the usual frequency expected in a tropical country like it was not met, due to climate change. More than 60% of India's workforce is employed in agriculture, a field very vulnerable to climate variability. And, with climate change at the forefront, this field has been very hard hit indeed. Heat waves cause many problems, which all directly or indirectly add stress to agricultural productivity. Droughts: with the Indian states already struggling with the dilemma of low rainfall in the crop season, a heat wave induced drought just added fuel to the fire. Energy consumption: because of the heat, more air conditioners were used, adding to global warming. Crop yield fell: 4-5 q/ha losses in wheat compared to normal [9]

Wheat is an important food crop for the world, and in order to meet the demand from the growing population, higher production is required in the same amount of land. So, since the 1940s, farmers managed to increase the thousand-kernel weight (TKW) by 2.19 g per decade, ie, a bigger kernel size was achieved. But, in dry and arid conditions, the size of the kernel tends to be smaller. For instance, India was hit by a massive heatwave in May 2022, resulting in a wheat loss of almost 400 million tons, primarily because most of the wheat grains were deemed too small to be sold. Climate change is making the world hotter day by day; in fact, 2010-19 was recorded as the hottest decade to date. So, in a market that demands large wheat kernels, farmers are unable to sell their yield, because the environmental conditions prevent them from growing the optimum size.

Despite such environmental pressures on wheat production, another stress point is the Russo-Ukrainian war. Russia and Ukraine contribute to 30% of the world's wheat exports, and with Ukrainian farmers fleeing, the country has banned wheat exports. So, the world turned to India, the second largest wheat exporter, only to find wheat exports banned there as well due to heatwaves. Climate change has heavily affected not only the global wheat supply, but also its dietary composition. Studies have shown that increased droughts and heat exposure reduces the amount of beneficial protein in every individual wheat kernel [10].

III. SYRIAN CIVIL WAR

In Syria's pre-civil war years, its northeast Jazira region faced an acute agrarian crisis: agricultural production declined heavily, leading to large-scale unemployment and migration. This out-migration and the added socio-economic pressures on this sudden concentration of population toward a few areas was a major driver of the Syrian civil war. An intense drought-- possibly worse than usual due to climate change-- also declined the water supply and played a major role in the collapse of Syria's agriculturally-driven state development. Conflicts usually arise from natural resource-demand imbalances, leading to environmental scarcities, which only aggravate existing economic issues [11].

IV. SUB SAHARAN AFRICA

Changes in climatic factors have a direct effect on civil conflict. Low employment: in areas of environmental stability, employment is more forgiving and less risky-- for eg, farming. So, those areas will have less number of people willing to join a potential rebel movement because the opportunity cost would be too high. Social status: because weather shocks affect the lower end of the economic spectrum-- namely, farmers and cultivators-- more, they are more likely to take up arms and cause a domino effect throughout the country, leading to a civil war. Drought in Africa had significant impact on income across economic classes: there was a lot of rural income inequality and this led to more chance of rebellion. For eg: A positive change in rainfall decreases likelihood of conflict in the following year. With a scarce amount of resources being overexploited by a growing population, distribution conflicts and resource competition is inevitable. Countries with most variable interannual rainfall variability are most conflict prone. Democratic Republic of Congo, Sierra Leone, Liberia and Burundi. Africa is a primarily rain-dependant country and this makes it vulnerable to political instability and collapse in this age of ever-intensifying climate change. Reducing agricultural dependency on rain may mitigate conflict. If countries lessened reliance on environmental factors, such as rainfall, land sustainability etc-- which is increasingly unreliable and variable-- it would help reduce conflict [12].

V. IT MARKET CRASH

Information Technology is an integral part of all sectors of the economy, promoting more organized and efficient output. COVID-19 changed the way IT employees worked and gave the whole field a new perspective. The global pandemic demanded more IT professionals in order to keep the world connected in this period of physical isolation. But, despite the increase in demand for IT, there was not a proportionate increase in budget [13]. Climate change has had an upward sloping trend since the early 1850s, manifesting in the forms of sea level rise, global temperature increment and ocean acidification. To safeguard against the economic repercussions, many countries have been attempting to employ a policy of 'mitigation costs', which might have an adverse relation on the stock market. Firstly, with an increase in the effects of climate change, the mitigation costs will increase proportionately and thus, reduce the cash inflow of firms. Secondly, the stock channel is based on a 'portfolio balance theory', which cites balance in the interest rates based on fluctuating demand. An increase in demand for climate-related stocks will lead to a decrease in investment for conventional stocks, resulting in a more volatile and less profitable stock market. Though some economists believe the stock market will be primarily unaffected by climate change, the volatility faced by some stock markets (primarily Asian) show otherwise -- like the Chinese market crash of 2015. The study by Tirimisiyu F. Oloko, Idris A. Adediran, Olalekan T. Fadiya shows that a riskier market results in lesser stock returns, which tends to cause higher volatility in 40% Asian markets with significant impacts [14].

VI. DISCUSSION & CONCLUSION

The near-term forward spread (NTFS) is a measure of the short-run nominal yield curve slope with respect to the short-term treasury yield six-quarter ahead as well as at present. If consumers foresee a recession, they expect the policymakers to vary the interest rates accordingly. This results in a negative NTFS. However, NTFS is also influenced by a number of factors, the most imminent of which is the policy gap. A negative gap occurs when a more accommodative future policy is expected. A tighter current monetary policy relative to a neutral stance is associated with a higher probability of an upcoming recession. Andrea Ajello, Luca Benzoni, Makena Schwinn, Yannick Timmer, Francisco Vazquez-Grandehe conclude from the wide and positive NTFS a near-zero probability of future recession. This directly contrasts the historic trend of a decrease in the expected inflationary graph predicting recessions [15].

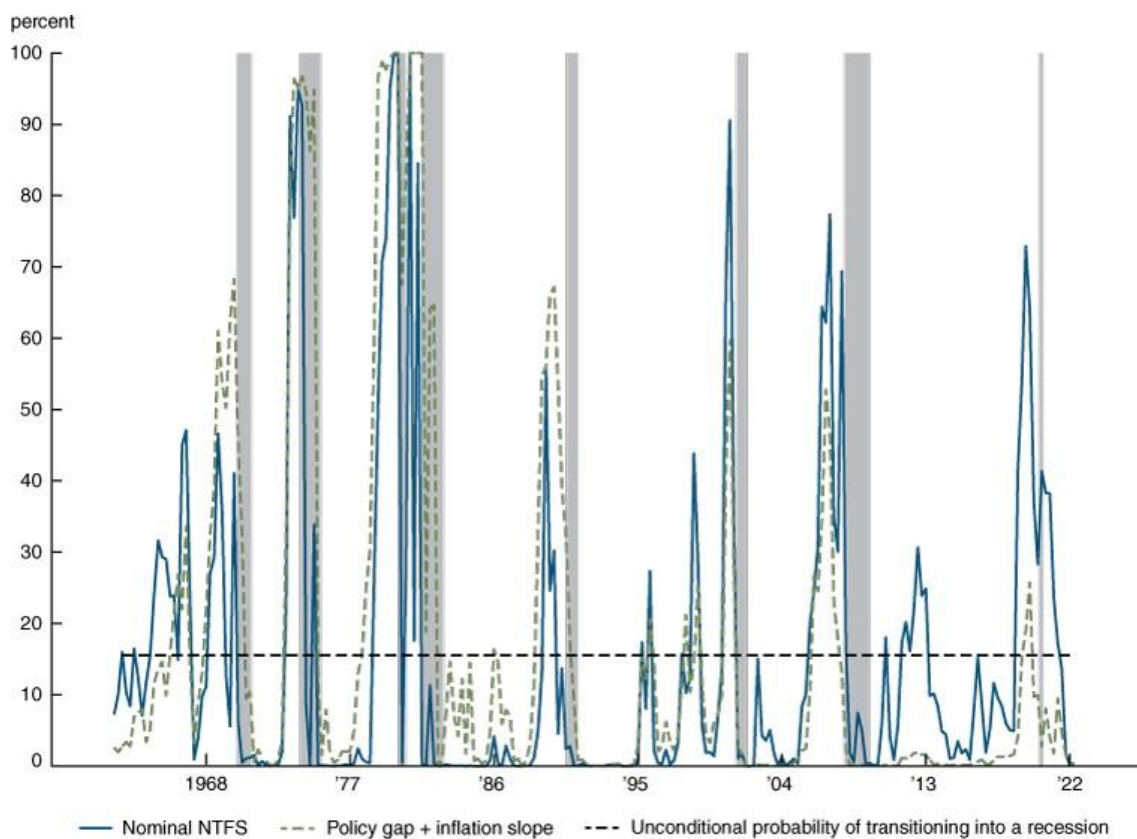


Fig 1

Chances of recession will reach 60% in 2023 upon tightening of monetary policies above the baseline, but only about 35% in case of mild restriction. We can conclusively say that environmental factors have a direct impact on the world economy, be it an IT crash due to the pandemic or political unrest due to insufficient rainfall.

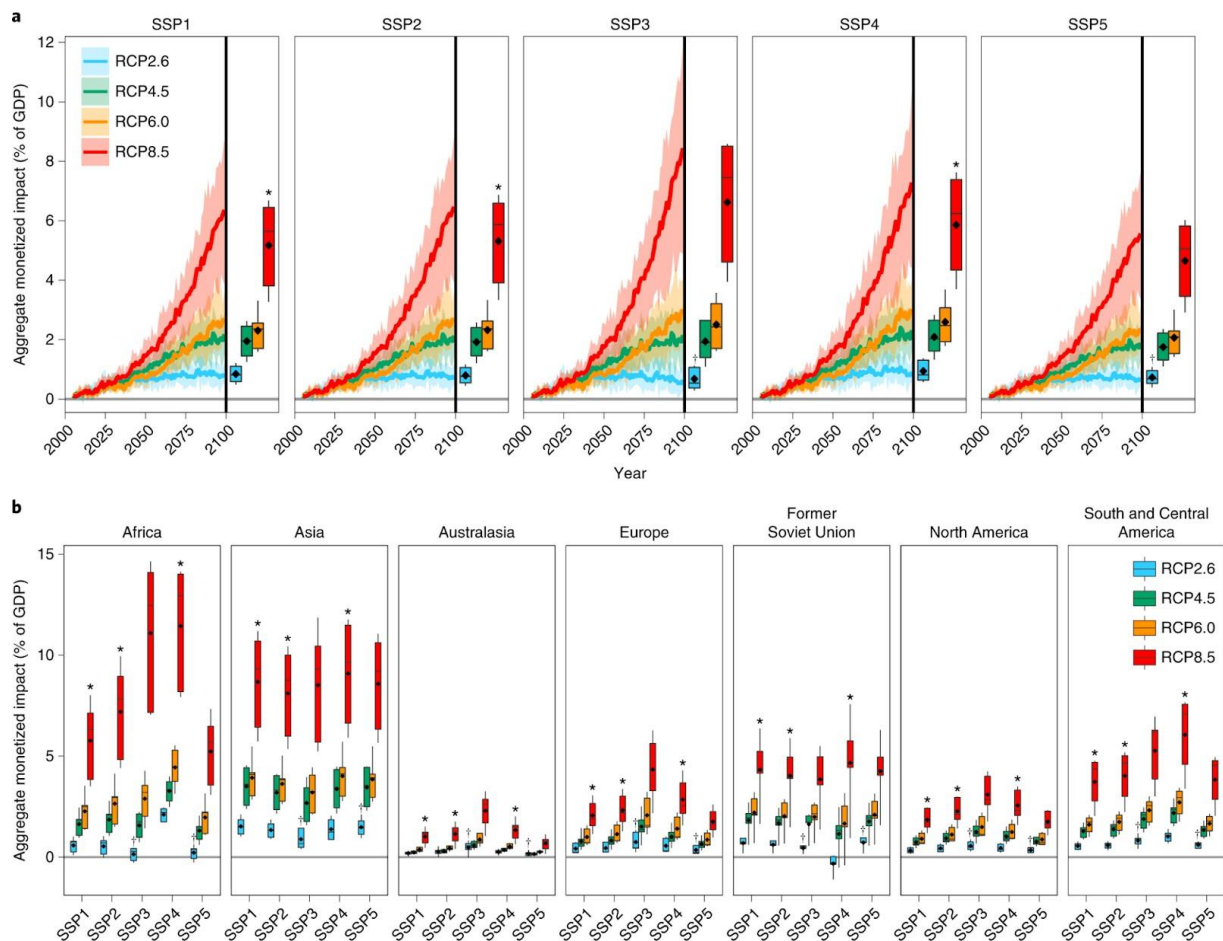


Fig 2

The above graph shows how climate change has already impacted economies of various countries, and future projections. We can see an increasing growth rate, resulting in more dire consequences in the future-- environmentally and economically. India faced one of its worst economic slumps this year due to the heatwave- induced drought in April 2022; despite having had multiple droughts throughout its years, the Indian economy did not face consequences of this magnitude before. As can be seen by the many case studies, steps taken by countries in times of crises, such as tax reductions and inflationary controls, only ever offer instant gratification. Long-term reforms will form more resilient and armored economies that can face unprecedented shocks, which have higher probability with climate change gaining speed. For instance, maintaining a mitigation cost reserve As a society, we have faced many things over the years-- the Great Depression, stock market crashes and more-- and with the looming 2023 recession, it seems like we are still not out of the woods. But, we will keep going,because what is to be human if not to persevere?

REFERENCES

- [1]. Li, J. (2020). Impact of environmental shocks on the preferred number of children of internal migrants: Evidence from China. *Cogent Psychology*, 7(1), 1801962. doi: 10.1080/23311908.2020.1801962
- [2]. Bretschger, L., & Vinogradova, A. (2019). Best policy response to environmental shocks: Applying a stochastic framework. *Journal of Environmental Economics and Management*, 97, 23–41. doi: 10.1016/j.jeem.2017.07.003
- [3]. Bretschger, L., & Vinogradova, A. (2018, May 29). Escaping Damocles' Sword: Endogenous Climate Shocks in a Growing Economy. doi: 10.2139/ssrn.3187976
- [4]. Farmer, J. D., Hepburn, C., Mealy, P., & Teytelboym, A. (2015). A Third Wave in the Economics of Climate Change. *Environ. Resour. Econ.*, 62(2), 329–357. doi: 10.1007/s10640-015-9965-2
- [5]. Kalkuhl, M., & Wenz, L. (2020). The impact of climate conditions on economic production. Evidence from a global panel of regions. *Journal of Environmental Economics and Management*, 103, 102360. doi: 10.1016/j.jeem.2020.102360
- [6]. Lenzen, M., Li, M., Malik, A., Pomponi, F., Sun, Y.-Y., Wiedmann, T., ...Yousefzadeh, M. (2020). Global socio-economic losses and environmental gains from the Coronavirus pandemic. *PLoS One*, 15(7), e0235654. doi: 10.1371/journal.pone.0235654

- [7]. Botzen, W. J. W., Deschenes, O., & Sanders, M. (2019). The Economic Impacts of Natural Disasters: A Review of Models and Empirical Studies. *Review of Environmental Economics and Policy*. doi: 10.1093/reep/rez004
- [8]. The Economic Consequences of Outdoor Air Pollution | en | OECD. (2022, November 05).
- [9]. Heat wave 2022: causes, impacts and way forward for Indian agriculture - India Environment Portal | News, reports, documents, blogs, data, analysis on environment & development | India, South Asia. (2022, November 05).
- [10]. Metcalfe, M. C., Estrada, H. E., & Jones, S. S. (2022). Climate-Changed Wheat: The Effect of Smaller Kernels on the Nutritional Value of Wheat. *Sustainability*, 14(11), 6546. doi: 10.3390/su14116546
- [11]. Selby, J. (2019). Climate change and the Syrian civil war, Part II: The Jazira's agrarian crisis. *Geoforum*, 101, 260–274. doi: 10.1016/j.geoforum.2018.06.010
- [12]. Hendrix, C. S., & Glaser, S. M. (2007). Trends and triggers: Climate, climate change and civil conflict in Sub-Saharan Africa. *Political Geography*, 26(6), 695–715. doi: 10.1016/j.polgeo.2007.06.006
- [13]. Coronavirus Recession Impact on Information Technology Management: An Exploratory Single-Case Study - ProQuest. (2022, November 26). Retrieved from <https://www.proquest.com/openview/0fdac6fa4dd629407073efae04ec2924/1.pdf?pq-origsite=gscholar&cbl=18750&diss=y>
- [14]. Oloko, T. F., Adediran, I. A., & Fadiya, O. T. (2022). Climate Change and Asian Stock Markets: A GARCH-MIDAS Approach. *Asian Economics Letters*, 4(Early View). doi: 10.46557/001c.37142
- [15]. Ajello, A., Benzoni, L., Schwinn, M., Timmer, Y., & Vazquez-Grande, F. (2022, July 07). Sources of Fluctuations in Short-Term Yields and Recession Probabilities. doi: 10.2139/ssrn.4179525