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AUTOMATION INFLICTED INCOME INEQUALITY POST THE COVID-19 PANDEMIC

Rohan Bhasin[1] and Dr. Arjun Mittal[2]

[1]Student Scholar, Modern School, Barakhamba Road, New Delhi
[2]Professor, Shriram College of Commerce, New Delhi

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ABSTRACT

Income Inequality can be defined as a gap or disparity of income distribution between certain segments of a population. In simple terms, the country gets divided into concentrations of income, with some sectors contributing in extremely high proportion to the GDP as compared to others. First, a pandemic like COVID-19 stops daily wage activities which are necessary for this infrastructural development, and second, the devoid of daily wage work for the rural sections leads to loss of domestic income. Automation, in itself, also leads to job displacement which favours skilled based job creation. Second, a pandemic where close contact activities come to a halt, automation of the economic sectors would be the path undertaken by most governments. The paper further dives into this automation construct, where we analyse the impact of these automation technologies on income inequality. Thus our paper talks about impending automation of certain sectors of the economy and how COVID-19 could influence automation, thereby, influencing income inequality.

JEL Codes : F66, M52

Keywords : COVID-19, IncOme Inequality, MacrOecOnomics, AutOmation

Introduction

Income Inequality can be defined as a gap or disparity of income distribution between certain segments of a population. In simple terms, the country gets divided into concentrations of income, with some sectors contributing in extremely high proportion to the GDP as compared to others. These disparities occur all over the world in segments like gender, geography, occupation. Some countries also develop disparities which are native to their cultural history, like the economic gaps projected within the caste system in India.

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These gaps become more prevalent once a pandemic takes swing at the economy of the Nation. A historic cause for income inequality in India can be dated to the bad shaping of the country's agricultural and rural safety nets coupled with lack of rural infrastructural development in power, electricity and road transport facilities. These causes are further augmented by a pandemic, where a dual toneeffect takes place.

First, a pandemic like COVID-19 stops daily wage activities which are necessary for this infrastructural development, and second, the devoid of daily wage work for the rural sections leads to loss of domestic income. To measure this dilemma, the Gini coefficient is deployed, which was 37.8 in 2011 (World Bank), ranking the country 95 on the Gini Coefficient rankings[1].

Second, a pandemic where close contact activities come to a halt, automation of the economic sectors would be the path undertaken by most governments. The paper further dives into this automation construct, where we analyse the impact of these automation technologies on income inequality.

Thus our paper talks about impending automation of certain sectors of the economy and how COVID-19 could influence automation, thereby, influencing income inequality.

2. Review of Literature

There have been limited publications on the direct impact of pandemics on pan-nation income inequalities, however, by analysing various outcomes of the pandemic and using historic precedents, one can analyse the viable outcome of such a pandemic on income inequality.

The first evidence we draw from is that COVID-19 will lead to a global shortage of approximately 15 million health workers by 2030. Countries with already deficient and inaccessible life - developing Africa in particular. The impact on healthcare from this workforce shortage in particular would lead to a rise in income inequality. (Faheem Ahmed, Na'eem Ahmed, Christopher Pissarides, & Joseph Stiglitz, 2020).

The paper also employs research conducted by the University of Copenhagen on the effect of health on cross-state income inequality in India, using various metrics or

[1] The coefficient ranges from 0 (or 0%) to 1 (or 100%), with 0 representing perfect equality and 1 representing perfect inequality. The Gini coefficient can then be thought of as the ratio of the area that lies between the line of equality and the Lorenz curve over the total area under the line of equality: The most basic formula to calculate it is : G = A / (A + B)

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determinants like height,BMI and physicians per capita. (Lena Lindbjerg Sperling & Anders Oskar Kjøller-Hansen, 2011)

There has also been research conducted on how digital divides or connection to digital technologies, a prevalent result of the pandemic, can also affect income inequality. The arguments proposed are relevant to our analysis on Income Inequality post COVID-19 as the disease would lead to **digital automation** of some economic sectors, posing an advantage to the people having the expertise to operate digital technology. (Nidhi Tewathia , Anant Kamath & P. Vigneswara Ilavarasan).

While robots, a form of automation technology, increase output per capita and productivity, it's deployment has a detrimental effect on the low-skilled sector of labour, a problem in India, where only 4.69% of the workforce is skilfully employed, the wages of whom have grown from the 1970s. This is because it is easier to automate low-skilled labour than high skill. One other aspect of the paper is that automative technologies raise the skill premium. A strong argument given is that automation does not raise marginal productivity, but it makes the labour factor for services such as driving a car completely obsolete. This is relevant for our paper, because distant contact and low workforce policies to sustain the COVID-19 pandemic will allow for the adoption of these technologies. (Clemens Lankisch, Klaus Prettner , Alexia Prskawetz)

We conclude this literature review by taking a look at the implications of taxes on automation-based technologies like robots. Based on research conducted by the Freie Universität Berlin, a robot tax can increase per capita capital and per capita output at the steady state of the recognised Overlapping Generations Model with automation. This does not however discount the possibility of economic stagnation during adoption of automation. It is important to consider these implications since a tax on robots would be the customary tariff policy on such technologies.

3. Research Methodology

We analyse the effect of the pandemic using 2 methods : Historical Precedent and the impact on and of Automation. The first part analyses income inequality today using the impact of the Spanish Influenza pandemic on the dispartiers in that time. We can thus use this historical precedent to gauge what this pandemic might to these disparities.

The second part of the paper introduces another angle to our research with how Automation would be affected and how it will affect these income disparities.

4. Anomalies in India's Gini Coefficient pre COVID-19

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The Gini Coefficient, while a useful tool for measuring inequality for countries with democratized and independent data institutions, cannot fully work in India to the politicization of data.

With elections come a change in the data, which is necessary for evaluating income inequality, thus economists are prone to confusion with employment data being highly scattered, coming from sources like : National Sample Survey Office (NSSO), the Employees Provident Fund Organization (EPFO) and the Centre of Monitoring Indian Economy (CMIE).

Thus, employment records and wages become hard to determine statistics for average incomes along the rural segments and the localized poverty lines for marginalized districts, where data collection is largely inaccurate.

Thus, the under 40 coefficient has to be taken with a grain of salt, and a number above that safe area is highly probable. With government policies becoming highly non-inclusive for Muslims and with the onslaught of demonetization of the 500 and 1000 rupee notes, it's highly likely that there might be a bump in the Gini Index in certain areas (Estimated Range includes 41 – 45 on the Gini Index).

However, these estimates are usually a little overstated or oversensitive to the Indian inequality scenario particularly with a derivative in the middle income distributions. Another relief is valid in the sense of the rural programs initiated by the BJP government, namely : MGNREGA, PM-KISAN, PMJDY and the PMGKP[2].

5. Analysis of Automation Benefits

Before moving forward to discuss to what extent Automation can impact Income Inequality, we first have to understand why Automation Technologies are being adopted in manufacturing and other corporate processes.

In a brief, automation poses certain benefits like increasing Production per Worker thereby increasing Labor Productivity. It also reduces the operations costs since these technologies only require an initial cost of establishment and maintenance costs are minimal. It also increases worker or labor safety by employing machines to hazardous manufacturing tasks. Automation is alsoresponsible for reduced factory lead times.

[2] Abbreviations used for government policies stand for - MgnREGA: Mahatma Gandhi National Rural Employment Guarantee Act, PM-KISAN : Pradhan Mantri Kisan Samman Nidhi, PMJDY : Pradhan Mantri Jan Dhan Yojana, PMGKP : Pradhan Mantri Garib Kalyan Yojana.

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A combination of these advantages seem to be sufficient for investors to acquire these technologies. Table 2 and Figure 4 highlights the composition of most cited results of Automation and visualises the Return on Investment for these technologies respectively.

6. Impact of COVID-19 on Automation

Automation technologies consist of machines or robots that automate production processes, they can also refer to digital technologies like Machine Learning or Artificial Intelligence.

This section discusses the impact of COVID-19 on Automotive technologies to gauge the further impact of Automation on Income Inequality. Since COVID-19 is a close contact disease, Industries are looking for robotic or automation technologies to replace human labour or at least cut down on some parts of the low skilled workforce, so that those areas can be more productive and would not involve humans. Thus we can categorize the impact of COVID-19 on Automation into two categories : short and long term.

7.1 Short Term Impact

7.1.1 Manufacturing of Automation Technologies

Since manufacturing, especially in China, has taken a hit due to the virus, it may prove to be difficult to produce physical technologies to replace human labor. This can be measured using the PMI (Purchasing Managers Index)[3], which saw a historic low of 35.7 in February in China. It reached 27.4 in India in April, the country's all time low, it relieved to 30.4 in May.

As seen in Table 1, a downward trend was registered in the PMI for India from January to April with a relief in May, severely impacting the Make In India Program, which stimulated and preferred national manufacturing programmes in the Country. Thus, the manufacturing for these automation technologies have taken a slump in this period.

[3] The **Purchasing Managers' Index** (**PMI**) is an **index** that gives an idea of the present trends and the situation in the manufacturing and servicing sector.

PMI = (P1 * 1) + (P2 * 0.5) + (P3 * 0)

Where: P1 = percentage of answers reporting an improvement , P2 = percentage of answers reporting no change, P3 = percentage of answers reporting a deterioration

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The progress of automation and the performance of global automation suppliers are dependent on the health and smooth functioning of the global manufacturing sector.

With factories and production units being forced to stop all production processes, decrease production capacity and lay off factory workers to control fixed costs and losses, the drive to automate and produce these physical technologies will concurrently take a hit in the short term. Only when economic and manufacturing activities return to normal can companies look to increase their capital expenditures and resume production of these automation technologies.

7.2 Long Term Impact

Since the lockdown stopped all physical economic activities, many companies in the private sector and the PSU's have taken to automation technologies in the longer run to replace the human labor counterparts. This incentivization will lead to a higher demand for such automotive technologies once the pandemic settles.

Another factor to take into account, in India, are the lockdown influenced policies that have come into place. The central government announced in the form of the 4th version of the lockdown on May 17th, where it allowed state governments more autonomy regarding the lockdown policy during the pandemic.

With gradual opening of workplaces, in states like Delhi, the full workforce at this point in time cannot be involved. Thus, companies have taken to automation tech and are adopting technologies to replace or augment both low and high skilled work positions.

Thus, as companies and industries in general face shortage of migrant labourers and strict labor related social distancing orders, manufacturers would be incentivized to automate factories - with an established prevalent preference for Robotic Manufacturing.

7.2.1 Increased Investment and Research in Automation

With the pandemic highlighting key supply chains and manufacturing flaws in the largely human intensive industries, it posits a market opportunity for companies to increase investment and research into these technologies.

This is not something new, seeing the potential and efficiency of these technologies, Indian companies have started adoption and investment pre Covid-19. There is substantive evidence stemming out of corporates for thisargument.

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The construction giant Larsen and Toubro have digitized over 60% of their construction processes using sensory equipment and gateway systems. Car manufacturers like Mahindra have automated 70% of their body shop methods. Even the Indian Railways was able to leverage a 20% increase in efficiency by deploying MDC plus, a real-time machine monitoring and manufacturing data collection system developed by a digital solutions provider.

We can see in Figure 5, the increased investment in the Automation Technology sector, has constantly increased in the years 2016-2021.

8. Conclusion

Concluding from our analysis that COVID-19 would probably increase the adoption of Automation Technologies in the long term, we now have to analysewhat this increase in automation yields for income disparities.

We can expect metrics to track income inequality like the Gini Index to see bumps in industrialized areas who adopt such automation technologies. The job displacement caused would not be even throughout the world or even within nations as geographical areas with better institutional and educational setups would be better equipped to qualify for the new jobs created. The poorer regions that are expected to lose the most jobs will probably not benefit equally from this new job creation due to a gap in skills.

Thus COVID-19, which acts as a catalyst for accelerating the pace of adoption for automation technologies, due to policies preventing close contact activities, will be detrimental to creating economies with equal incomes. Automation will continue regional polarization in many of the world's advanced economies, unevenly distributing the benefits and costs across the population

7. Data

7.1 Tables

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Table 1: Manufacturing Purchasing Managers Index for India in 2020

Month	*PMI for Manufacturing*
January	55.3
February	54.5
March	51.8
April	27.4
May	30.8

Source : IHS Markit

Table 2: Composition of most Cited Benefits of Automation

Principal Benefits of Automation	*Percentage composition of Most Cited Benefits*
Cost Reduction	30
Productivity	27
Availability	23
Reliability	14
Performance	6

Source : Pat Cameron, Helpsystems

7.2 Graphs

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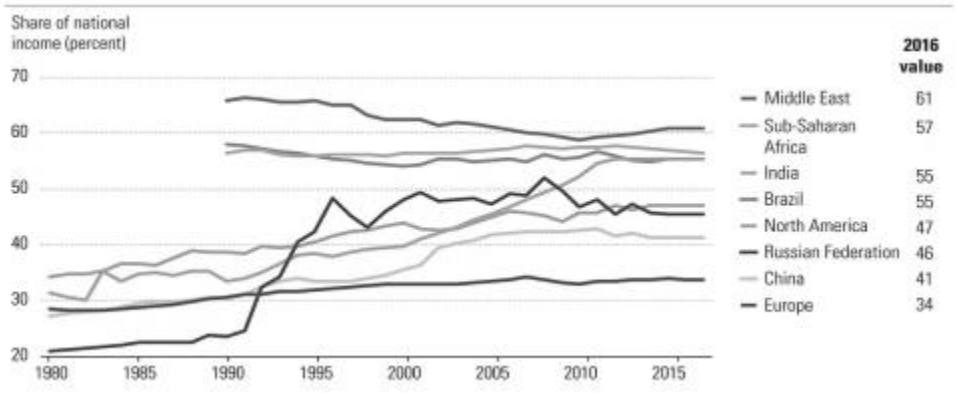
Figure 1: Income Inequality in India (Pre- Coronavirus)



Sources: Estimates are provided by Bloomberg, Quint

Figure 2: The wealth share of the top 10% shows an increasing trend. The top 10% of the population accounted for 63% of the total household wealth share in 2012.

Sources: Estimates are based on NSS All India Debt and Investment Surveys (AIDIS).

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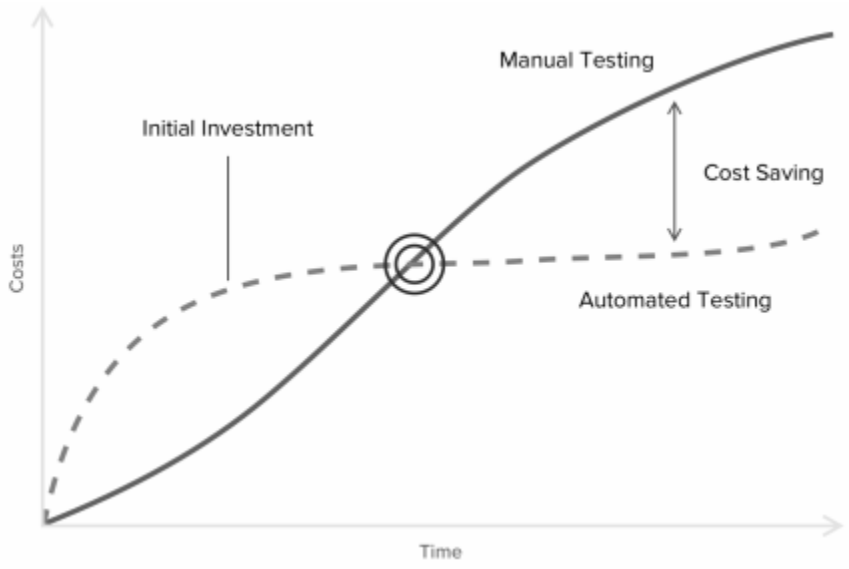
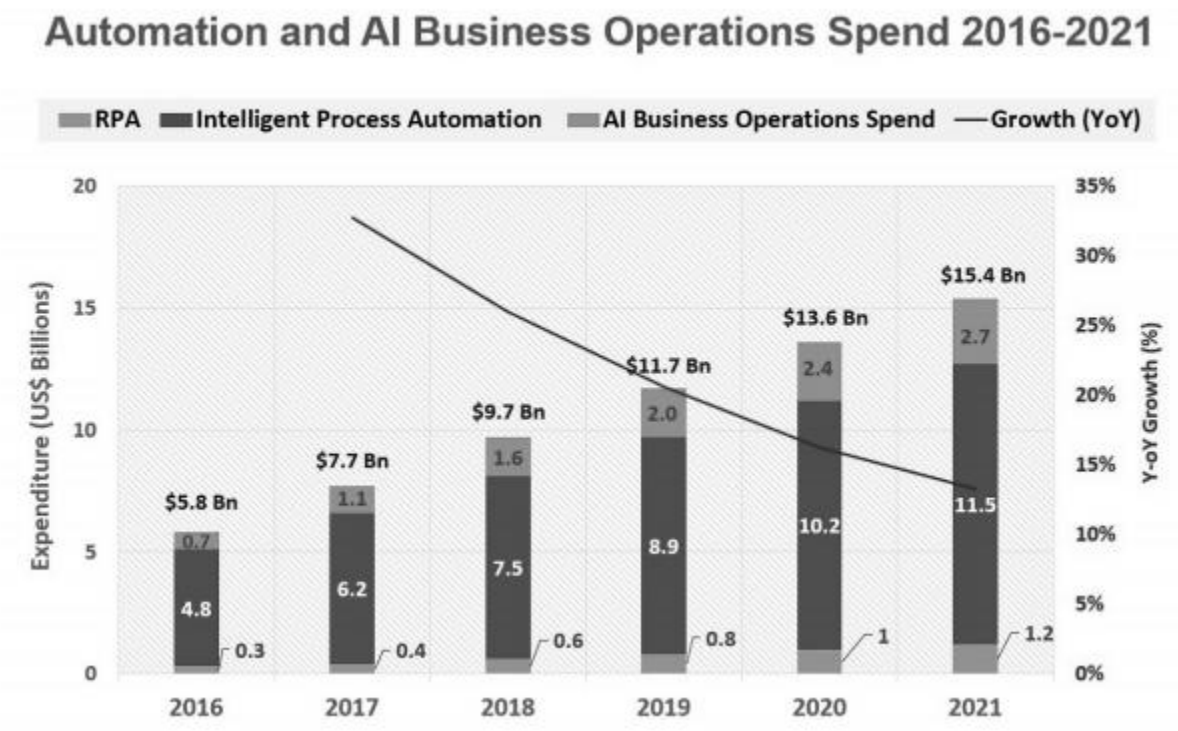
Figure 3: Ratio between time and cost to highlight the cost saving with Automation



Source : Maria D. , Cleveroad, 2019

Figure 4 : Increase in Automation and AI business operations costs.



Source : HFS Research, 2017

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