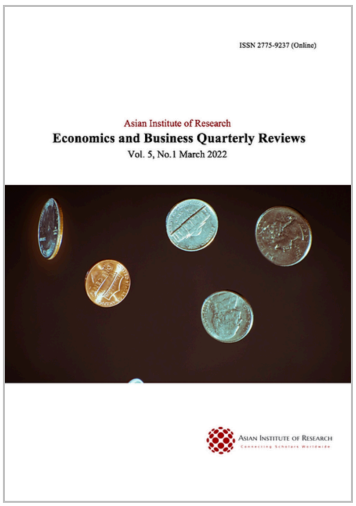

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Industrial 'ROBOT' Taxation System

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Abstract
Technology and Humankind have mutually coexisted in this world for decades. However, the world is changing fast and our technology is changing faster; the dynamics of this relationship between humans and technology is feared by many to change soon. The 'ROBOT apocalypse' as seen in science fiction can soon become reality for some aspects of our world, in particular, the job market. How do we save our jobs and therefore save our lives from such an event? Is this event even going to happen or is this just yet another false alarm? The legal applications for such an event are relatively unexplored and this is exactly what this paper delves into. We start off my understanding what such an event could look like by drawing parallels from history where similar speculation took place about our relationship with technology, i.e. the Industrial Revolutions. We discover how our current situation is much different from history and how we face a huge challenge to come up with public policy solutions and regulations to combat such an event. This paper takes up this challenge and discusses some ways in which technology governance can be changed and how a system of taxation might be our best bet to protect jobs while also not hindering the growth and progress of our society. The idea of such a tax has been discussed quite a lot, however, major concerns over its implementation have halted this discussion. This paper seeks to breathe a new life into the discussion by clearing up many concerns about such a taxation system and laying down foundations for a new governance system in the best interest of our society.

Keywords: Taxation System, Industrial, Robot

1. Introduction

We live in a cutthroat world where we are constantly put up to compete against one another to earn our place in society. This society has been designed in a way over time where we have to compete for our survival, an important part of which is competing for money and jobs. For the major part of human existence we have only had to fight against each other for these jobs. But something changed. Over time the introduction of better tools, development in machinery and technology has transformed our world in such a way that we now fear having to compete with more candidates for jobs. Interestingly, these candidates are no longer just other humans. Technology has taken up an important part in our society and with time this is only set to grow. So what lies ahead for the future of humanity? Let's first look at the past to get some answers.

2. The Past and Human Nature

Humans, ever since the stone ages, have been driven by a characteristic which is extremely counterproductive yet so brilliant that it is one of the main reasons for the development of the world we now live in. The human attribute of laziness is considered by many to be one of the most important human qualities throughout time. The early men,

tired of hunting with random objects, came up with new weapons to make things easier. The innovation of the wheel, also a product of laziness was made to make transport of goods easier.

This inherent quality of laziness and wanting to make things easier through innovation is how humanity reached where it is today. The industrial revolutions have marked the major periods throughout history where innovation was at its peak. New inventions, discoveries and upgrades changed the entire scene of an economy instantly. New industries being formed, old ones dying out, people learning new skills and the constant commotion in the job market. These are the transitions that have moulded are society and brought us where we are today. These industrial revolutions also signify times of employment uncertainty. People see technological advancements as a direct threat to their jobs and therefore a direct threat on their lives.

The popularisation of a capitalist structure in most societies perfectly incapsulates the human quality of laziness. Factories, farms or corporations, no matter what industry you talk about, the inheritance of capitalism has had a major shift on how they operate. Everyone everywhere is in competition with each other. A competition to earn money from whatever means possible. For producers this means increasing profits which can be done either by increase prices or cutting costs. The beauty of capitalism and the free market does not allow most producers to set high prices because of the amount of competition in the market. Firms in most industries are mere price takers from the consumers. So increasing prices is a no go, what about cutting costs? Many producers do try to cut costs wherever possible, this sometimes takes the form of sacrificing the quality of the product or cutting down on wages. This also doesn't work because it reduces the productivity of labour as well as reduces the value of the product. Since both these routes have some problems, producers now seek to improve profits in other ways. But what are these ways?

Efficiency was the solution to most of these problems. Introduced first by the 'father of civil engineering', John Smeaton, the concept of efficiency changed the game forever. Instead of cutting costs or increasing prices, firms now looked towards utilising the full potential of the inputs that they had. Increasing the productivity of labour as well as ensuring minimal losses and wastage in production led to higher and higher growth in profits for producers. Sounds good so far. Producers are happy because they are producing more and making more money and the consumers are happy because they get consistent goods at cheaper prices. So what's the problem?

Turns out that human labour is quite inefficient when it comes to most things. Not only do humans have limited capacity when it comes to their working and productivity. Humans get tired and often make mistakes, which is not the most ideal way to go about things when efficiency is your primary concern. Producers of goods and services have faced these problems from the very beginning. The interesting fact to note is that for the greater part of our history, producers did not do much about this troubling quality of humans. This was simply because they could not do much since there were no decent alternatives. They just went about their work because c'est la vie and work continued as usual.

Fast forward to the 1700s, the invention of the steam engine served the role of the missing piece in the puzzle of achieving efficiency. Within a hundred years the steam engine became a regular part of most industries. It first entered as a way to power ships. Later it started being used to power locomotives but eventually the steam engine became a key component of how factories were powered.

Larger machinery became more commonplace in many factories and production saw a massive boom. No longer were systems powered by water, wind, horses or men, deemed fit to keep up with the speed and efficiency of the steam engine powered machines.

Soon enough producers started to realise that they no longer needed a massive workforce, since a lot of the work was now being done by the machines. A large number of factory floorman lost their jobs to the mighty machine. In the pursuit of efficiency and productivity, factory owners were now able to cut loose the part that was holding them back.

So are machines bad? Is automation something to be feared? And will we all eventually lose our jobs to ROBOTs? These are some of the questions we will deal with in this paper. We are in the middle of a period, referred to by many as the fourth industrial revolution. The rapidly increasing viability of machines, programs, algorithms, and automation is taking us one step closer to a more technologically advanced future. We will discuss the issues revolving around this development and discuss one solution to a problem that we might face soon.

3. Follow up to the first industrial revolution

Despite what we discussed so far, the first industrial revolution is still known for the technological advancements that it brought along and not for the unemployment that followed with it. The simple explanation is that the phase of increase in job loses did not last very long.

Soon after the factory workers were let go, they explored new options and discovered a variety of new jobs for them to take up. A major role in the creation of new jobs is due to the very same thing that caused the job losses in the first place – the steam engine.

The steam engine brought with it an opportunity for people to sign up for jobs to compliment the work engine. These jobs although few in number initially, provided scope for labour to get technically skilled since these new jobs required certain skills and abilities that other jobs did not.

So, after the displacement of a huge amount of labour, some of them moved on to higher level jobs. But this still left a large amount of people without jobs. What happened to them?

In order to maintain their livelihood, the displaced labour was forced on to look for employment in other sectors of the society. Throughout the 19th century, a huge number of [1]workforce of the society migrated into the service sector. More and more people started entering professional jobs as well after enhancing their skills.

While manufacturing lightened up on its labour force, it was either reabsorbed into manufacturing as higher skilled jobs or they were absorbed into other industries and the service sector. So, overall there wasn't much of a problem caused by the introduction of the steam engine on the employment within the society. And therefore there wasn't any need to fear innovation or fear technological advancements. But can the same be said about today?

4. The present and the future

Ever since the first industrial revolution, technological advancements have been on a rapid rise. The previously static global economy now has to move around and create accommodations for these advancements. New technology comes in, some jobs are lost, but also some jobs are created. The employment structure of the society shifts around a bit but the world keeps moving forward. There has not been any substantial technological advance that has created a cause for concern regarding the employment status of the individuals in a society. Even after multiple industrial revolutions over centuries, change has always been welcomed and adequately dealt with. But something different is happening right now.

The introduction of computation and the invention of the computer proved to be the source of many changes for the global economy. As the computational advancements took place, development became faster but the world became more complicated. Computational innovation in the form of the creation of the internet influenced almost every industry in the global economy.

But still innovation has been happening and will keep on happening. And along with this innovation, the world will learn to shift and mould itself to accommodate these changes. So what seems to be the problem.

5. The tipping point theory

The concept of the tipping point is simple. Massive accumulation or advancement in something can often lead to a point where it exhausts the holding capacity of its environment.

The tipping point theory is massively popular mainly because of its observed application in various fields. We see the tipping point theory explain the process of global warming. It is also a popular belief among economists when discussing the reasons behind a recession. The theory has historical evidence from the first revolution, the great depression and the great recession. Rapid change or development in a particular thing over time ends up in incompatibility of the thing and its environment. From the first industrial revolution, we know that the small amount of innovation and development over multiple centuries set up the stage for the introduction of the steam engine to change the entire society. The innovation after the introduction of the steam engine took a back seat after a few more years of inventions. The development game calmed down for a while after reaching the tipping point. A central point of this paper is that the rapid development of computation and other technologies has once again pointed towards the possibility of a new tipping point. The rapid advancements has seemed to maxed out the ability of the job market to hold a position of substantial employment levels and now we might soon see the society reach the tipping point and live through its aftermath.

6. The fourth industrial revolution and employment

As of writing this paper, we are in the middle of what is considered by many to be the fourth industrial revolution. The increasing practicality and feasibility of using tools of automation in all sorts of industries is at the core of this industrial revolution. We have tools ranging from software and algorithms to pieces of machinery capable of replicating human functions in industries with a higher level of efficiency. We are currently at a very unique point in history where every decision we make about advancements will shape the future forever.

The problem with the fourth industrial revolution remains the same as earlier revolutions or times of innovation boom. The problem still is the potential threat to human jobs by these advanced tools. As we looked at before, the previous industrial revolutions initially seemed to be a bane for employment but ended up creating more jobs and helping the society by distributing labour to different industries. This time it's different. The fourth industrial revolution has within it the potential to take over the majority of the jobs in the economy. Not only does it have the potential to take over jobs, it might not have the ability to create new jobs for the average skilled person. So why is it different this time around?

The internet and other advancements in computation have made it possible for this new wave of tools to take over the job market. Algorithms and software has the ability to take over any industry because of how easily they can be changed to suit a specific industry making them extremely versatile. On top of this, these tools bring along with them the ability to learn new skills as and when the job requires it. They can also be used to do multiple functions at once, something which only humans were able to manage at this point. No industry is safe, whether it be manufacturing or service industry, these tools have the potential to take over every single position that they can be put into. All jobs up to middle management are in danger of being taken over by these tools.

The industrial revolutions of the past have mainly been focused on one industry at a time or rather just a handful of industries at a time. The tools which took over the jobs were very specific as in they were designed particularly for one function and one function only. Tools such as the steam engine had an impact on many industries but yet again, the steam engine was designed for a particular purpose.

This is why this time its different. Any unemployment caused by the previous industrial revolutions was under control precisely due to the fact that unemployment was concentrated in a handful of industries. The current tools of automation, with their ability to impact a large number of industries poses the threat of levels of unemployment so large and from so many backgrounds that society will no longer be able to handle it, thus reaching the tipping point.

The argument that new jobs will be created when these new tools take over human jobs is valid in theory yet it might not hold in practice because of a few key reasons. When these tools take over human jobs, any new jobs created would be work to compliment the tool's work. This means jobs of repairing and updating and upgrading these tools. The possibility of such jobs being created is also not certain because for all we know the future might hold the possibility of some tools tsking up functions of assisting other tools thus creating a hierarchical line of tools similar to the ones we have now for humans. But regardless of this possibility, if these new jobs do get created they would require an extremely high technical skill level for a person to get that job, which makes it even harder for the massive pool of unemployed people to seek for new jobs. The ability to reskill someone is limited to a certain extent and this might mean that a large number of the lowest class of workers, once unemployed would not be able to find new jobs.

Unlike the previous industrial revolutions, this time the newly unemployed people would not have an option to migrate to other industries in search of work because these tools that took over their jobs are capable of doing so in other industries as well. This leaves the people with no place to go in search of jobs.

These 'ROBOTs' are much more capable of displacing the job market than any other industrial revolution or innovation so far.

Now that we have concluded that these 'ROBOTs' pose a great threat to human jobs, let's try to understand what can be done to make sure that something like does not happen or if it does, then what might be the better way of handling the unemployment situation.

7. The Generation of the 'ROBOTs'

Based on what we have talked about so far, it is not hard to imagine a situation in the near future where industries start preferring 'ROBOTS' over human workers for more and more jobs as time goes on. In this situation, unemployment is on the rise and the lower skilled workers face the worst situations where they are no longer able to find jobs at a reasonable income level. So withing such a society it is clear to see that the rich, who own the industries or fill higher positions in these industries, get richer as a result of better productivity and efficiency of the industry at a lower cost because of the 'ROBOTS.' Whereas the poor lose jobs or are forced into jobs based on their skill level, leaving them worse off. This rising inequality within our society might prove to be a hindrance for progress.

Now that we know of this very real possibility, we must make a tough decision. We must decide whether this 'ROBOT'-induced development in the society counts as progress. The answer to this question will define how we look at this situation. If this development is indeed progress then there might not be much need to interfere with it. But if it is actually against progress then it means that someone must step in an introduce a change in this development.

8. The Question of Progress

We have already discussed how important it is for us to find an answer to the question of progress. It will dictate our the stance that we take against/for this development in our society. To figure out whether this development is or is not progress, we must first understand what it actually means to contribute to progress and we must understand what is the meaning of the concept of progress.

Progress is a complicated word to define. There exist a lot of definitions of progress based on the area of focus. The essence of the concept still remains that progress is the process of moving closer to a goal or objective. Based on the area of study, this goal and objective changes. Some consider the objective to be greater human welfare, which is opposed by some for being to anthropomorphic. The economic definition of progress defines the end goal or objective to be greater economic growth or the increase in the societies ability to produce higher quality output at a same or lower level of input. Within the context od this paper and the concept of 'ROBOTs' displacing humans from jobs in industries, we must come up with a definition of progress that fits both the aspects of the two

definitions mentioned above. This is because this unique case directly impacts the welfare of humans but at the same time also helps increase the economic output of the society.

Now let's assume that we only have two elements in a society- human welfare and economic growth. Progress according to a general policy making point of view and from the point of view of this paper must be looked at as the process of reaching the goal of increasing economic growth as well as human welfare where an increase in either one d[2]oes not result in a decrease in the other such that the decrease is not large enough to offset any potential in the future growth of that element.

The following definition of progress can be made from the context of public policy making and overall development of the society:

A state or process wherein a change causing an increase in either economic development or human welfare does not cause a decrease in the other element (human welfare or economic growth) to the extent of offsetting the possibility of a potential increase of that element in the future had the initial change not taken place is referred to as a state or process of progress.

Now that we have finally established what progress means in the context of this paper, we must decide whether the possibility of 'ROBOTs' taking over a large number of human jobs, contributes towards progress or not.

So what would it mean for the society when this situation arises. There are a lot of variables involved but we can still make solid assumptions about some events.

In the scenario where 'ROBOTs' become increasingly commonplace in many industries, two things are certain to happen. a) The increasing dependence on 'ROBOTs' to carry out a majority of the work in an industry would cause a situation wherein the owners or the people at high positions within an industry decide that they no longer need as large of a work force that they have right now. This will directly lead to a situation of mass unemployment. b) The increase in usage of 'ROBOTs' will lead to an increase in efficiency for industries and will also be the source of reduction in the cost of operations and production.

What do these two cases mean for the society at large. Let's have a look at the situation of wealth inequality within a society after the above mentioned events have taken place.

9. Reality of Inequality

To study the affect of the mentioned events on the inequality within a society, we must use tools like the Gini Coefficient to judge whether there is an increase in the levels of inequality.

Let's assume that the society is made up of 3 sectors based on income namely, the elite rich, the middleclass and the poor. We will study the inequality within a society by comparing the change in income levels of these sectors. We will now study these changes with the help of the Gini coefficient.

$$G = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n}|x_i - x_j|}{2n^2\overline{x}}$$

G denotes the value of the Gini coefficient. n is the number of observations recorded while making the judgment of inequality. In this case we have n as 3. All x_i represent the income level of each observation. X bar is the mean of all the observations. Now keeping these things in mind the above formula can be elaborated as:

$$G = \frac{|x_1 - x_2| + |x_1 - x_3| + |x_2 - x_1| + |x_2 - x_3| + |x_3 - x_1| + |x_3 - x_2|}{2 \times 3^2 \times \overline{x}}$$
$$= \frac{2(|x_1 - x_2| + |x_2 - x_3| + |x_3 - x_1|)}{2 \times 9 \times \left(\frac{x_1+x_2+x_3}{3}\right)}$$
$$G = \frac{|x_1 - x_2| + |x_2 - x_3| + |x_3 - x_1|}{3(x_1 + x_2 + x_3)}$$

All x_i in the equation are a measure of wealth with that particular segment. Therefore, we have:

$$x_1 < x_2 < x_3$$

Here x_3 represents the elite rich since this segment hold a huge part of the total wealth of the society. This wealth is larger than the wealth held by the middleclass who are represented here by x_2. The middleclass also hold a large part of wealth in a society which is less than the wealth held by the elite rich but still more than the poor who are represented here by x_1. Based on this information we can further simplify our equation:

$$G = \frac{x_2 - x_1 + x_3 - x_2 + x_3 - x_1}{3(x_1 + x_2 + x_3)}$$
$$= \frac{2(x_3 - x_1)}{3(x_1 + x_2 + x_3)}$$

This is the measure of inequality within a society with only three segments. This is of course the situation before any change. We must now study the impact of the previously mentioned events on this equation. We represent this situation after the changes caused by 'ROBOTs' taking over jobs in a society as G.'

$$G' = \frac{2(x'_3 - x'_1)}{3(x'_1 + x'_2 + x'_3)}$$

We can now make our assumptions about the events and their aftermath. The rapid increase in the usage of 'ROBOTs' in industries would mean an increase in efficiency as well as a reduction in cost of production/operations. This ultimately means that the people who own the industries or are situated at higher positions within these industries will experience a growth in their earnings thereby further increasing the level of wealth held by them within the society.

On the other hand, the poor as well as the middleclass will face massive unemployment from the 'ROBOTs' taking over most of their jobs. Within this unemployed pool which is a mixture of the middleclass and the poor, some people will still be at an advantageous position compared to others. This is because the increase in usage of 'ROBOTs' in industries and the subsequent unemployment will eventually result in creation of new jobs in new industries or increase in jobs in already existing industries. These new jobs in no way would be able to cover the massive pool of unemployed people in a society and moreover a shift in occupations for people or taking up these new higher-level jobs requires the people within the unemployed pool to go through extensive reskilling. This

opportunity to reskill themselves and compete for new jobs only lies with people who can afford to reskill themselves while being unemployed. This takes most of the people from the poor segment of the society out of the running for these new jobs. The middleclass still has enough resources to reskill themselves and compete for new jobs. This leaves the poor in a massively worse off situation than they were before and the middleclass in a situation which is more or less the same just slightly worse than before since the new jobs will be competitive and not the entire middleclass unemployed pool would find new jobs.

From all these observations we can compare and express the change in the income levels of each sector as follows:

$$x'_1 < x_1$$
$$x'_2 <\approx x_2$$
$$x'_3 > x_3$$

Using the above comparisons, we can say:

$$(x'_3 - x'_1) > (x_3 - x_1)$$
$$\Rightarrow \frac{2(x'_3 - x'_1)}{3} > \frac{2(x_3 - x_1)}{3}$$

The overall wealth in the society would be more or less the same since income is merely redistributed by the occurrence of these events. This can be seen by looking at the process of calculating national income of a country. According to that we know that National Income is a sum of the factor incomes paid out to the factors of production in the form of wages, rent, profits and interest. After the rapid increase in the usage of 'ROBOTs' in industries we see that the wages portion of the national income takes a massive hit since there is a lot of unemployment in the society. On the other hand, we also know that there will also be a substantial increase in the profits earned by industries. After these changes it appears as though the new national income is more or less equivalent to the old national income since the reduction from wages is offset by the increase in profits. Therefore we have:

$$x_1 + x_2 + x_3 \approx x'_1 + x'_2 + x'_3$$
$$\Rightarrow \frac{1}{x_1 + x_2 + x_3} \approx \frac{1}{x'_1 + x'_2 + x'_3}$$

Using all the previous equations we can say:

$$\frac{2(x'_3 - x'_1)}{3(x'_1 + x'_2 + x'_3)} > \frac{2(x_3 - x_1)}{3(x_1 + x_2 + x_3)}$$
$$\Rightarrow G' > G$$

Therefore we have proved that after the increase in usage of 'ROBOTs' the Gini coefficient would increase signalling towards an increase in inequality. Inequality is the perfect measure to study the balance between human welfare and economic growth. Therefore making inequality a perfect measure of progress. The more ineq[3]uality in a society, the less is the progress. And by proving that the discussed events would lead to an increase in inequality we can say that it will lead to a decrease in progress or go against progress.

Now that we know that this scenario would result in a situation that goes against progress, it is certain that we must do something to stop or control it in a way that does not restrict development but at the same time also does not reduce human welfare due to massive unemployment.

Before we look into the solutions to the problem, there is one last piece of the puzzle that needs to figured out to truly understand the problem. Throughout this paper we have been mentioning the term 'ROBOTs' while trying to explain the problem at hand of how these 'ROBOTs' can prove to be threat to human jobs and therefore to human welfare. We must find a proper definition of this term before going into any further ideation.

10. Ro-what?

To come up with a proper definition of what a 'ROBOT' is we must understand some of the key characteristics of these 'ROBOTs' that seem to be causing trouble to the idea of progressing human society. These characteristics are key in identifying and labelling something as a 'ROBOT.' We will now look at some of these characteristics

- A 'ROBOT' is automated

A 'ROBOT' carries out its functions without the need of human control or with minimal human interaction. Something which is not a 'ROBOT' would require a high level of human interaction or control.

- A 'ROBOT' is not a fixed medium

A 'ROBOT' is not necessarily a physical entity or in other words, a 'ROBOT' does not have a fixed form and can exist in countless forms or mediums. A 'ROBOT' can be a machine, software, algorithm or any other mean that satisfies the other qualities of being a 'ROBOT.'

- A 'ROBOT' has aptitude

A 'ROBOT' has aptitude or the ability to learn new commands and functions or has the ability to learn how to do the same task more efficiently. This also includes something as small as being able to handle a different input or type of input

- A 'ROBOT' is a perfect substitute

A 'ROBOT' is a perfect or near perfect substitute for a function performed by a human or a perfect substitute for a human. Something which compliments the work of a human is not a 'ROBOT.' Only when something does the same level of work as compared to a human or better, it is considered to be 'ROBOT.'

- A 'ROBOT' displaces labour

Something is only considered to be a 'ROBOT' when it displaces labour. As long as something can work alongside humans without replacing them, it is not considered to be a 'ROBOT'

These mentioned characteristics are what makes something a 'ROBOT.' This means that if a computational tool/medium possesses all of these characteristics then it can be termed as a 'ROBOT.' Now based on these we can come up with a definition for a 'ROBOT' and this definition can be used and applied in various places once we come up with a viable solution. The definition is as follows:

Any automated computational tool or medium in the form of a machine, software, algorithm or any other mean that possesses aptitude and the ability to operate as a close or perfect substitute for a function performed by a human, thereby displacing labour is termed as a 'ROBOT.'

Henceforth, any mention of the term 'ROBOT' in this paper shall be referring to this definition.

It is important to note that this definition only works for a certain idea of what a 'ROBOT' is or the idea of what we as humans face as a threat in terms of our employment status. This definition is inclined towards 'ROBOTs' which are computational tools. Advancements in technology that might not necessarily take the form of a computational tool are not considered here. Further, it also alienates certain tools that have an impact on unemployment such as a washing machine or a sewing machine or even software like Excel. The definition has specifically been designed to exclude such tools in a way that they do not meet all the elements of the definition. If there were a fully automated washing machine that had aptitude as in the ability to automatically make decisions, then it would fit the definition better. Excel on the other hand is a tool that compliments human work rather than substituting it thereby not being a substitute for humans and failing to match the definition.

Now so far we have defined what a 'ROBOT' is and we have come to the conclusion that a massive increase in the usage of 'ROBOTs' for jobs previously performed by humans is an actual threat. We have also concluded that this process goes against the idea of progress meaning that we must ensure that we somehow change this situation to reinstate a state of progress. We must now discuss some of the possible solutions to this situation.

11. Finding a Solution

Before going on to list the possible solutions on how to deal with this unique situation, we must clarify one thing. The objective of finding the solution is not to completely stop 'ROBOTs' from taking over human jobs as that is clearly interfering in natural development of how industries function. Instead our solution should be created in a way that simply slows down the usage of 'ROBOTs' in industries in a way that does not harm the industries too much but more importantly does not lead to mass unemployment instantly thereby causing a decrease in human welfare. The ideal solution must slow down the usage of 'ROBOTs' enough to give time for the society to deal with the unemployment situation by creating new jobs or reskilling people at a similar rate to the rate of unemployment. Here are a few possible solutions, we will discuss each of them in great depth to find the ideal solution to this situation.

- A 'ROBOT' Quota system
- A 'ROBOT'-human ratio system
- Ministerial intervention
- A 'ROBOT' taxation system

Let's look at each of these solutions and figure out how viable they are in the context of the problem we are facing.

- 'ROBOT' Quota System:
  The idea behind introducing a quota system is to set a limit to the number of 'ROBOTs' a company/firm can own a time depending on several factors related to the size of the firm. This measure will ensure that firms do not over use 'ROBOTs' in their organization. The quota will also set a limit to the amount of hours a 'ROBOT' can be operated or a limit on the amount of output created by a 'ROBOT.' This ensures that even after a firm employs some 'ROBOTs', it cannot carry out the entirety of workload just by using 'ROBOTs.' This slows down the rate at which 'ROBOTs' will become commonplace in industries and also slows down the unemployment rate since a few human employees would still be required to take on the workload because of the quota.
- 'ROBOT'-human ratio
  The idea behind a 'ROBOT'-human ratio is pretty evident from the name itself. It plans on imposing a ratio between either the number of 'ROBOT' and human employees in a firm or a ratio between the number of hours worked by 'ROBOT' and human employees in a firm. The key concept still remains the same, the ratio tries to limit the number or usage of 'ROBOT' employees within a firm. It ensures that at least some amount of humans are doing the work in a firm which is following the ratio. In order to employ more 'ROBOTs', a firm would have to employ more human workers as well.

Both of these solution seem like they could work but they have some key problems. The fact that not all 'ROBOTs' do the same type of work or the same amount of work, individual 'ROBOT' specific quotas will be needed to put in place. Since there is no limit to innovation, there is no limit to the number of 'ROBOT' types therefore making the job of setting quotas impossible because of the infinite number of combinations. As far as the ratio goes, a similar problem exists because of the infinite number of possible 'ROBOTs' which would have an infinite number of productivity combinations making the job of finding a ratio really hard. Even if the ratio is implemented on the number of hours worked by the 'ROBOTs' as compared to humans, it would still be extremely difficult to form a stable ratio since the efficiency and speed of different types of 'ROBOTs' would mean the requirement of different ratios.

- Ministerial intervention
  The idea behind this solution is to use bureaucracy and red-tapism to the advantage of society. The main

goal of this solution is to make all industrial 'ROBOT' related matters transfer to an appropriate ministry under the government of a particular country where in each firm has to follow a long process to employ 'ROBOTs' in their firms through this ministry. This makes the speed of making 'ROBOTs' commonplace, extremely slow thus giving more time for the society to solve the unemployment problem.

This solution also seems like it could work but whenever the government is concerned with matters of the industries it always means that there is always a chance of corruption. Apart from this flaw, the solution might work in an effective way to slow down the rate of increase in usage of 'ROBOTs'

- 'ROBOT' Taxation System

  The idea behind this is to build a taxation system around the usage of 'ROBOTs' in industries. The main goal is to increase the costs of industries by implementing a tax on some aspect of the usage of 'ROBOTs' within a firm. Not only would it make it harder for firms to completely shift to a 'ROBOT' workforce, it incentivizes the use of human labour by making it a little cheaper in comparison to the taxed 'ROBOTs.' This controls the unemployment level and makes sure that the employment situation in the society keeps track with the slowly increasing usage of 'ROBOTs.' In top of all this, this system has a unique advantage over all the other ones discussed before. Since this is a taxation system, this means that by using 'ROBOTs', firms will be generating tax revenue for the government. There is yet another point that warrant the use of a tax. Since human labour is taxed and 'ROBOTs' are not, firms have an increased incentive to opt for 'ROBOTs' over employees since they save on taxes as well as benefit from the recording 'ROBOTs' as depreciating assets and benefiting largely on the cost of the labour. A tax would ensure that this incentive goes away and it slows down the usage of 'ROBOTs'

Deciding on how to implement such a system is a hard task but it seems to be the best option out of the alternatives to ensure a steady rate of progress of human welfare alongside the already increasing economic development. We shall now discuss the viability and various aspects of how to go about this taxation system.

12. A Taxing Situation

Now that we have concluded that a 'ROBOT' taxation system is the best way to go about preserving progress of human welfare as well as not jeopardising the growth of economic development, we must delve deep into what the tax has to offer. There are a few key questions that we need to address before deciding whether this is a viable option to be practically implemented in real life. Here is a non-exhaustive list of questions whose answers will tell us a great deal about how the tax would function and how it would interact with the other elements in the society:

13. What exactly is this tax?

We have already answered this question but to summarize once again, The 'ROBOT' taxation system is a plan to impose a tax on the corporate/industrial usage of 'ROBOTs' that results in the displacement labour. The key use of this tax is to disincentivize the usage of 'ROBOTs' over human employees by making the cost of operating 'ROBOTs' more expensive. The tax also has another key motive which is to slow down the rapidly increasing usage of 'ROBOTs' in industries by an amount that gives enough time for the displaced labour to get reskilled and find new jobs or enough time for the creation of new jobs. There are a few nuances within how the tax would function which will be discussed through the other questions about the tax. After most of the key questions have been answered we may come up with yet another definition which would include everything about the tax in a easy to understand manner.

14. Who all are going to be taxed?

As discussed before, this tax would only be borne by firms whose usage of 'ROBOTs' has resulted in a displacement of labour or firms who have used a workforce of 'ROBOTs' instead of more humans to expand their output, this includes new firms and is essentially covering the situation where the usage of 'ROBOTs' does not lead to an actual displacement of human jobs but rather where the use of 'ROBOTs' has taken over potential

human jobs or in other words a situation where 'ROBOTs' are being used to do new or more tasks which could have been done by employing human labour. Only those industries will be taxed where there is already some sort of taxation in place, for example there is no tax on agriculture so implementing a 'ROBOT' tax would not be possible.

15. How to know whether use of 'ROBOT' has led to displacement of labour or the loss of potential labour opportunities?

This is a rather tricky metric to calculate since getting absolute numbers from multiple firms from multiple industries along with keeping track of loss of potential job opportunities is a huge task. There are two ways to go about this, both of them must be used simultaneously to get the most accurate data on the actual affect on labour and jobs because of the usage of 'ROBOTs.' We require these two methods because there are two parties involved in the process of hiring or displacing labour, namely the firms and the employees.

The role of Cost Accounting

In order to get the most data out of the firms, we must seek the help of accounting and enforce struct requirements for regular and thorough cost audits of the firms. Since cost audits are quite extensive, firm would be required to get a cost audit done on a yearly basis where a full record of payrolls and hiring of 'ROBOT' employees will be taken into account to calculate the displacement of labour caused by a particular firm over a given period of time. It will take into account the actual contribution of each 'ROBOT' employed by the firms and their direct impact on the output of the firm as well as the displacement of labour or reduction in requirements for potential labour

This method of collecting data about labour displacement has some shortcomings, the most major one being the problem of time. Since these cost audits will be done on a yearly basis, the actual displacement caused would only be known at the end of a cycle of a year which is quite a long time since it also means that a pool of unemployed people would be unaccounted for at least a year. This is a major problem and this is exactly why we need to compliment this method of data collection by a labour side approach as well.

The role of Worker's Unions

The basic ideas of the labour side approach is to get quick and accurate data about the labour displacement directly from the people who have been affected. This can be done by setting up major worker's unions. A key point to note is that this will only work out if this is implemented on a large scale. The best way to do this is to get these unions set up by the government itself to ensure a large-scale possibility of data collection as well getting important information about how to implement the tax by having the data about unemployment directly available to them. What do these worker's unions do? These workers unions have two jobs, we shall only discuss one of these right now and the other will be taken up later when we discuss how the tax is going to be used. So, the job of the unions is to collect data, it is essentially a place for people to sign up as a person who has either, a) lost their job directly because of direct termination of their employment cause by the hiring of 'ROBOTs', or, b) failed to find employment in an industry despite having the required skills or qualifications as an indirect effect of the usage of 'ROBOTs' in firms. The job of these unions is to collect this data and form a directory of this pool of unemployed persons.

A combination of both these methods will be essential in finding out the exact impact of the usage of 'ROBOTs.' The cost auding gives us a detailed report on how exactly 'ROBOTs' are causing a displacement in labour or reducing the employment opportunities in different industries over a given period of time. Whereas the worker's unions gives a quick estimate of the unemployment situation caused by 'ROBOTs' at a given point of time.

By using these methods of finding out whether a firm has displaced labour or not ad this data would then be used to ascertain whether a firm is to be taxed or not.

Some Auxiliary services required to make the taxing system more efficient

An important part of the whole need for a taxation system is to slow down the increasing pace of the usage of 'ROBOTs' in industries. This slow down is essential to ensure that the people who lose their jobs have enough time to get reskilled and find better jobs. In order to further slow down the speed of this development we must look towards the crown jewel of Indian administration, the sluggishly paced bureaucratic system of Indian government. This can be an essential part in slowing down the growth. By making it compulsory for all firms to get permits and licences for every unit of 'ROBOT' they plan to employ for their firm. This will massively slow down the pace at which 'ROBOTs' become commonplace and therefore will give enough time for people to find new jobs.

16. When and where to implement this taxation system

This is a complicated question primarily because of the amount of choices. Let's focus on the question of timing. There are mainly two ways to go about planning on when to implement the tax, a) when major shift in unemployment happens, or b) as soon as possible. Both of these options have their advantages. The industries and firms would prefer delaying the implementation of the tax to protect their own interests. There is a valid argument that we should only implement this tax once we know there is an actual need for it which would be signalled by a shift in the unemployment levels. This poses another question:

Will it be too late?

Short answer, we don't know but we should not take a risk. If we were to delay the implementation of the tax until there is a large enough shift in the unemployment levels then there might be some complications. The primary complication is that a huge amount of unemployment local to a specific industry might take place and might go unnoticed since it is won't be enough to cause a substantial change in the overall unemployment levels to signal a change however the people losing their jobs from that industry would have to face unemployment without much aid. Therefore it would be too late to save these people from a world where they lose out to 'ROBOTs' and now have to loo for other modes of employment.

Now, this means that the more affective way to go about implementing this taxation system is to roll it out as soon as possible. There is not much scope for something to go wrong if we were to implement it now. The firms would only have to pay if they employ 'ROBOTs' instead of humans, the firms that don't do so will not be affected. There is no downside to this approach.

Now that we have discussed the timeline of the implementation of this taxation system, let's focus on where this should be implemented. This refers to the question of somehow rolling it out in various countries all at once or by implementing it locally and taking it one country at a time. This is not too important of a question but there are still some complications that need to be discussed. The main concern from the point of economics is that once such a tax is imposed in one specific country, it makes it harder for foreign investment to come in since the cost of production within that country becomes higher. Someone would rather invest in another country that does not have the tax. This is not as easy as it sounds since there are many factors to consider but there is another point to consider. After implementing this tax, it is natural to expect the firms to transfer some of the tax burden onto the consumers, thus making their output more expensive. This means that it becomes easier for companies to import goods and sell it at a cheaper rate since they don't have to pay for the extra tax. This is only possible if the custom duty is low enough and static enough for someone to take advantage of this opportunity. These are very specific conditions and might not be close to what a realistic scenario might look like but it is extremely important to discuss such situations to avoid worse situations in the future by being prepared. On the other hand, trying to roll out a tax over multiple countries is a near impossible task. Since most countries have unique tax laws and industrial rules and regulations as well as custom duties, it becomes incredibly hard to pull off a large scale rollout of such a tax over multiple countries.

Now we must discuss the most important aspect of this taxation system:

17. How to tax and how to calculate the tax?

This is perhaps the most complicated and difficult question to answer in this entire paper. How do we even begin to start planning a way to tax such things that do not have any specific form, do net have any specific use and do not have any specific productivity levels. The sheer variety in what a 'ROBOT' can be and what sort of function it can perform as well as what kind of impact it has on the output on an industry is what makes this a challenging question.

To fully answer this question to the best of our ability we mus5t divide into various parts which might be easier to handle at a time. These parts are:

- What is the nature of this tax (Direct/Indirect)?
- What element of a firm's operations is being taxed?
- What are the internal factors within a firm that affect the calculation of the tax?
- What are external factors that affect the calculation of the tax?
- How often is the tax to be charged?
- Miscellaneous questions

We shall now look into all these questions and try to answer them in a way that might be useful in understanding the overall tax.

Nature of this tax:

Both possible solutions to this question, direct and indirect, have a decent amount of claims to back their stand. Indirect taxes are taxes which are imposed on goods and services in a way that they are paid by the consumer by applying a tax on top of a good/service market price. Popular examples being GST or VAT. Direct taxes on the other hand are paid directly by the entity on whom the tax is imposed. Common examples being income tax and corporate tax. The rationale behind imposing an indirect tax is to increase the market price of the good/service, therefore making it more expensive for the consumers and ultimately driving down demand for the product because of the increased price. This decrease in demand is how the firms and industries bear the burden of the tax. On the other hand, direct taxes, especially on firms and industries, impose a tax on the earnings of the firms which is to be borne by them. Firms might offset some of this burden by increasing the price of their good/service but like we discussed before, that too brings down the demand for the firm's output. Since the purpose of this tax is to disincentivize the use of 'ROBOTs' by firms, the tax should ideally be such that the maximum burden is borne by the firms rather than the consumers. This leads us to the conclusion that a direct tax is much more suitable for our 'ROBOT' tax. Another interesting point to note is that choosing a direct taxation system makes it easier to properly implement such a tax since direct taxes are calculated on the overall earnings of a firm. On the other hand, indirect taxes are complicated to apply since there is a huge variety of goods/services upon which the tax is calculated which might lead to inaccurate or underwhelming results. Therefore, the route of a direct tax is the best way to proceed.

What element is to be taxed:

As discussed in the previous point, choosing a direct tax policy means implementing the tax to be calculated on the overall earnings of a firm. Now the question is, what exactly is the element upon which the tax rate is based on? Once again, we have a few options. We can either proceed with calculation from a firm side approach or a 'ROBOT' side approach. A firm sided approach would take the form of calculating the tax based on either, the net increase in production value or the net increase in profits. Both of these shall be calculated by measuring the increase in production value or profits due to a increase in the usage of 'ROBOTs' (work hours or number of units). We are essentially interested in understanding the change within the operations of a firm due to the employment of more 'ROBOTs.' This does follow up with a question of as to

how to quantify something like that and the answer to that is simple and we have discussed this before. Calculating such metrics may not be a huge task for most firms. They shall make an assumption (just like in the case of any tax) and pay their dues accordingly. Any discrepancies shall be brought up and penalised during the regular cost audits which are an essential part of the working of this tax system.

The other side, namely the 'ROBOT' side approach looks at how much work is being done by a 'ROBOT' a rate of interest. One way to get this done is to maintain a record of how many hours of work is done by a 'ROBOT' during a given period of time, and referencing that with its contribution to the output of a firm, and finally finding out a rate at which it shall be taxed on an hourly basis. This tax rate is now applied to all other same or similar 'ROBOTs' working in a firm or industry. Quantifying this should also not be a big effort as discussed below due to the constant and regular mandated cost audit of firms.

The firm side approach works but it has one key problem, since it only looks at the net increase in output due to an increase in 'ROBOTs.' The way in which this would be calculated would alienate the fact that the firm might be employing different types of 'ROBOTs' with different levels of productivity. Since it is comparing the output or profits of two different time intervals and comparing them to figure out the increase caused by 'ROBOTs', it does not take into account that this increase may have been caused by different types of 'ROBOTs.' The 'ROBOT' side approach works quite nicely since it overcomes this hurdle. By quantifying the output per hour ratio of a type of 'ROBOT', it can be implemented only on similar 'ROBOTs' whereas a different type would have its own ratio. This is a tailor made system to figure out a tax rate suitable for each and every 'ROBOT.'

Important internal and external factors to consider:

The main important factor is the displacement of labour caused from within the firm. An ideal tax should take into account the level of change in the employment structure within a firm or industry to figure out a perfect tax rate.

Externally, it is important to measure the level of displacement happening in the society as well as within the same industry as the firm being taxed. This gives us an overall sense of where the societies unemployment conditions are at.

To figure out the tax rate, one key component must be some sort of a ratio between the displacement of labour within the firm to the displacement in labour outside the firm. A firm that is displacing a proportionately higher amount of labour than the industry or society should ideally be taxed more and a firm with a proportionately lower amount of labour displacement should be taxed lower.

Time intervals and tax cycles:

Similar to how a corporate tax is charged on firms by the government, the 'ROBOT' tax will essentially follow the same timeline and tax cycle just with a few extra details pertaining to how the tax (to be submitted) is to be calculated.

Here is the a brief overview of how the tax cycle of 'ROBOT' tax would look like:

- Firms must be mandated by law to go through thorough cost audits on an annual basis. This will provide them essential data based on which they would have to calculate the tax
- Firms must make their tax payments at the end of every quarter. Since the cost audits only take place annually, firms must estimate their tax payments at the beginning of the financial year. These estimates may be based on the latest available cost audits. The estimate shall be distributed equally over the quarters.
- Firms must adjust their estimates at the end of each quarter and submit a revised payment based on any changes made in the usage of 'ROBOTs' within the firm.
- At the end of the financial year, firms must now tally their quarterly payments with the latest cost audit to see the deviation. If less than 90% of the actual payment (as revealed

by the audit) has been submitted over the quarters, then the firms must pay an extra interest on their dues.

- Firms may also file tax returns at the end of the financial year in order to rectify overpayment or underpayment of tax.

Use of tax revenue:

As discussed earlier the purpose of the tax is to slow down the usage of 'ROBOTs' in industries as well as collecting tax revenue. This tax revenue serves an important purpose. The tax is levied as a direct response to rising unemployment from industries and this unemployment is precisely the reason why we need tax revenue.

The pool of unemployed people still serves an essential purpose in the society. They must use the opportunity of their unemployment to look for jobs in other sectors or newly created jobs. However, as we stated before, entry into these newly created jobs or a change in job in general requires some amount of reskilling on part of the unemployed people. Now, the poor sections of society as well as the middle class may not have enough support to either stay unemployed or reskill themselves and end up getting lower paid jobs leaving them worse off. This is exactly where the tax revenue comes in play. The government through the collection of this 'ROBOT' tax ensures that some part of the benefit enjoyed by people employing 'ROBOTs' also reaches the ones who lost their jobs. The government must decide a level of support that shall be given to these unemployed people. This will be done through the previously mentioned worker's unions. All the tax collected from industries for the employment of 'ROBOTs' will ultimately be given to the unemployed which provides them the opportunity and time to reskill themselves or sustain themselves while they look for another job

So all in all, with the implementation of this tax we have managed tpo make it more expensive for industries to employ 'ROBOTs', which in turn reduces the speed of their increase in usage in order to give enough time for new jobs t be created and for the unemployed to find jobs. We have now further improved the situation by allowing these unemployed to reskill themselves and wait for better jobs through the tax revenue collected.

So now that we have discussed the details about how the tax functions, let's finally define what it is and compile everything we have discussed so far to create a sufficient formula for the calculation of the tax:

Now lets focus on how a tax rate is to be calculated (To bear in mind that this is a proposed formula for the taxation system that taken into account several factors. There might be scope for improvement within this formula):

The Industrial 'ROBOT' Tax is a taxation system to redistribute the benefit from the use of 'ROBOTs' to compensate the unemployment induced by the usage of 'ROBOTs' in industries. The tax is calculated based on a formula derived from factors including, the productivity of a 'ROBOT' and the level of labour displaced.

The revenue collected from this tax shall be applied to provide support for the unemployed to get reskilled in order to further increase the process of progress.

This tax formula is designed in such a way that it provides the exact amount payable by a firm to the government. It mainly has three components:

$$T_R = t(o_1 - o)$$

This is the taxation formula for an individual 'ROBOT' and as discussed earlier this will be based on the productivity of the 'ROBOT' and taxed on the increase in output. Here, t is the tax rate to be levied on a particular 'ROBOT' and $(o_1 - o)$ is the change in output of the particular function performed by the 'ROBOT.' The essential meaning behind this is to only tax the amount of output that has increased due to the employment of a 'ROBOT.' This is why we only levy the tax on the change and not the gross value. Let us now look at how we define the value of t:

$$t = \begin{cases} slab_2 & ;if \quad \left[\frac{(OPH_1 - OPH)}{OPH}\right] > \left[\frac{O_1 - O}{O}\right] \\ slab_1 & ;if \quad \left[\frac{(OPH_1 - OPH)}{OPH}\right] \leq \left[\frac{O_1 - O}{O}\right] \end{cases}$$

$$where, OPH = \frac{Value\ of\ Output}{Time}$$

Here, OPH stands for output per hour and measures the productivity of a 'ROBOT.' There are two tax slabs which depend on the productivity if the particular 'ROBOT.' If the change in output per hour after the employment of a 'ROBOT' is greater than the change in the Output of the firm, here represented by $\left[\frac{O_1 - O}{O}\right]$, then a greater tax slab must be levied on the 'ROBOT.' This is essentially implemented in such a way to ensure that a more productive 'ROBOT' is more expensive for industries since more productivity means more gain realised from the displacement of labour and employment of 'ROBOTs.' The $slab_1$ and $slab_2$ can be anything that the government deems fit. For example: $slab_1$ can be 30% and $slab_2$ can be 70%. These tax slabs need to be chosen in a way that works for the government of a country given the situation of the society, need of the tax and resistance from industries.

Now, this has all been for calculating the tax amount for an individual 'ROBOT.' We must now come up with a formula for the calculation of tax for the entire firm:

$$T_F = \mathcal{D} \sum_{i=1}^{n} (T_{R_i})$$

Here, the summation calculates the sum of tax charged on the individual 'ROBOTs' employed by a firm. $\mathcal{D}$ in the formula represents the coefficient of displacement which is defined as follows:

$$\mathcal{D} = 1 + \left(\frac{d_F - d_S}{d_S}\right)$$

Where, d_F is the measure of the labour displacement ratio within the firm and d_S represents the measure of the labour displacement ratio in the entire society. The reason for adding the coefficient of labour displacement is to incentivize firms to employ less 'ROBOTs' than the other firms in the society. If the displacement caused from within the firm is greater than the displacement in the society, this would make the coefficient of labour displacement greater than 1 meaning that the firm would have to pay a greater amount of tax as an extra compensation for the extra labour displaced by it. Similarly a firm who displaces less labour than the society ratio would have to pay a lower amount of tax because their displacement coefficient would fall below 1. It is also important to notice that if a firm does not displaces any labour, it would make its coefficient zero therefore allowing the firm to not pay any taxes since they did not displace any labour.

So now finally we have the formula for calculating the tax amount to be paid by a firm as:

$$T_F = \left[1 + \left(\frac{d_F - d_S}{d_S}\right)\right]\sum_{i=1}^{n}(T_{R_i}) \quad or \quad \mathcal{D}\sum_{i=1}^{n}(T_{R_i})$$

This is the 'ROBOT' tax.

18. Some issues and grey areas

Just like any public policy, this too is not perfect. There are some areas where it is hard to implement this tax. The tax works best for formal sector jobs, mainly because of the systematic nature of record keeping as well as the status of the employees or labour. Even in formal sector jobs, it is hard to implement this tax in gig based jobs where the people working are not actually termed as employees. These people can still avail the unemployment benefits through worker's unions and the tax can be charged on the companies but the implementation is a little tricky as compared to formal sector jobs. Same goes for freelancing jobs, it is extremely hard to implement the tax on the freelancing industry, mainly because there is no specific firm on whom the tax can be levied. Maybe this is a situation which the tax cannot cover and requires some additional support. Entrepreneurship might be another sector that might go under the radar of this tax. These are not impossible scenarios to overcome and do not negate the actual usefulness of the 'ROBOT' tax. They are a few exceptions that lie outside the reach of the taxation system. In some specific areas such as India, it is hard to implement any sort of tax on a sector such as the agriculture industry. This industry does not have any tax levied on it and remains an industry with great potential for 'ROBOT' use. However the unwillingness of the government cannot be changed easily making this sector unreachable in India.

Despite these challenges, the 'ROBOT' tax is applicable to a huge amount of industries and would be in the best interest of workers.

19. Where do we stand

We have been able to discuss and conclude that the increasing development and usage of 'ROBOTs' goes against the idea of progress which is why there is a need for intervention. We successfully formed a definition that satisfies the idea of what a 'ROBOT' is in the context of this paper. We further formed a proper model on the implementation and use of the taxation system and defined the way in which the tax amount is to be calculated by firms.

Overall, it is evident that 'ROBOTs' pose a threat to a huge number of humans who work in low to middle level jobs and this threat is big enough for action to be taken in the form of the 'ROBOT' tax.

The 'ROBOT' tax is a necessity and the time to implement it is now. No longer is this threat in the distant future. We must act quick and act smart to develop this system in a way that benefits society as a whole.

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