



The internal workings of Chat-GPT visualized as a Tron-style animation with lots of bright lights, colors, grids, and lens flares, by Stable Diffusion via NightCafe

I think: *this is an occasionally hallucinatory conventional-wisdom generator:*

I gave Chat-GPT a prompt:

Write a 1000 word New York Times-style op-ed in the style of Brad DeLong about productivity growth, making four points:

- *First, worldwide productivity growth was relatively stable at an average of about 2% per year from 1870â€“2010 as a tremendous expansion in the STEM research-and-development workforce was offset by the harvesting of the low-hanging technological fruit.*
- *Second, the ramping up of the STEM research-and-development workforce is likely to soon reach its limits without a major reconfiguration of what world governments do, hence, the rate of growth is likely to decline.*
- *Third, the 2% per year, productivity growth of 1870 to 2010 was not enough to lead us to focus effectively on living wisely and well. Rather, the problems of equitably distributing and beneficently utilizing our material wealth continue to flummox us.*
- *Fourth, the arrival of global warming will derange economies and societies. Hence the next 50 years are likely to see a world much richer than the last 50, but one that is significantly less happy and suffers significantly more in the way of human-caused catastrophe.*

Its response, with the pieces that it added in **bold**:

In recent years, there has been much discussion about productivity growth and its role in driving economic development. While it is true that productivity growth has been a key driver of economic growth over the past century, it is important to understand that this growth has not been constant or evenly distributed. In fact, worldwide productivity growth has been relatively stable at an average of about 2% per year from 1870 to 2010, with a tremendous expansion in the STEM research-and-development workforce offset by the harvesting of the low-hanging technological fruit.

The first point to consider is that the 2% per year productivity growth seen from 1870 to 2010 was driven largely by the expansion of the STEM research-and-development workforce. **This expansion was made possible by the growth of educational institutions and the rising number of people with advanced degrees in science, technology, engineering, and mathematics. As a result, new technologies and innovations were developed at a rapid pace, driving productivity growth.**

However, as the second point to consider, this expansion of the STEM workforce is likely to soon reach its limits without a major reconfiguration of what world governments do. **In order to continue to drive productivity growth, we will need to**

- **Fourth, the arrival of global warming will derange economies and societies. Hence the next 50 years are likely to see a world much richer than the last 50, but one that is significantly less happy and suffers significantly more in the way of human-caused catastrophe.**

Its response, with the pieces that it added in **bold**:

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However, as the second point to consider, this expansion of the STEM workforce is likely to soon reach its limits without a major reconfiguration of what world governments do. **In order to continue to drive productivity growth, we will need to reconfigure our research and development systems, invest in new and emerging technologies, and encourage more collaboration between the private sector and government. This is not only a task for government but also for companies and private organizations. Without these changes,** we can expect productivity growth to decline.

The third point to consider is that even with 2% per year productivity growth, we have not been able to effectively focus on living wisely and well. **While the growth in productivity has certainly brought many material benefits, it has also created significant challenges** in terms of equitably distributing and beneficently utilizing our wealth. **We still struggle with poverty and inequality, despite having more resources than ever before. Additionally, the growth in productivity has not necessarily led to greater happiness or well-being for individuals and communities.**

Finally, the fourth point to consider is that the arrival of global warming will derange economies and societies in the next 50 years. **Climate change is already causing significant disruption to weather patterns and ecosystems, and it is likely to only get worse in the coming years. This will have severe economic and social consequences, affecting everything from food production to infrastructure and human health.** As a result, the next 50 years are likely to see a world much richer than the last 50, but one that is significantly less happy and suffers significantly more in the way of human-caused catastrophe.

In conclusion, productivity growth has been a key driver of economic development over the past century, but it is important to understand that this growth has not been constant or evenly distributed. To continue to drive productivity growth and to address the many challenges facing our societies today, we must reconfigure our research and development systems, invest in new and emerging technologies, and encourage more collaboration between the private sector and government. Additionally, addressing the problems of equitably distributing and beneficently utilizing our material wealth, and **tackling the global warming challenge, must be our priorities for the next 50 years.**

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But it had not gotten up to a full 1000 wordsâ€”it had only gotten up to 500. So I nudged it again:

continue your discussion to a full 1000 words:

And it essentially freestyled:

While productivity growth has been a key driver of economic development, it is important to recognize that it is not a panacea for all of our problems. In fact, it has created some of its own challenges, and it is unclear whether it will be able to continue driving economic growth in the future.

One of the biggest challenges created by productivity growth is the issue of income inequality. As productivity has increased, the benefits have not been evenly distributed across society. Instead, they have been concentrated in the hands of a small elite, leading to a widening gap between the rich and the poor. This has led to increased social unrest and political polarization, as well as a host of other social problems. Additionally, It can lead to an unhealthy society where people who donâ€™t have access to resources and opportunities to participate in economic growth, can have negative externalities on the overall economy.

Another challenge created by productivity growth is the issue of job displacement. As automation and other technological advances have increased productivity, they have also led to the displacement of millions of workers. This has led to increased unemployment, underemployment, and a host of other social problems. Additionally, the changes in the economy, such as gig-working and short-term contracts, have resulted in a less secure employment for a significant part of the population. Itâ€™s important to consider how the government and private organizations can address and mitigate these issues, for example, through retraining programs and policies that support secure employment.

A third challenge created by productivity growth is the issue of environmental degradation. As economies have grown and productivity has increased, we have seen a corresponding increase in carbon emissions and other forms of pollution. This has led to global warming and other environmental problems that threaten to undermine economic growth and human well-being. Tackling this issue will require a concerted effort by governments, the private sector, and individuals to reduce our carbon footprint and invest in cleaner, more sustainable technologies.

In order to continue to drive productivity growth and address these challenges, we will need to rethink our approach to research and development. As we have already seen, the expansion of the STEM research-and-development workforce has been a key driver of productivity growth in the past. However, it is unclear whether we can continue to rely on this model in the future. Instead, we may need to reconfigure our research and development systems to focus on areas like renewable energy, green technologies, and other forms of clean innovation.

Additionally, governments have a key role in setting up policies and regulations that encourages companies to invest in research and development, and to facilitate the technology transfer and commercialization. For example, tax incentives or subsidies for research and development, intellectual property rights protections, or research collaboration agreements can incentivize the private sector to invest in research and development.

Another important step that governments can take is to invest more in education and training programs. As more and more jobs are automated, it will be essential to ensure that workers have the skills and knowledge they need to succeed in the new economy. Additionally, investing in education can have positive externalities in the overall economy by increasing the number of people with advanced degrees and increasing the number of people working in STEM fields.

In conclusion, productivity growth has been a key driver of economic development over the past century, but it is important to recognize that it is not a panacea for all of our problems. It has created some of its own challenges and it is unclear whether it will be able to continue driving economic growth in the future. In order to continue to drive productivity growth and address these challenges, we will need to rethink our approach to research and development, invest in education and training programs, and consider the role of government in driving innovation and mitigating the negative effects of productivity growth.

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As I said: *an occasionally hallucinatory conventional-wisdom generator*. After all, what else could it possibly be? Chat-GPT looks back at up to 4000 tokens (maybe 3000 words?) in the prompt(s), and then, probabilistically, it selects the next token to output. It was trained on half a trillion words, and it has 175 billion connection weights between nodes.

And yet how it is wired together is not obvious to me, and it is not obvious why its wiring is the right wiring for us to be trying to build.

For example, when I feed it *the quick brown fox jumped over the lazy*, its response is not â€œdogâ€œ, period, followed by something else. It is:

The phrase "the quick brown fox jumped over the lazy" is a well-known sentence that is used to test the quality of typefaces. The sentence uses every letter of the English alphabet, making it a good sentence to test the completeness of a typeface. The sentence is also commonly used as a typing test and as a sentence that can be used to test the autocomplete function of a word processing program.

First, this is wrong. â€œThe quick brown fox jumped over the lazyâ€œ is not a sentence. It is not well-known. It is not used to test the quality of typefaces. All of those are true not of the prompt but of â€œThe quick brown fox jumped over the lazy dog.â€œ

What is right is that â€œThe quick brown fox jumped over the lazyâ€œ can be used to test the autocomplete function of a word processing program. And, as autocomplete, Chat-GPT has just flunked.

It is pretty clear to me what Chat-GPT did here:

- It thought â€œThe quick brown fox jumped over the lazyâ€œ is almost the same as â€œThe quick brown fox jumped over the lazy dogâ€œ, so I will say the things that usually follow â€œThe quick brown fox jumped over the lazy dogâ€œ
- There are some occurrences of â€œThe quick brown fox jumped over the lazyâ€œ which are then soon followed by â€œtest the autocomplete functionâ€œ and â€œword processing programâ€œ, so I will output that as well.

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Chat-GPT Prompt Book: <https://docs.google.com/presentation/d/17b_ocq-GL5lhV_bYSShzUgxL02mtWDoiw9xEroJ5m3Q/edit#slide=id.gc6f83aa91_0_79>

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