

The Impact Of COVID-19 On the Economy of Selected Developed Nations

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ABSTRACT: The COVID-19 pandemic is an unprecedented event that has shocked economies worldwide, propelling large-scale adaptation of expansionary policies. This paper examines how, specifically in the scope of developed countries, key economic indicators such as tax revenue and burden, labor force participation rate, and federal budget have been impacted by the pandemic. The specific nations examined in the paper include the United States of America (USA), Japan, Germany, France, and the United Kingdom (UK). The article reveals that tax revenue had fallen at a rate similar to the GDP, and a redistribution of the tax burden has also occurred to some extent. Simultaneously, a fall in the labor force participation rate and increased government deficit were observed. This observation is primarily consistent across all five countries sampled.

KEYWORDS: Economics; COVID-19; Indicators; Developed Nations; Impact.

■ Introduction

The novel Coronavirus (COVID-19) was first identified in Wuhan, China, in December 2019. Since then, the highly infectious virus spread internationally, resulting in its status as a pandemic determined by the World Health Organisation (WHO) on the 11th of March 2020. The virus has spread to 231 countries and caused 6.9 million deaths as of May 2023. Due to various factors, such as population density, the presence of COVID-19, and inappropriate responses, various developed countries suffered substantial damages. The United States (US) has seen 107 million cases, of which 1.16 million people died due to the virus. The UK has seen 24.6 million patients with approximately 225,000 deaths.¹

Naturally, when considering patient numbers, there is an undoubted deviation from the original patterns experienced by the economies in question. Non-pharmaceutical government interventions such as travel bans and quarantines only further slow economic activity as human mobility and business operations are significantly reduced.^{2,3} In the second quarter of 2020, for example, the United States of America saw an 8.9% fall in gross domestic product (GDP). In the same quarter for the United Kingdom, a 21.4% drop in GDP was observed compared to their 2019 average.⁴

To combat the effects of the pandemic on the economy, countries adopted both fiscal stimulus packages and monetary policies, which varied greatly depending on the nation.⁵⁻⁷ Monetary policies adopted by most nations come from policy rate cuts and reserve ratio requirements.⁸ However, the effect of the monetary policy adopted appears to vary in effectiveness and impact across different countries and circumstances.⁹ There needs to be more research on the economic implications of COVID-19 and monetary policies adopted in developed countries. The economic effect of COVID-19 must be quantified in the form of economic indicators so a better understanding of its effect on society can be achieved.

This paper aims to address the aforementioned gap and achieve the above theoretical objective through a cross-country examination of five highly developed economies: the USA, Germany, Japan, the UK, and France. These countries were chosen for being large economies and being known as well-developed nations. The paper will evaluate how various economic indicators have changed due to the pandemic. Due to the present lack of work on this topic, the article intentionally takes a generalist approach to establish the groundwork and invite further discussion into similar or related research for the future. Furthermore, only developed countries are selected to reduce variation and minimize confounding variables for reasons other than COVID-19 when analyzing the study results. Studies on developing countries have been done, and different hypotheses have been formed about them in other research.

The economic indicators analyzed are tax-related statistics, labor participation rate, and the federal budget. It is hypothesized that developed countries would see a significantly lowered contribution of tax revenue to the GDP, lower tax received from personal and corporate tax, a drastically reduced labor participation rate, and a significant deficit in the federal budget. The hypotheses were formulated considering the widespread loss of jobs that in the middle of 2020 had cumulated the equivalent of 525 million working hours due to various measures such as lockdown and quarantine.¹⁰ Loss of hours of employment directly translates to lower income, economic activity, and real output, leading to the hypothesis.

■ Review of Related Literature

Many researchers have examined the changes to various economic variables during the pandemic. Examples include research on the relationship between central bank independence and the degree of expansionary policy adopted, as well as the role of the informal economy in impacting the size of fiscal packages.^{11,12} In this instance, the role of factors on a constitutional level, such as federalism, and its impact on the size of fiscal packages are also investigated.¹³

Various cross-country examinations of the impact of policy-making have also occurred. The relationship between whether selected Mediterranean countries were part of the EU and their recovery following the pandemic revealed that countries not part of the EU struggled to achieve successful recovery.¹⁴ Indexes have analyzed 168 countries and measured the fiscal, monetary, and exchange rate policies during the pandemic.⁷

Some research has also been done regarding the three key indicators discussed in this research during the pandemic. As measured by the uncertainty avoidance index, a country's degree of uncertainty avoidance is directly proportional to the decrease in labor participation rates.¹⁵ Research into the tax burden has also revealed that variables such as income per capita and foreign trade volume correlate statistically and positively with the tax burden.¹⁶ However, government budget research has not been significantly undertaken since the pandemic.

Finally, some research papers have investigated the direct effects of the COVID-19 pandemic. Containment measures and their impact on quantifiable indicators such as air traffic sought to examine the effects of COVID-19 pandemic responses on the economy.⁸ Other papers investigated topics indirectly related to the economy, such as the effectiveness of contact tracing by calculating fatality rates and bias toward preferred vaccines due to country-of-origin vaccinations.^{17,18} While these may not directly connect to economics, their conclusions still relate to the state of the economy post-pandemic.

■ Methods

Data:

This paper will examine key economic indicators for the following five countries: the US, Germany, Japan, the UK, and France, among the most developed economies in the world. The indicators to be analyzed in this paper include tax revenue and rates, the labor participation rate, and the state of the national budget. These indicators have been chosen due to a lack of present research and their significant role in revealing the state of an economy. Tax revenue is presented as a percentage of the real GDP or the tax-to-GDP ratio. The unemployment rate is defined as the ratio of people currently without a job but actively looking for one to the total working population. The GDP utilizes real GDP to prevent skew as a result of inflation. The size of fiscal policy responses will likewise be presented as a percentage of the real GDP. The state of the national budget would be presented as either being in deficit or surplus and the amount.

Data concerning tax primarily comes from OECD's Revenue Statistics 2022 and 2021, which provides crucial details regarding both amounts of tax gained during the pandemic period of various nations and how the tax is allocated or contributed. The database contains highly detailed explanations of various statistics and ratios contained within. It simultaneously provides graphical representations for various related statistics on a cross-country basis, facilitating easy comparison. However, a limitation of the database is that most statistics are only updated to 2020. Data sourced by the World Bank is used to verify the integrity of the OECD as a source. This is because

the information provided by the World Bank is highly rudimentary and thus does not suffice as a primary source in and of itself.

Data concerning the labor participation rate is again taken from a database by OECD's labor market statistics.^{19,20} The database defines working age as the percentage of individuals between 15 and 64 participating in the labor force.^{19,20} Simultaneously, it provides both a column graph for inter-country comparison and a table that offers specific numbers for quantitative analysis. The source is verified against the International Labour Organisation statistics and compiled by the World Bank.

The national budget, where both surplus and deficit are represented as a percentage of the GDP, is derived from the authorities of the respective countries. This data was compiled by Trading Economics, which is a database with datasets related to various economic indicators. The database also provides summaries, observations, and definitions for each indicator. This makes Trading Economics overall a reliable source.

■ Methodology

The research will be presented in separate sections, each addressing an economic indicator listed previously. Initially, the indicators taken above would be taken from and averaged over as many years between 2020 and 2023 as available. The surplus would be treated as positive for the indicator describing the federal budget, while the deficit would be calculated as negative. Statistics would then be taken from a matching number of years before the pandemic and similarly averaged. Observations on the data and its significance would then be made. This process will be repeated across all five countries and all five economic indicators.

The results are then comparatively analyzed for cross-country trends describing similarities and differences. A discussion on why such tendencies may be observable and the relevant economic theory will follow. It will then be analyzed if the conclusion predicted and derived by economic theory aligns with real-world events.

■ Results and Discussion

Tax-Related Indicators:

Table 1: Tax-To-GDP Ratio expressed as a percentage of annual tax revenue to the nominal GDP.

	Tax To GDP Ratio 2021 (%)	Tax To GDP Ratio 2020 (%)	Tax To GDP Ratio Pandemic Average (%)	Tax To GDP Ratio 2019 (%)	Tax To GDP Ratio 2018 (%)	Tax To GDP Ratio Pandemic Average (%)
USA	26.6	25.8	26.2	25.2	24.9	25.1
Germany	39.5	37.9	38.7	38.6	38.4	38.5
Japan	-	33.2	33.2	31.4	31.6	31.5
UK	33.5	32.1	32.8	32.2	32.9	32.6
France	45.1	45.3	45.2	44.9	45.9	45.4

Note: Data for Japan's Tax To GDP Ratio is not available
Source: OECD Revenue Statistics 2022 and OECD Revenue Statistics 2021^{19,20}

The first indicator to be examined is the five countries' tax revenue and tax structure. Tax revenue is examined as a percentage of the GDP but does not directly contribute to it. Comparing tax as a percentage of a country's GDP is better than taking raw values as it takes into account the differences in the GDP size of each country and thus gives a better image of the impact of COVID-19 on tax revenue. Tax-to-GDP ratio is calculated with two components: taxation and nominal GDP. Theoretically, an increased tax-to-GDP ratio will occur due to increased demand for public services, which applies primarily to developed countries with established welfare systems. This would lead to higher tax requirements to fund the services, increasing the tax burden and tax-to-GDP ratio. Simultaneously, the pandemic would have lowered the nominal GDP due to sluggish economic activity arising from restrictions such as lockdowns. From Table One, while the USA, UK, Germany, and Japan saw a relatively minor increase in the tax-to-GDP ratio, France contrarily saw a decrease in the tax-to-GDP ratio as a percentage of annual GDP. However, since the changes are quite minor, the result does not provide sufficient evidence that the theoretical conclusion aligns with what is happening.

Table 2: Tax Structure for the Year 2020.

	Personal Income Tax (% of total tax revenue)	Corporate Income Tax (% of total tax revenue)	Social Security Contributions (% of total tax revenue)	Property Taxes (% of total tax revenue)	Goods and Services Taxes (% of total tax revenue)	Other Taxes (% of total tax revenue)
USA	40.58	4.90	24.79	12.44	17.22	0.06
Germany	27.03	4.31	39.67	3.29	25.69	0.02
Japan	18.72	11.70	40.35	8.08	20.90	0.25
UK	28.56	7.25	21.00	11.61	31.16	0.42
France	21.03	5.12	32.70	8.74	27.08	5.32

Source: OECD Revenue Statistics 2022¹⁹

Table 3: Tax Structure for the Year 2019.

	Personal Income Tax (% of total tax revenue)	Corporate Income Tax (% of total tax revenue)	Social Security Contributions (% of total tax revenue)	Property Taxes (% of total tax revenue)	Goods and Services Taxes (% of total tax revenue)	Other Taxes (% of total tax revenue)
USA	41.07	5.37	24.47	11.48	17.55	0.05
Germany	27.39	5.18	37.88	2.88	26.65	0.02
Japan	18.79	12.00	41.05	8.18	19.73	0.26
UK	27.03	7.03	19.74	12.44	32.78	0.38
France	20.72	4.95	33.03	8.66	27.56	5.08

Source: OECD Revenue Statistics 2021²⁰

The tax structure describes the contribution of each type of tax to the total tax revenue. Theoretically, with the large waves of unemployment leading to reduced income and output, personal and corporate tax revenues should decrease. The reduced disposable income would have also led to diminished goods and services tax contribution. However, an increase in public services and unemployment benefits would have increased demand for funding for social security and theoretically led to an increase in contributions for social security

tax. However, as seen in the table, the tax structure between the pre-pandemic year and the first year of the pandemic is similar.

Furthermore, no consistent, observable patterns exist within the sample of countries selected above. In many instances, as described above, while three countries may tend towards one change, the other two will tend towards another change. Therefore, there is insufficient evidence to prove that COVID-19 impacted the tax structure of a selected developed country, and the theory does not align with the real world.

Instead, the alterations are likely more dependent on each country's unique fiscal response to COVID-19. In America, for example, an increase in social security contribution may be attributed to increased demand for healthcare and unemployment benefits, which led to the Social Security Administration increasing the maximum earnings subject to the Social Security payroll tax by 9%.²¹ However, the existence of a developed welfare state that has the political capital to influence taxation changes is mostly seen within developed nations.

Labor force participation rate:

Table 4: Labour Force Participation Rates for pandemic and pre-pandemic periods.

	Labour Participation Rate 2021 (% of total population age 15+)	Labour Participation Rate 2020 (% of total population)	Labour Participation Rate Pandemic Average (% of total population)	Labour Participation Rate 2019 (% of total population)	Labour Participation Rate 2018 (% of the total population)	Labour Participation Rate Pre-pandemic average (% of the total population)
USA	61.66	61.75	61.71	63.10	62.87	62.99
Germany	60.46	60.67	60.57	61.92	61.28	61.60
Japan	62.12	61.98	62.05	62.04	61.53	61.79
UK	62.70	63.39	63.05	63.53	63.30	63.42
France	55.85	54.53	55.19	55.33	55.80	55.57

Source: International Labour Organisation, OECD Labour Market Statistics²²⁻²⁴

Labour force participation rate is defined as the percentage of individuals who are economically active and contributing or seeking to do so between 15 to 64 years of age. From Table 3, labor force participation likely decreases due to the pandemic. While Japan saw an increase in the labor force participation rate, all four other countries saw a decrease in the labor participation rate when comparing the pre-COVID-19 to the post-COVID-19 period. Theoretically, the results seen in the USA, UK, Germany, and France are expected, as the pandemic would have caused parents to exit the workforce due to school closures or increased the number of discouraged workers, leading to premature retirement on improved social welfare and health concerns. Discouraged workers describe people who are not counted as part of the labor force because they believe they cannot find meaningful work and have been discouraged from pursuing a job. As these workers had lost jobs in many industries more heavily impacted, such as tourism or hospitality, their inability to locate other work on the market might have led to discouragement. As a result, they no longer seek employment and hence cannot be counted in the labor force. This can be seen in America; as of February 2021, 529000 Americans could be classified as discouraged workers, a 100,000 increase in the number of discouraged workers from the previous year.²⁵ In Germany, a spike in the number of discouraged workers can also be observed to approximately double between December

2019 and December 2020.²⁴ This thus suggests discouraged workers may be causing the drop in the labour force participation rate.

While Japan's average might point to a net increase in the labor force participation rate, a drop between 2019 and 2020 was nevertheless observable. Like France, Japan saw a substantial increase in the labor force participation rate in 2021. Therefore, a conclusion can be made that COVID-19 would cause a drop in the labor force participation rate, but subsequent changes are contingent on a country's recovery from COVID-19. Countries with a faster recovery will see a rebound in labor force participation rates before other countries. Alternatively, the health impact of COVID-19 may have reduced the number of people whose ages are in the eligible population. The degree of health mandates exercised by the government thus may also influence labor force participation rates. For example, Japan's stringent response to COVID-19, to the point of declaring a state-wide emergency, may also have contributed to its increase in labor force participation rate since stringent measures were able to reduce the impact of COVID-19, thus making it easier for people to return to work.

Federal Budget:

Table 5: Federal budget.

	2021 Budget (% of GDP)	2020 Budget (% of GDP)	Average Pandemic Budget (% Of GDP)	2019 Budget (% of GDP)	2018 Budget (% of GDP)	Average Pandemic Budget (% Of GDP)
USA	-16.70	-14.90	-15.80	-4.60	-3.80	-3.93
Germany	-3.70	-4.30	-4.00	1.50	1.90	1.60
Japan	-5.90	-9.30	-7.10	-3.40	-3.40	-3.63
UK	-5.20	-15.00	-10.10	-2.70	-2.00	-2.35
France	-6.50	-9.00	-7.75	-3.10	-2.30	-2.70

Source: Germany Federal Statistical Office, US Treasury and Japan Ministry of Finance; Compiled at Trading Economics²⁵⁻³⁰

Federal deficit is represented as a negative number, and surplus is represented as a positive number, represented as a percentage of the GDP. In accordance with the data from Table 4, the hypothesis concerning the growth in government deficit during the pandemic is corroborated across all five examined developed countries. The escalation in deficit can be attributed directly to the pandemic's impact on economic activity, leading to a decrease in GDP and consequently pronounced deficits. The increase in spending on public services further exacerbates this trend. Furthermore, the USA distinguished itself from the other four nations by substantially increasing its pandemic-related budget deficit. This can be interpreted as a reflection of the USA's unique situation, having reported around 107 million cases of COVID-19, which is the highest globally. The observed trend also aligns with the USA's historical inclination toward large budget deficits since the 1970s. Overall, the analysis reveals a consistent tendency for governments to gravitate towards greater budget deficits during the pandemic period.

Conclusion

In this paper, the five countries, the USA, Germany, Japan, the UK, and France, were sampled as highly developed economies and used to determine the effect of the pandemic on

their tax system, labor participation rate, and federal budget. The hypothesis is that reduced economic activity would significantly lower the contribution of tax revenue to the GDP, lower tax received from personal and corporate tax, drastically lower the labor participation rate, and produce a substantial deficit in the federal budget.

While the hypothesis is not rejected regarding participation and budget, there is insufficient evidence for the hypothesis concerning the impact of the pandemic on the taxation system. Furthermore, the sampled countries demonstrated different degrees or timing of economic recovery, indicating that fiscal response varied greatly between nations, leading to different economic trends. The relationship between each country's response to COVID-19 and its impact on various economic indicators is a definite avenue for further research.

Overall, however, this paper has shown that for highly developed economies, of which this sample is representative, the theoretical predictions tend to occur, and most developed nations will hence tend to behave similarly economically in circumstances like the COVID-19 pandemic.

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References

1. Countries where COVID-19 has spread <https://www.worldometers.info/coronavirus/countries-where-coronavirus-has-spread/> (accessed 2023-06-01).
2. Atkeson, A. (2020). *What will be the economic impact of covid-19 in the US? rough estimates of disease scenarios*. DOI: 10.3386/w26882 (accessed 2023-01-18)
3. Eichenbaum, M., Rebelo, S., and Trabandt, M. (2020). *The macroeconomics of epidemics*. DOI: 10.3386/w26882 (accessed 2023-01-15)
4. The White House. *Summary of the 2022 Economic Report of the President*. Rev. 04.2022. <https://www.whitehouse.gov/cea/written-materials/2022/04/14/summary-of-the-2022-economic-report-of-the-president/> (accessed 2023-01-20)
5. Baldwin, R. E., and di Mauro, B. W. *Mitigating the COVID-19 economic crisis: Act fast and do whatever it takes*. CEPR Press, 2020. (accessed 2023-01-20)
6. Gourinchas, P-O. *Flattening the Pandemic and Recession Curves. Mitigating the COVID-19 Economic Crisis*. CEPR Press, 2020. (accessed 2023-01-22)
7. Elgin, Ceyhan, Bokce Basbug, and Abdullah Yalaman. "Economic Policy Responses to a Pandemic: Developing the Covid-19 Economic Stimulus Index." *COVID-19 Economics*, no. 3. CEPR Press, 2020. (accessed 2023-01-13)
8. Deb, Pragyan, Davide Furceri, Jonathan Ostry, and Nour Tawk. "The Economic Effects of Covid-19 Containment Measures." *IMF Working Papers* 20, no. 158 (2020). <https://doi.org/10.5089/9781513550251.001>. (accessed 2023-01-09)
9. Kim, Soyoung. "Counter-Cyclical and Counter-Inflation Monetary Policy Rules and Comovement Properties of Money Growth." *Topics in Macroeconomics* 6, no. 2 (2006). <https://doi.org/10.2202/1534-5998.1324>. (accessed 2023-01-11)
10. *Uncertain and uneven recovery expected following unprecedented labour market crisis*, ILO Monitor, 7th ed. ILO, 2016. (accessed 2023-01-12)
11. Elgin, Ceyhan, Abdullah Yalaman, Sezer Yasar, and Gokce Bas

- bug. "Economic Policy Responses to the COVID-19 Pandemic: The Role of Central Bank Independence." *Economics Letters* 204 (2021): 109874. (accessed 2023-01-14)
12. Elgin, Ceyhun, Colin C. Williams, Gamze Oz-Yalaman, and Abdullah Yalaman. "Fiscal Stimulus Packages to Covid-19: The Role of Informality." *Journal of International Development* 34, no. 4 (2022): 861-79. <https://doi.org/10.1002/jid.3628>. (accessed 2023-01-08)
 13. Elgin, C., Yalaman, A., & Yasar, S. (2023). Economic stimulus measures in the pandemic: The role of fiscal decentralisation. *Cambridge Journal of Regions, Economy and Society* (accessed 2023-01-10)
 14. Elgin, Ceyhun, and Gokce Basbug. "Economic Policy Responses to COVID-19: the Case of EU and Non-EU Mediterranean Countries." *COVID-19 Med Briefs*, November 2020. (accessed 2023-01-14)
 15. Zhen Yu, Yao Xiao & Yuankun Li (2020) The Response of the Labor Force Participation Rate to an Epidemic: Evidence from a Cross-Country Analysis, *Emerging Markets Finance and Trade*, 56: 10, 2390-2407, DOI: 10.1080/1540496X.2020.1787149 (accessed 2023-01-08)
 16. Celikay, F. (2020), "Dimensions of tax burden: a review on OECD countries," *Journal of Economics, Finance and Administrative Science*, Vol. 25 No. 49, pp. 27-43. <https://doi.org/10.1108/JEFAS-12-2018-0138> (accessed 2023-01-08)
 17. Yalaman, Abdullah, Gokce Basbug, Ceyhun Elgin, and Alison P. Galvani. "Cross-Country Evidence on the Association between Contact Tracing and Covid-19 Case Fatality Rates." *Scientific Reports* 11, no. 1 (2021). <https://doi.org/10.1038/s41598-020-78760-x>. (accessed 2023-01-22)
 18. Elgin, Ceyhun, and Hatime Kamilcelebi. "Country-of-Origin Bias towards Covid-19 Vaccination: Evidence from Turkey," 2022. <https://doi.org/10.21203/rs.3.rs-2320945/v1> (accessed 2023-01-22)
 19. "Revenue Statistics 2022." OECD ILibrary, https://www.oecd-ilibrary.org/taxation/revenue-statistics-2022_8a691b03-en. (accessed 2023-01-14)
 20. "Revenue Statistics 2021." OECD ILibrary, https://www.oecd-ilibrary.org/taxation/revenue-statistics-2021_6e87f932-en. (accessed 2023-01-14)
 21. Stephen Miller, CEBS. "2023 Social Security Wage Cap Jumps to \$160,200 for Payroll Taxes." *SHRM*, February 10, 2023. <https://www.shrm.org/resourcesandtools/hr-topics/compensation/pages/2023-wage-cap-rises-for-social-security-payroll-taxes.aspx>.
 22. *Employment and Unemployment Database*. Eurostat. <https://ec.europa.eu/eurostat/web/lfs/database> (accessed 2023-06-02)
 23. "Employment - Labour Force Participation Rate - OECD Data." The OECD, <https://data.oecd.org/emp/labour-force-participation-rate.htm>. (accessed 2023-01-06)
 24. "Labor Force Participation Rate, Total (% of Total Population Ages 15+) (Modeled ILO Estimate) - Germany." Data, <https://data.worldbank.org/indicator/SL.TLF.CACT.ZS?locations=DE>. (accessed 2023-01-12)
 25. Bennett, J. (2021, March 11). *Long-term unemployment has risen sharply in U.S. amid the pandemic, especially among Asian Americans*. Pew Research Center. <https://www.pewresearch.org/short-reads/2021/03/11/long-term-unemployment-has-risen-sharply-in-u-s-amid-the-pandemic-especially-among-asian-americans/> (accessed 2023-06-02)
 26. "France Federal Government Budget" Trading Economics, <https://tradingeconomics.com/france/government-budget>. (accessed 2023-01-09)
 27. "Germany Government Budget" Trading Economics, <https://tradingeconomics.com/germany/government-budget>. (accessed 2023-01-09)
 28. "Japan Government Budget" Trading Economics, <https://tradingeconomics.com/japan/government-budget>. (accessed 2023-01-09)
 29. "United States Federal Government Budget" Trading Economics, <https://tradingeconomics.com/united-states/government-budget>. (accessed 2023-01-09)
 30. "United Kingdom Federal Government Budget" Trading Economics, <https://tradingeconomics.com/united-kingdom/government-budget>. (accessed 2023-01-09)

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