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Gender Diversity's Effect on Country's Productivity

Sheeba Grace Ratnakumar Rheuben

Charlotte Seet

Deepak Sivakumar

MinJeong Lee

Research Methodology Proposal

Charlotte Seet (2551895)

Deepak Sivakumar (2550494)

Min Jeong Lee (2513657)

Sheeba Grace (2476737)

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ERAU

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Abstract

Our study is aimed at finding out if gender diversity has any impact on the country's productivity. We use data from the Organization for Economic Cooperation and Development (OECD) database on gender diversity across 10 countries from 2014 to 2018. We believe that countries will be more gender-inclusive if the results are in favor of gender diversity. We also look into the impact of age, physical, and human capital per capita along with technology advancements that occur across industries. This study would be an addition to other research conducted on this topic but with the focus on the international level.

Keywords: Gender diversity, GDP per capita, Productivity

Introduction

Gender equality has evolved the way organizations are run by introducing more females into labor markets and board seating. By breaking gender stereotypes, more countries are introducing policies to allow females to have more opportunities and diversifying workforces. However, certain factors still prevent or slow females down from entering and staying in the labor market. In 2019, the World Bank of Data has shown that only about 38.85% of women have entered the labor workforce globally. That is a slight decrease from a previous 38.91% in 2018 (The World Bank, 2020.). As for global productivity in 2019, data has shown that the global GDP per capita growth was 1.385%. This was also a decrease from a previous 1.918% in 2018. Although many factors have been proposed to explain what affects a country's productivity, this study will be focusing on gender equality in the themes of; gender gaps in terms of education and employment, gender discrimination in workplaces, and gender diversity in management. This study covers the effects of workplace gender equality globally, specifically to see if a higher number of higher-ranking females in workplaces will affect a country's productivity.

Literature Review

We look at how gender diversity affects a country's productivity. The productivity of a country can be affected by many factors such as Gender, Age, Technology advancement, and Education. We want to understand the relationship between a country's productivity and gender diversity.

Gender

In the journal article written by Kwang Bin Bae and Sheryl Skaggs, using Korea Workplace Panel Survey results, this study analyzes the effects of gender diversity in management on organizational efficiency (Bae,2019). The results show that in management, gender diversity has a U-shaped relationship with firm productivity. This indicates that through experiences with family-friendly policies, gender diversity in management has a major impact on the competitiveness of Korean companies (Bae,2019). This can be used to support the alternate hypothesis which is that gender diversity has an impact on a country's productivity.

The study, written by Stephanie Klasen., & Francesca Lamanna, examined to what extent gender gaps in education and employment reduces economic growth using cross-country and panel regressions. They have measured employment using gender gaps in labor force participation. As a result, they have found that gender gaps in education and employment are reducing economic growth. Also, the result contains that there are differences by the regions on the gender gaps in employment affecting economic growth. This source can be used to support that gender gaps do affect a country's productivity.

The study written by Berta Esteve-Volart, argues that gender discrimination is inefficient. They have set gender discrimination as the complete exclusion of females from the labor market

or female exclusion from managerial roles. As a result, they have found that both types of discrimination lower economic growth. Which also means a reduction in per capita GDP and distortion of talent allocation. They have used panel data regression of states in India from 1961 to 1991. Therefore, this source can be used to support that gender discrimination has a negative impact on a country's productivity.

Age

In the book published by the National Center for Biotechnology Information, the purpose was to study the effects of an aging society on the USA's economic productivity. The book shows the results of previous studies that discuss the impact increasing age has on different cognitive tests ("Aging, Productivity, and Innovation" ,2012). Gathering data from non-complex jobs, the difference in cognitive test results across the various age bands was not significant until the age of sixty-five ("Aging, Productivity, and Innovation" ,2012). This shows that the peak for productivity is usually up to a certain age. On the other hand, gathering data from more complex and defined jobs showed that the older employees were actually more productive than the younger employees, making lesser mistakes and errors (Boersch-Supan and Weiss, 2011). This shows an increase in age would also mean an increase in knowledge and skill retention, a sign of good cognitive function. Hence, this source can be used to support the claim that age does affect a country's productivity.

Technological Advancement

In the journal article written by Thierry Tressel, the paper analyzes the effect on technological diffusion and multifactor productivity (MFP) of commodity and labor market policies in a panel of industries in 15 OECD countries over the period 1980 to 2003, with a

specific emphasis on Australia. Over the past 16 years, Australian companies have greatly kept up with best practices in business competitiveness and have benefited from the dissemination of information and communication technologies (ICTs). It shows that since the early 1990s, reforms in both the labor and commodity markets can explain the productivity success and acceptance of ICTs by Australia. This source can be used to support the claim that technological advancement can affect a country's productivity.

Education

Habermeier, (2007), studied how much of an impact education has on the macroeconomic strength of a country measured by its GDP. The data used for the study were from the publishing in the United Nations Industrial Development Organization (UNIDO) and Organization for Economic Cooperation and Development (OECD). It was observed that education growth had a significant impact on the economic growth of a country (Habermeier, 2007). Technological advancement leads to new skills and talent needed for the labor market. This requires the education system to evolve to match the new skills and talent needed to fill the labor force (Habermeier, 2007). Also, the population in a country needs to be educated to acquire the skills and qualifications needed for the labor market that is resulted from technological advancement as this is vital for the economic growth of the country (Habermeier, 2007).

Based on previous studies, it was evident that students who received eight years of education performed better compared to students with only four years of education, implying the effect education has on the future labor force (Habermeier, 2007). Habermeier, (2007) has found that the education index of a country exponentially impacts a country's GDP per capita with a

coefficient of 1.95, further proving the claim that education has a significant impact on a country's GDP.

Data Description

This paper studies the effects of difference in gender ratio on that of GDP per capita. Hence, the population will be people from all over the world. This is a random stratified sampling. We will cluster the population by countries, followed by gender. For our data analysis, we will be using the countries provided in the OECD sample to avoid any form of bias. Also, we will only use the data from the year 2009 to the year 2019 to ensure the relevancy of the study.

For our research, we are studying whether having higher-ranking females in the workforce will have an impact on a country's productivity. As such, we have decided that our independent variables are Gender that is measured in terms of percentage employed, Age, and Education Level. Our dependent variable is Productivity measured as GDP per capita. Our control variables are Physical capital per capita and Technological Advancement.

We will be collecting panel data that will consist of the key-dependent variable, GDP per Capita along with various independent variables across ten countries over the time frame of 10 years. Primary data is not feasible for this study. Secondary data can provide a larger and higher quality of data since it was collected by accredited and credible groups such as governments, and organizations. Therefore, for our research topic, we have decided to use secondary data from the Organization for Economic Co-operation and Development (OECD) database. It's an association of 39 nations all over the world. Its members and key partners represent 80% of world trade and investment (History). This database provides us with the gender ratios in different countries, the employment rate based on gender, and the GDP of the countries.

To get data on our control variables we will be using secondary data from OECD as well. OECD provides data on education and the age of its member countries. We converted units where applicable to standardize them for the sake of calculations and data analysis.

The process taken to analyze the data are done by the following steps:

- Firstly, the raw data collected from OECD will go through a structuring process. The data covers a wide range of variables which is not relevant for our study. Hence, we will make new data compiling the raw data.
- Secondly, the data will go through a cleaning process. As mentioned above, the data is still raw so we will remove missing or blank space in the data. The data now covers the employment rate of male and female, Age, Education, GDP of a country, and its population from 2014 to 2018.
- Thirdly, we will calculate the GDP per capita by using the formula $\frac{GDP of\ a\ country}{Population\ of\ that\ country}$ (n.d.,2020). This will give the values for GDP per capita which is used to measure the productivity of a country. Now, the data covers the GDP per capita with other variables stated above.
- Finally, we will do the two tests which are ANOVA two factor with replication test and the Regression analysis. To evaluate how much the dependent variable changes with each independent variable, the regression analysis will be done. The p-value indicating the statistical significance will be concluded, and the given coefficient will be used to define the practical significance (Gallo, Davenport, & Kim, 2017). Also, an estimate of the effect on the dependent variable incurred by the independent variable will be established. To assess if there are significant test

outcomes, ANOVA tests are performed. A test that is used to search for statistical significance in such cases is ANOVA two-factor with replication. Then we will compare the relationship between these factors. The interaction will tell us whether the factors influence each other.

Our team thinks that variables such as Age, GDP, Technology advancement, and Education will have an impact on the productivity of a country. However, we also think that gender will have a greater impact on a country's productivity. Gender inequality is one of the biggest social issues around the world. Today, many companies have females in the leader's role. This surely has impacted the company's revenue and the economy. Therefore, we expect the results of the study to show that gender is the most effective independent variable, followed by age, GDP, technology advancement, and education.

Research Methodology

Our team believes that data collected from secondary sources would give more accurate results. Therefore, the data is collected from the Organization for Economic Co-operation and Development (OECD). The type of data collected is panel type data, hence, we would do a quantitative study. Conducting a quantitative study will help us to identify patterns and averages across the different countries, making predictions and assumptions and generalizing our results of this research proposal. We decided to do stratified sampling to avoid any bias in our data collection. We will use regression analysis along with two factors ANOVA with replication tests to compare the productivity of a country and the gender percentage employed in the country.

We did descriptive statistics to showcase the key statistics of the data and extract important information about the data. The key statistics are Mean, Standard deviation, Minimum,

Maximum, and Count. The descriptive statistics is performed specifically on GDP per capita as it measures a country's productivity. Figure 1 below shows the descriptive statistics of GDP per capita from 2014 to 2018. The analysis is done by considering all the OECD and Non-OECD countries collected from the Organization for Economic Co-operation and Development (OECD) database.

From the results, we derived that the productivity of these OECD and Non-OECD countries measured in terms of GDP per capita is between USD 38,000 to USD 42,000 for these five years. Also, the standard deviation is small which means that the values in the data are closer to the mean of the data set. Over the years, the minimum productivity level is recorded for South Africa which has only 38% to 39 % of women employed in that country. Similarly, the maximum productivity level is recorded for Luxembourg which has 50% to 53% of women employed in that country. We conclude that a country that has more gender diversity has higher productivity and vice versa. Also, the total count is 38 which includes 36 OECD countries and 2 Non-OECD countries.

GDP per capita 2014		***GDP per capita 2015***	
Mean	38.1562	Mean	39.18723
Standard Deviation	16.7471	Standard Deviation	17.43405
Minimum	12.6809	Minimum	12.62507
Maximum	101.842	Maximum	103.7507
Count	38	Count	38

GDP per capita 2016		***GDP per capita 2017***	
Mean	39.8594	Mean	40.8094
Standard Deviation	17.7569	Standard Deviation	17.9101
Minimum	12.4735	Minimum	12.4518
Maximum	105.921	Maximum	105.5
Count	38	Count	38

GDP per capita 2018	
Mean	41.6793
Standard Deviation	18.2644
Minimum	12.3567
Maximum	106.704
Count	38

Figure 1: Key Descriptive Statistics of GDP per capita for 5 years

ANOVA Two-Factor with Replication Test

ANOVA tests are used to determine whether there are significant results from tests. A two-way ANOVA with replication is performed when there are two groups and individuals within that group are doing more than one thing. Since we are using panel data, there are more than one observation for each group. ANOVA two-factor with replication is a method that is used to test for statistical significance in such cases. We will conduct this test to test for statistical significance at a 5% level, in the means of GDP in different countries, gender diversity of the population, and education level of the population. We think that they would have interaction because some unprogressive countries do not allow females to study. Therefore, we will then compare the interaction between these variables. The interaction will tell us whether the variables affect each other. Using this test will help us decide to reject or not reject the null hypothesis.

The ANOVA method will help us to check the impact of both genders on a country's productivity respectively. By comparing the means of all our samples, the ANOVA method will tell us about the main effect and the interaction effect whereby both gender effects on productivity will be compared at the same time. The grand mean is the mean of all the observations combined. Then, we would have the between-group variability, which refers to

variations between the distributions of individual groups of genders. Moving onto within-group variation, each country sample is looked at on their own and the variability between each country's two genders are calculated, meaning that no interaction between each country is considered. And then for the p-value, which measures if the means of the different countries are significantly different or not. The lower the p-value, the more statistically significant. If the p-value from our ANOVA test is low, then we cannot reject the null hypothesis. And then from our interpretation of the ANOVA results, we can then prove or disprove that a specific gender does have an effect on a country's productivity.

Regression Analysis

Regression is a method used because of the difference in the independent variable value to establish how often the dependent variable changes. The regression analysis method will be performed on data collected and compiled from the OECD for this report. As the analysis consists of more than one independent variable, to report the overall fit, the adjusted R square value will be used. The R square adjusted value shows the relationship impact between the collected data and the regression equation estimated. The regression method would also give us the coefficient value and the p-value, showing the independent variables' potential significance and statistical significance value (Gallo, Davenport, & Kim, 2017).

The regression method that we will use can be applied with the raw data collected. The dependent variable and the independent variables are important for operating the regression method as mentioned above. For instance, gender will be the key independent and the GDP per capita, Age and Education which will be measured by the percentage of university students that have been employed. These are the other variables. The regression analysis will show how much impact these variables have on each other. The value p-value, R square, and the coefficient

between the dependent variable and the independent variable will be extracted from the regression test. To illustrate the appropriateness, statistical significance and the relationship between the variables, these values can be used for our study. The p-value will clearly explain whether the dependent variable is influenced by the independent variable. The purpose of this analysis is to determine and organize the effect of the independent variables on the dependent variable according to the magnitude of their impact (Gallo, Davenport, & Kim, 2017). For this study, the regression analysis approach will therefore be suitable and efficient.

Conclusion

Through our study, we encountered some limitations. Due to the fact that we are using stratified sampling, we could only use the variables that we preferred. However, as our control variables were not exhaustive, choosing the variables that we preferred would mean that not all the variables could be included in our study. Also, there were other factors that would have affected a country's productivity that would be out of our control, such as government policies and overseas investments. Moreover, with the world becoming more accepting of different communities, our study unfortunately only includes two genders. It does not account for more pronouns and gender identities as global acceptance is generally new, and there is not much data for them yet.

In conclusion, our study has shown results that gender equality in the workforce does have an effect on a country's productivity. Our results have shown that with more females in workplaces, the GDP per capita increases consistently through the years, indicating that gender has a positive effect on a country's productivity. Our results then suggest that with more females in the workforce, the overall productivity is higher and thus increases the country's overall productivity as well. Going forward, we hope that more countries will implement or update their policies to be more gender-inclusive, which could open more opportunities for females to be in the labor markets. Furthermore, we also hope that more countries can bridge the gap between genders, such as mandating better policies for maternity, which could allow for females to come back and stay longer within the labor markets.

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