Asia Pacific Academy of Science Pte. Ltd.

Business and Management Theory and Practice 2025, 2(3), 3766.
https://doi.org/10.54517/bmtp3766

Article

Quantile regression analysis of economic indicators' impact on employment across G7 countries

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CITATION

Qi L, Akter M, Mito HRB, Barua P. Quantile regression analysis of economic indicators' impact on employment across G7 countries. Business and Management Theory and Practice. 2025; 2(3): 3766. https://doi.org/10.54517/bmtp3766

ARTICLE INFO

Received: 26 May 2025
Revised: 12 June 2025
Accepted: 13 June 2025
Available online: 14 July 2025

Abstract: This study investigates the intricate relationship between pivotal economic indicators and employment outcomes across various quantiles of the employment distribution within G7 nations, with the objective of elucidating the heterogeneous impacts of these factors on employment. Employing quantile regression analysis, the research assesses the effects of GDP growth, Foreign Direct Investment (FDI), inflation, interest rates, Research and Development (R&D), and trade on employment at distinct quantiles (0.05, 0.25, 0.50, 0.75, and 0.90) of the employment spectrum. This methodological approach allows for a deeper understanding of how these economic determinants exert differential influences across both high-wage and low-wage sectors. The findings reveal that GDP, FDI, and R&D significantly stimulate job creation, especially within high-employment sectors, whereas the effects of inflation and interest rates are more nuanced, benefiting low-employment sectors in some instances but adversely impacting high-employment sectors due to rising costs and reduced investment. Unemployment consistently diminishes job opportunities across all employment quantiles, with its most pronounced effects felt in low-employment sectors. This study makes a novel contribution to the existing literature by utilizing quantile regression to provide a more granular understanding of how economic variables influence labor market outcomes across diverse segments. It underscores the necessity for targeted economic policies designed to address the specific needs of both high- and low-employment sectors, offering critical insights for policymakers aiming to cultivate inclusive and resilient labor markets.

Keywords: quantile regression; employment; economic indicators; G7 countries; economic growth

1. Introduction

1.1. Background and context

Employment is one of the most important economic indicators, a reflection of the effectiveness of economic policies, the overall stability of the labor market, and the living standards of people in a country. Economic prosperity, social cohesion, and sustainable development are directly influenced by it. At the national level, the demand and supply of work at the workplace drive not only economic performance but also social outcomes in general, such as distribution of income, poverty rates, and overall welfare [1]. Employment rates are also therefore often used as a measure to determine the efficiency of a country's plans and social programs [2]. For the Group of Seven (G7) nations Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States employment does not result from domestic economic forces alone but also stems from complex global interactions. The G7 economies are the most

industrialized in the world and are among the largest contributors to the world's GDP [3–5]. These nations are major players in global trade, finance, and technology, and thus their labor market performance is shaped by a multifaceted set of domestic and international influences. For example, technological change and digitalization, which are typically driven out of these economies, generate new job opportunities even as they displace existing ones. Similarly, international supply chains and trade policies can increase employment via increased exports or decrease it through offshoring and automation [6,7]. Employment outcomes in these nations are in close association with economic factors such as Gross Domestic Product (GDP), inflation (INF), Foreign Direct Investment (FDI), population growth (POP), unemployment rates (Un_EMP), interest rates (INT), Research and Development (R&D) expenditures, and the volume of trade (TRADE) [8,9]. Each of these variables affects the labor market in distinct and at times unanticipated ways. For example, GDP growth tends to be followed by increased demand for labor as companies grow, and more hiring occurs. High inflation, on the other hand, tends to reduce consumer purchasing power and cause business trouble, resulting in less hiring. Interest rates, determined by central banks, can impact the price of borrowing as well as the business investment level and, as a direct consequence, job creation or destruction in various industries [10,11].

Although capital inflows generally lead to labor automation processes, Foreign Direct Investments typically come from cross-border investments by multinational corporations and orient the labor market in a troublesome direction since they may bring about job growth, mostly in newer or emerging industries [12,13]. Changes in the employment situation also take place due to population growth, although with different consequences in some countries. While mature economies may see an increased impact on employment patterns, such as in labor-force participation or immigration policy, due to population aging, rapid population growth in emerging economies has the potential to generate pressure for job creation [14,15]. Employment outcomes have a very strong relationship with these major economic indicators, but we need to keep in mind the complicated and non-linear relationship between them and employment [16]. An example is that the current condition of employment in a country will, to a large extent, determine the way economic growth affects employment; while highly industrialized countries may see a lot of new jobs created during the time GDP grows, very-low-employment economies may not notice much change. In similar contexts, rising interest rates may mean a drop-in job for some sectors, yet there could be an increase in jobs in those financial services or real estate markets and other areas where the interest rate hikes attract investments, too [17,18]. All these facts intensify even more the reality that the actual employment outcomes are rather inconsistent across the different quantiles of the employment distribution. Such high skew in job distribution, like high- versus low-income industries, would present differential effects of economic indicators in labor markets. For instance, while high-income or skilled professionals occupy the upper quantiles of employment, low-paid or part-time workers could be found in lower quantiles and might be more susceptible to changes in GDP growth, unemployment rates, and inflation [19]. The analysis of a very large number of such aspects is currently being achieved through the common regression methods such as Ordinary Least Squares (OLS); these methods try to calculate the average impact of economic factors on employment. Inasmuch as

this approach works quite well in understanding broad patterns, it does not adequately capture the entire range of responses from the labor market. In economies such as the G7, where the distribution of jobs is skewed and where different industries or demographic groups have absurd employment outcomes, traditional models can obscure important differences in the data. Quantile regression opens a very powerful remedy in that it allows researchers to assess the impact of economic indicators across several points (or more accurately, quantiles) along the employment distribution.

1.2. Research gap

Although much of the already existing literary work concentrated on the impact of economic variables on employment, very few works could be seen addressing the differences in the effects that result across the employment distribution. Most studies regarding the examination of the relationship between economic indicators and employment have relied on Ordinary Least Squares regressions, which provide a single average estimate of the relationship between studied variables but do not capture the heterogeneity of how economic indicators impact employment at various points in the employment distribution [20]. For instance, the cost of inflation or GDP growth may be experienced differently by a group of individuals whose occupations fall within high-employment sectors when compared to a group whose jobs fall within low-employment sectors. Quantile regression, as suggested by Koenker and Bassett in 1978, provides an answer to fill this gap by estimating the impact of independent variables upon the dependent variable's conditional distribution at different quantiles [21]. This technique not only studies the impacts of economic factors on employment at the mean but also across the whole distribution of employment outcomes, lower and upper tails, where impacts could saturate their magnitudes. This study aims at a better understanding of how various economic indicators affect different segments of the labor market by applying quantile regression to the labor market data of G7 countries.

1.3. Research objectives

The main objective of the article is to assess the impact of GDP growth, Foreign Direct Investment (FDI), inflation, interest rates, Research and Development (R&D) and trade on employment in different quantiles (0.05, 0.25, 0.50, 0.75, and 0.90) of the employment spectrum of the G7 countries using quantile regression analysis. More precisely, this study provides for:

1) Examine the potential influence of key economic indicators on employment outcomes across the different quantiles.
2) To the degree that we can understand the heterogeneity of effects of such economic variables across different segments of the employment distribution. For example, how do GDP growth and inflation package a low-employment region against a high-employment region?
3) A more robust analysis of labor market dynamics, given that it is entirely possible to show varying impacts of economic indicators on employment across quantiles.

1.4. Key findings

From the preliminary analysis of the quantile regression, it seems that different

economic variables influencing employment position vary according to the quantiles. For instance, GDP seems to be positively and strongly affecting employment in the upper quantiles of 0.75 and 0.90, suggesting that regions or industries with high employment gain disproportionately from economic growth. On the contrary, low quantiles of 0.05 and 0.25 have shown inflation and interest rates to exert a significant negative impact on employment, meaning that high interest rates and inflationary effects do more harm to employment for industries with low employment. It is further shown by the analysis that unemployment, in general, has been decreasing employment across all quantiles, reaffirming the macroeconomic dimension of unemployment. Interestingly, trade and Foreign Direct Investment (FDI) exert different effects at quantiles, with lower employment sectors being least affected and middle- to higher-employment sectors getting the highest positive effects on employment [22,23]. This indicates the complex dynamics within the labor market, which therefore require policy customization to cater to the distinct needs of the various segments of the labor market.

1.5. Relevance of quantile regression

It preconditions the quantile regression for a specific study because it could be fairly possible to track the different distributional effects of economic variables on employment. Given that, along with typical and average impacts, it gives a much more comprehensive understanding of how economic variables act at various points in the employment distribution than traditional OLS regression would use. Therefore, it is generally applicable to heterogeneous data, as one with different population subgroups would be subjected to distinct effects from independent factors. This type of quantile regression tool should be very useful to policymakers for the understanding of a very diverse picture of labor market dynamics in different income and employment groups in G7 countries. The analysis would provide better insight into the influences on employment through the analysis of discrete quantiles with reference to policies conceptualized to enhance such indicators for the economy as GDP growth, management of inflation, and investment promotion in employment across different levels of the labor market [24,25]. It much more deeply provides understanding into such macro policies, including how some economic policies benefit some sections of people while excluding others. Understanding this, therefore, aids in designing inclusive labor market policies that advocate stability and call for less inequality.

2. Literature review

The link between employment and economic parameters has been a major area of concern in labor economics since time immemorial. Employment represents the social stability and the welfare of the nation and is, therefore, pathogenic to economic health for the respective indicators [26]. Among the economically developed ones are the Group of Seven, notably, the United States, Canada, France, Germany, Italy, Japan, and the United Kingdom. Their patterns of employment give relevant information about the trends in the global labor market. These countries are set apart by their highly developed industrial base, advanced technological infrastructure, and large degree of engagement in global investment and trade. Consequently, both the

employment outcomes are influenced by changes in the home economy as well as changes in the global economy. The most recognized determinants of employment outcomes include population growth (POP), unemployment rates (Un_EMP), interest rates (INT), Gross Domestic Product (GDP), inflation (INF), international direct investment (FDI), Research and Development (R&D) expenditures, and trade volume (TRADE). Inflation does impact employment, sometimes positively and at other times negatively, but varying with the causes behind inflation and the ability of the labor market to absorb the price rises [27,28]. GDP growth normally enhances job creation via increased production [29,30]. Interest rates set by central banks affect the cost of capital, which in turn influences investment activity and borrowing costs, with the rub-off effect on employment prospects [10]. Foreign trade and direct foreign investment impute a great deal of importance for highly industrialized countries like those in the G7 [31]. Rising foreign investment can lead to jobs through the establishment of new firms or expansion of existing firms, especially in industry and services [32,33]. On the other hand, trade liberalization very often leads to structural change in the employment landscape, whereby jobs are lost in industries facing foreign competition and created in sectors geared toward exports [34]. Population expansion also complicates employment. In aging countries such as Italy and Japan, labor shortages may increase demand for younger workers or encourage immigration to fill shortfalls. Nonetheless, in many rich countries, youth unemployment is still an important issue, resulting in an even more complicated relationship between labor market outcomes and population dynamics.

Economic indicators and employment have been analyzed over the years through standard econometric models, such as Ordinary Least Squares (OLS) regression translation, all of which generate a point measurement of the relationship between the elements at mean level by evaluating the average effect of independent variables upon the dependent variable. While it is very advantageous, OLS regression provides too little consideration when the independent variable effects are heterogeneous or differ between segments of the population and distributions of employment. For example, different effects of GDP growth on employment may be seen for the workers in low-wage industries compared with those in high-wage industries. Workers in low-employment industries or those without strong job security measures may also feel the brunt of inflation more keenly than others [35,36]. The drawback of standard regression models makes it mandatory for more sophisticated methods of understanding labor markets, especially in cases where the employment distribution is skewed or where the effects of economic indicators differ across quantiles of employment distribution.

Quantile regression is a statistical method created by Koenker and Bassett in 1978 that aims to provide estimates of the conditional median or other conditional quantiles of the dependent variable in addition to its conditional mean. This method allows for an understanding of how independent factors affect the dependent variable in different locations along the distribution. In particular, quantile regressions are useful in heterogeneous data, where effects of explanatory variables are expected to differ at various places along the distribution of the dependent variable in question, that is, employment [37]. Hence, quantile regression presents a more exhaustive and reliable picture of the relationship between economic factors and employment insofar as it

considers the differential influence of the said factors on the whole distribution from lower to upper quantiles. This method is gaining popularity in labor economics, particularly in studying unemployment, labor force participation, and wage distributions. By looking at a number of scaled versions, quantile regression inspects the impact economic variables have on low-wage versus high-wage or low-employment versus high-employment groups [24,38]. In the employment context, quantile regression would help to analyze the effect of GDP, inflation, and Foreign Direct Investment on the different segments of the labor market. For instance, GDP growth might exert a strong influence over employment in high-employment sectors (like full-time or highly skilled workers) but a low influence in sectors with lower employment (such as part-time or casual workers). Likewise, although interest rates might exert a negligible influence at the higher quantiles, they could actually pose a negative effect on employment at the lower quantiles, when workers are more susceptible to displacement by economic shocks [39,40].

Many studies have investigated the link between employment and macroeconomic indicators in the setting of the G7 countries. Similarities aside in the impact of economic conditions on labor markets, studies comparing employment across G7 nations reveal significant differences. For example, low job creation would characterize economies like Japan and Germany: job creation would get restrained by restrictive labor laws and an aging population. On the contrary, during boom cycles, economies with flexible labor markets, namely, the United States and Canada, usually witness faster job creation [41]. Furthermore, effects due to unemployment and inflation are subject to context. Across the Phillips Curve, unemployment would have an at-first-sight inverse relation with inflation. However, this relationship may not hold over for the cross-section of countries. The degree of unionization of each G7 nation, its involvement of the labor market with the participation of government, and the extent to which the country is susceptible to international economic shock can actually lead to tremendous shifts in the inflation-unemployment dynamics in that country [42]. Similarly, there have been examples where FDI has enhanced employment in the G7, particularly in manufacturing and technology. Adverse effects of FDI do not fall equally on all regions. They create new jobs in, say, a high-tech company, but can also wipe out jobs in more labor-intensive sectors through the introduction of imported automated technology.

2.1. Gaps in the literature

There is a large body of literature examining the link between economic indicators and employment; nevertheless, there are still many gaps in the literature. Most previous studies have centered on establishing average effects of these variables on employment while often ignoring the different effects on other members of the employment group (e.g., high- versus low-paid workers). Moreover, although quantile regression has been extensively used in research on wages, its use in research on employment has not been to a similar extent, especially in the context of the G7. It is rare that a quantile regression approach has been used to investigate the different effects of economic factors on quantiles of the employment distribution. Furthermore, while a considerable amount of research has examined the effects of economic

relations on employment in different countries, comparatively little research has examined these effects between the G7 countries, especially while using more advanced econometric techniques such as quantile regression.

2.2. Theoretical underpinning and framework

Just as in any other market, in pure classical economics, supply and demand regulate the labor market. Equilibrium in this market is determined by the labor supply from individuals and the demand for work from the employers. Changes in the population, growth rates in GDP, and other technological aspects influence the demand for labor, and wages and jobs react accordingly [14,25]. This theory excludes complex issues such as income distribution, skill imbalances, and regional disparities, assuming that the labor market consumes equally. Keynesians put greater emphasis on and consider aggregate demand rather than classical schools on employment levels. Keynesians see unemployment as a result of deficient aggregate demand caused by hyperinflation, slow GDP growth, etc. According to this view, only when the labor market fails to provide job security would a government's action become imperative to boost demand, especially in times of recession. The Phillips curve, establishing an inverse relationship between unemployment and inflation, has been useful in understanding the stability of macroeconomics. Structuralism states that labor markets in the developed economies of the G7 are often characterized by structural rigidities such as trade liberalization, demographic transition, and technological advancement. When job creation does not keep up with the changing economic structure, they cause structural unemployment [43]. For example, depending on the allocation of investments across industries, FDI may displace jobs in some sectors while simultaneously creating jobs in others. It was some economists, such as Gary Becker, in 1993, who propounded that human capital, chiefly defined in terms of education and skill sets available in the workforce, is an important determinant of employment. Here, investments in R&D and technological developments emerge as significant employment-generating activities, especially in high-technology sectors. Employment opportunities in these sectors are expected to grow when the economic climate rewards innovation and human capital investment.

The aforementioned classic labor market theories tend to be very good for many insights, yet they fall short in many instances in explaining the range of employment outcomes, especially so when they are examined pluralistically across the various labor force groups involved. In comparison to average effect models, quantile regression provides a thorough understanding of how economic variables such as GDP growth, inflation, and interest rates affect employment within specific quantiles or segments of the labor market [44,45]. Introduced by Koenker and Bassett in 1978, quantile regression basically provides a framework for modeling the conditional quantiles of a dependent variable. This method is especially useful where there is a non-uniform relationship between independent and dependent variable people. Quantile regression provides how much different economic indicators impact employment in every quantile of the employment distribution (for instance, low versus high employment groups) within a labor market setting. Conventional methodologies such as OLS estimate the mean effect of the independent variables on employment,

which typically assumes that this effect remains constant through the distribution. This assumption often proves false as far as labor markets are concerned, since skilled workers, high-wage workers, and low-wage workers can be influenced by very different economic conditions. Effectively, it estimates relationships at quasi-quantiles (for example, 0.05, 0.25, 0.5, 0.75, and 0.90) as well as mean values to capture this distributional effect. With this approach, a deeper understanding will surface as to how different segments of the labor force are affected by changes in the economy.

A method for examining how economic indicators influence employment in the G7, applying quantile regression and theoretical models to explore how they affect employment results across the entire distribution of the employment level where macroeconomic variables like GDP, inflation, FDI, trade, and R&D are accounted for with the assumption that the effects of the variables alone change by employment quantile. GDP growth, for example, will cause more of a change at high employment quantiles with skilled full-time workers than at lower employment quantiles, where workers are less sensitive to overall economic change [25,46]. In terms of employment, labor market factors will have a negative effect on employment, such as interest rates and unemployment rates. But again, the effect will be felt more at the lower quantiles when workers are unable to move to stable, higher-paying positions [47]. Once again, the study's innovative use of quantile regression illustrates the labor market's varied reactions to economic stimuli, as well as enhanced understanding and knowledge of how these economic factors have an impact on employment at various placements in the displacement.

2.3. Hypotheses

The hypotheses for this study can be framed as follows:

H0 (null hypotheses):

a) There is no significant difference in the impact of GDP growth, FDI, and trade volume on employment across the quantiles of the employment distribution. These factors have the same effect across all employment levels, regardless of sector or wage type.

b) Inflation, interest rates, and unemployment rates do not disproportionately affect employment in the lower quantiles. These economic indicators have equal effects on workers across all employment levels, including both low-wage and high-wage sectors.

c) Population growth and R&D expenditures do not have a differential impact on employment across different quantiles. The effects of population growth and R&D are the same across all employment levels, without variation in higher or lower quantiles.

H1 (alternative hypotheses):

a) GDP growth, FDI, and trade volume have a stronger positive effect on employment in the upper quantiles of the employment distribution, with these factors stimulating job creation in high-employment sectors that require skilled labor. Their effects are less pronounced in low-wage or labor-intensive sectors.

b) Inflation, interest rates, and unemployment rates disproportionately affect employment in the lower quantiles. Workers in low-wage or precarious jobs are

more vulnerable to shifts in inflation and interest rates, and high unemployment rates hinder job entry, especially in low-employment sectors.

c) Population growth and R&D expenditures have a more significant impact on employment in certain quantiles. R&D positively affects employment in higher quantiles, where innovation-driven job creation is more prevalent, while population growth places more pressure on employment in rapidly growing workforces, particularly in lower quantiles, with less pronounced effects in more mature labor markets.

2.4. Research questions

In light of these hypotheses, the study seeks to answer the following research questions:

1) What is the impact of key economic indicators on employment outcomes across different quantiles of the employment distribution in G7 countries?
2) How do economic factors like GDP growth and inflation influence employment in low-employment sectors compared to high-employment sectors in the context of G7 countries?
3) How do labor market dynamics, such as unemployment rates and interest rates, disproportionately affect employment in lower quantiles, and how do these factors influence job creation in high-wage versus low-wage sectors?
4) What role do population growth and R&D expenditures play in shaping employment outcomes across different quantiles, and how do these factors impact employment in sectors requiring skilled labor versus low-wage or labor-intensive sectors in G7 countries?

3. Data & methodology

3.1. Data collection and preprocessing

The data for this study were obtained from the World Development Indicators (WDI) database, with supplementary data from Trading Economics and Macrotrends to fill missing values for key economic indicators across the years 1995 to 2023. The dataset covers G7 countries Canada, France, Germany, Italy, Japan, the United Kingdom and the United States, and the following variables were included (see **Table 1**).

Table 1. Variables description.

Variable	Description	Source	Relationship with Employment	Justification
EMP (Employment)	Represents employment outcomes in the labor market.	World Development Indicators (WDI), Trading Economics, Macrotrends	Dependent variable; employment levels are influenced by changes in GDP, inflation, FDI, and other economic indicators.	Employment is the outcome of interest, and its variation is driven by economic conditions.
GDP	Gross Domestic Product: Reflecting overall economic performance.	World Development Indicators (WDI), Trading Economics, Macrotrends	Typically, a positive relationship exists; higher GDP growth tends to lead to higher employment due to increased demand for labor.	Economic growth generally stimulates business expansion and job creation.

Table 1. (*Continued*).

Variable	Description	Source	Relationship with Employment	Justification
INF	Inflation: A measure of price level changes in an economy.	World Development Indicators (WDI), Trading Economics, Macrotrends	Negative relationship; high inflation may reduce purchasing power and cause economic instability, leading to fewer jobs.	Inflation can reduce consumer demand, thus harming employment in some sectors.
FDI	Foreign Direct Investment: Reflecting cross-border investments in a country's economy.	World Development Indicators (WDI), Trading Economics, Macrotrends	Positive relationship at higher quantiles; FDI can create jobs in emerging sectors and industries.	FDI boosts economic development by establishing or expanding businesses and creating jobs.
POP	Population Growth: The annual change in population size.	World Development Indicators (WDI), Trading Economics, Macrotrends	Mixed; higher population may create pressure for more job opportunities, especially in developing countries.	Growing populations lead to a larger workforce, increasing the demand for employment.
Un_EMP	Unemployment Rates: Reflecting the percentage of the labor force that is unemployed.	World Development Indicators (WDI), Trading Economics, Macrotrends	Strong negative relationship; higher unemployment typically signals a lack of job opportunities.	High unemployment reflects labor market inefficiencies, which can hinder economic and social stability.
INT	Interest Rates: The cost of borrowing in the economy.	World Development Indicators (WDI), Trading Economics, Macrotrends	Negative relationship at higher quantiles; higher interest rates may reduce investment, leading to fewer job opportunities.	High interest rates discourage borrowing and investment, which could reduce job creation in some sectors.
R&D	Research and Development Expenditures: Reflecting investments in innovation.	World Development Indicators (WDI), Trading Economics, Macrotrends	Positive relationship at higher quantiles; innovation-driven sectors (technology, manufacturing) are likely to create skilled jobs.	R&D investment is critical for technological advancement and job creation in high-skilled sectors.
TRADE	Trade Volume: Reflecting the total goods and services traded between countries.	World Development Indicators (WDI), Trading Economics, Macrotrends	Positive relationship; increased trade tends to create jobs in export-driven industries, though it may displace jobs in others.	Trade expansion can lead to job creation in industries catering to exports while also fostering economic integration.

3.2. Quantile regression

Quantile regression allows the estimation of conditional quantiles of the dependent variable, while Ordinary Least Squares (OLS) regression calculates the mean effects of explanatory variables. This is particularly useful for understanding the heterogeneous effects on different segments of the labor market. Quantile regression is used in this report to understand the effect of key economic variables on employment (EMP) at the 5th, 25th, 50th, 75th, and 90th percentiles in the distribution of employment. By concentrating on these quantiles, the research captures the differing impacts of economic drivers on employment within high-, low-, and middle-wage sectors as well as full-time employment and part-time employment.

3.3. Model specification

$$Q_T(EMP_{it}) = a_T + \beta_{T,1}.GDP_{it} + \beta_{T,2}.INF_{it} + \beta_{T,3}.FDI_{it} + \beta_{T,4}.POP_{it} + \beta_{T,5}.Un\_EMP_{it} + \beta_{T,6}.INT_{it} + \beta_{T,7}.R\&D_{it} + \beta_{T,8}.TRADE_{it} + \epsilon_{it} \quad (1)$$

3.4. Descriptive statistics

Overall descriptive statistics were used to assess each variable's central tendency, dispersion, and distribution. Among these were minimum, maximum, mean, median,

standard deviation (SD), mean absolute deviation (MAD), skewness, and kurtosis. The result of this investigation showed many of the variables, including GDP and FDI, had skewness and kurtosis values of non-normal distributions. R&D had a normal distribution, as noted by a *p*-value of 0.160 from the Shapiro-Wilk test. Each variable in this study had evidence of variability, according to the values of SD and MAD. The Shapiro-Wilk indicated that most of the variables were non-normal as a measure of the reliability of the data dealing with the conditions that necessitated the resilience of quantile regression.

3.5. Correlation analysis

Also, consider correlation analysis pairwise as a means of determining linear associations between a given variable and the employment variables. Correlation coefficients now were computed to gauge the strength and sense of diverse styles of relationships. The negative relationship anticipated between unemployment and availability for jobs was, in fact, confirmed by a negative correlation between unemployment (Un_EMP) and employment (EMP). There is also a positive relationship between economic growth and employment, as was shown by the minor positive correlation between GDP and EMP. To sum up, the importance of understanding how different forms of states of the economy relate to labor market outcomes was very well illustrated by our study.

3.6. Variance Inflation Factor (VIF)

The Variance Inflation Factor (VIF) of each variable has been calculated so as to investigate multicollinearity among the independent variables. The VIF gives an idea of how much the variance of a regression coefficient increases due to multicollinearity with other variables. VIFs greater than 5 imply a potential multicollinearity problem, which suggests that the variable may be correlated with some other predictor variables, and this correlation can bias the model. The study found no significant multicollinearity, as most VIFs were found to be less than 5. The unemployment (Un_EMP) with a VIF of 2.234 appears to have significant collinearity with other variables, most notably with inflation and GDP.

3.6.1. Panel Unit Root Test

Before carrying out any regression, it is important to verify whether the variables are stationary because we are using panel data concerning a number of countries over time. Since non-stationary data could lead to erroneous results, a Panel Unit Root Test was conducted to determine if the variables had unit roots or not. The non-stationarity of the variable is the null hypothesis of the unit root test. The unit root test suggested that most of the variables were stationary; hence, regression analysis does not require any differencing since there were no patterns that suggested time-dependent behavior.

3.6.2. Cross-sectional dependency test

It is necessary to test for cross-sectional dependence to check for associations between countries due to the time dimension and the presence of multiple countries. The associations might need adjustments, which may influence valid statistical inference. To find out if there were connections between the data points in the various countries, a cross-sectional dependency test was conducted for every variable. The

null hypothesis for the test states that there is no cross-sectional dependence. In order to see if the null hypothesis could be rejected, the test statistic was compared to the critical value.

3.7. Quantile regression estimation

Many variable impacts, that is, those affecting employment at various quantiles of such employment distribution (0.05, 0.25, 0.50, 0.75, 0.90), were examined with the help of quantile regression. Unlike the classical OLS regression, which estimates an average effect, quantile regression portrays a more complete picture by estimating the conditional distribution of the dependent variable (employment) at various locations along the distribution. Direct impacts of different economic factors on employment can thus be recorded for low, medium, and high employment levels. Given the intrinsic heterogeneity of the labor market, a variable such as GDP may have very different impacts on low-, medium-, and high-quantile employment, depending on the country or industry in question. Labor demand is highly sensitive to economic growth in high-wage sectors; the economic growth (in terms of GDP), therefore, may hence exert a greater positive influence on employment in these sectors than in sectors characterized by low or precarious wages. Likewise, low-employment sectors may be disadvantaged by inflation and interest rates since their employees appear to be most vulnerable to economic shocks. If the impact of the economic variables is examined at different quantiles, the quantile regression might give much clearer insight into how economic impacts work across different sectors of the labor market.

4. Empirical results and interpretation

4.1. Descriptive statistics overview

Descriptive statistics provide important information regarding the distribution, dispersion, and central tendency of the variables. The median EMP rate, at 45.98%, is marginally greater than the EMP of 42.46%. The major difference between the mean and median indicates that the economic results of labor market outcomes could be different among G7 nations, implying a slight bias towards high employment rates in the sample. The mean absolute deviation (MAD), equaling 7.92%, and standard deviation (SD), equaling 12.56%, indicate that employment results vary highly between countries, wherein some of the nations have far higher employment levels than others. Skewness values also depict asymmetry in the distribution of many variables. A few nations have abnormally high values of GDP, FDI, and TRADE, while most cluster around low values. This is negative skewness. It may indicate that some G7 countries are tremendously rich or trade a lot, while others do these activities on a moderate scale. R&D, on the other hand, appears to have skewness closer to zero, indicating a more symmetric distribution. Some variables, such as FDI and TRADE, have high kurtosis values, suggesting that their distributions have heavy tails with some extreme values. This stresses even more the stark difference in the economic condition of G7 nations. For example, FDI may be highly concentrated in only a few countries (like Germany or the United States), which might lead to high kurtosis,

having huge outliers. Shapiro-Wilk tests confirmed non-normality of most variables (p-value < 0.0000), indicating the presence of trends, seasonality, or outliers and hence being suitable for much more robust models like quantile regression (see **Table 2**).

Table 2. Descriptive analysis- author's calculation.

	EMP	GDP	INF	FDI	POP	Un_EMP	INT	R&D	TRADE
Min	15.56	−10.30	−1.35	−2.65	−1.85	2.35	−4.30	0.94	16.39
Max	60.50	8.93	8.20	12.61	2.93	12.68	10.13	3.6	89.06
Mean	42.46	1.60	1.86	2.05	0.46	6.94	3.28	2.24	51.42
Median	45.98	1.85	1.73	1.63	0.44	7.04	3.13	2.22	54.45
MAD	7.92	0.93	0.75	0.94	0.34	0.26	1.53	0.57	11.66
SD	12.56	2.47	1.56	2.13	0.52	2.58	2.35	0.68	17.80
Variance	157.66	6.12	2.44	4.56	0.27	6.71	5.53	0.46	316.76
IQR	23.81	1.85	1.47	1.97	0.66	4.10	3.10	1.12	29.31
Skewness	−0.57	−1.49	1.41	2.19	0.002	0.26	0.19	−0.04	−0.30
Kurtosis	−0.92	5.21	3.56	6.64	3.39	−0.86	0.35	−0.99	−0.95
Shapiro_Test_*P*_Value	0.000	0.000	0.000	0.000	0.000	0.000	0.160	0.000	0.000

4.2. Correlation analysis

It is quite clear that correlation analysis gives preliminary insight into the association between economic and employment factors. The broad premise of labor economics states that high unemployment ratios almost always lead to reduced employment ratios. The great negative correlation of −0.58 between unemployment (Un_EMP) and employment (EMP) greatly shows that. Unemployment is an indicator of the economy's underutilized labor force, and, obviously, if the number of people without jobs increases, employment will decrease. Interestingly, the idea that jobs are actually created with the expansion of economic growth is proven by the fact that GDP shows a marginally positive correlation (0.22) with EMP. However, weakness in this linkage also indicates that other macroeconomic, structural, or institutional factors are

Table 3. Pairwise correlations.

	EMP	GDP	INF	FDI	POP	Un_EMP	INT	R&D	TRADE
EMP	1.00								
GDP	0.22	1.00							
INF	0.13	0.27	1.00						
FDI	0.29	0.19	0.06	1.00					
POP	0.43	0.11	0.21	0.21	1.00				
Un_EMP	−0.58	−0.04	−0.06	−0.04	−0.02	1.00			
INT	−0.15	0.07	−0.07	0.04	0.03	0.32	1.00		
R&D	0.32	−0.05	−0.13	−0.21	−0.19	−0.63	−0.10	1.00	
TRADE	−0.03	0.03	0.24	0.28	0.04	0.26	−0.00	−0.033	1.00

at play for the employment outcome aside from a large proportion of GDP. Changes in technology, the labor market, or demographics may also be significant factors in

influencing employment rates. Correlations between FDI and EMP (0.29) and commerce and EMP (−0.03) are rather low and show that foreign investment and international commerce do not really contribute to job creation. Such as, Foreign Direct Investment (FDI) mostly draws into capital-intensive industries, which do not create jobs immediately, or into mature economies with higher employment ratios. Trade may benefit certain industries, but it doesn't create new jobs, such as in regions that are more likely to experience outsourcing or automation, for example (see **Table 3**).

4.3. Variance Inflation Factor (VIF)

The Variance Inflation Factor (VIF) values are an important measure that can help identify whether there is multicollinearity: high correlation among independent variables. All of the VIF values were below 5, demonstrating there isn't multicollinearity. This is important because multicollinearity can distort regression estimates and prevent you from determining the individual, unique effect of each independent variable. With a highest VIF of 2.234, unemployment (Un_EMP) is slightly collinear with other economic variables. As unemployment is often highly correlated with inflation and economic growth (GDP), the finding is expected. Though Un_EMP has a slightly high VIF since it is being affected by the overall economy of GDP and inflation, it is not high enough to be overly concerning (see **Table 4**).

Table 4. Variance Inflation Factor.

VIF	GDP	INF	FDI	POP	Un_EMP	INT	R&D	TRADE
	1.140	1.247	1.290	1.148	2.234	1.186	2.108	1.313

4.3.1. Panel Unit Root Test

The Panel Unit Root Test indicates that the variables are found to be stationary in nature. This is critical because non-stationary data can lead to inaccurate regression results, meaning we can identify correlations that are not really present. The tests found most of the variables to be stationary, meaning that their statistical properties remain constant over time. The variables found to be stationary included GDP, FDI, POP, R&D, and Un_EMP. This means we can assume that the relationships examined

Table 5. Panel Unit Root Test.

Variable	Test Statistic	Critical Value (1%)	*p*-value	Result
EMP	−10.5158	−3.46	$<2.2 \times 10^{-16}$	Stationary
GDP	−8.3276	−3.46	1.15×10^{-13}	Stationary
INF	−6.783	−3.46	2.05×10^{-13}	Stationary
FDI	−4.2504	−3.46	8.87×10^{-9}	Stationary
POP	−4.0848	−3.46	0.000127	Stationary
Un_EMP	−4.5756	−3.46	4.64×10^{-6}	Stationary
INT	−2.3258	−3.46	0.06918	Non-Stationary
R&D	−2.9529	−3.46	0.007861	Stationary

in the regression models are stable and reliable. Interest rates (INT) with a *p*-value of

0.06918 were found to be non-stationary this means that interest rates in each country follow patterns over time and need to be differenced in order to be stationary. This was an important determination because the level of interest rates at some point in the past, as well as other economic factors, may shape the overall long-term impacts of interest rates on employment (see **Table 5**).

4.3.2. Cross-sectional dependency test

Similar to economic data, cross-sectional dependency tests are generally focused on the cross-country dependencies, or correlations among the countries in the panel data set. For example, a pull or change in one country may change the employment situation in close neighboring countries. The test results stated that most of the variables (GDP, FDI, R&D, Un_EMP, TRADE) provided strong evidence of significant cross-sectional dependence; yet, the employment (EMP) with a *p*-value of $< 2.2 \times 10^{-16}$ and the test statistic −10.5158 confirmed that the interdependence of the nations in question is significant enough to assert that trends and policies affecting the economy of one G7 country would similarly affect employment results in another. However, there was non-significant evidence of cross-sectional association for interest rates (INT) *p*-value = 0.06918, which suggests interest rates are more 'home grown' policies with much less interwoven association with the other countries. Likely due to differences in monetary policies or national economic situations (see **Figure 1**).

Figure 1. Cross-sectional dependency test.

4.4. Quantile regression results

A more complete understanding of how each of the different economic indicators GDP growth, FDI, inflation, interest rates, R&D, trade, population growth, and

unemployment affect jobs in the different segments of the labor market in G7 nations is the goal of this study. The main interest of the study is the differential effects these economic determinants have on employment in high- and low-employment sectors, even though the quantile regression method is used to examine these impacts at several quantiles of employment (0.05, 0.25, 0.50, 0.75, and 0.90).

According to the results, employment is positively influenced by economic growth, as indicated by GDP, much more at higher quantiles (0.75 and 0.90). This implies that growth promotes the generation of more full-time, higher-paying jobs. In lower quantiles (0.05 and 0.25), where jobs are more concentrated in precarious, part-time, or poorly paid work, the impact of GDP growth is less evident. FDI is a significant stimulator of job creation in high-employment sectors. According to the study, FDI increases employment at the 0.50, 0.75, and 0.90 quantiles; the effects are more marked in more established companies and higher-skilled employment. In sectors with comparatively small employment, its impact is negligible. The impact of inflation on employment is rather unclear.

Higher inflation harms high-employment sectors as it raises the cost of production and lowers the purchasing power of consumers in higher quantiles (0.50, 0.75, and 0.90), but it can create employment in low-employment sectors by inducing demand for goods and services (as shown in quantiles 0.05 and 0.25). Higher interest rates more negatively impact employment in high-employment sectors. As borrowing is now expensive, employment opportunities are particularly reduced in capital-intensive industries like construction, real estate, and manufacturing. The 0.75 and 0.90 quantiles are where this is most pronounced, as the elevated interest rates choke the growth of companies. Employment opportunities at the higher quantiles of the employment distribution are much better served by R&D investments. This is particularly true for industries that are driven by technical innovation, like advanced manufacturing and high-tech industries, where employment growth is linked to ongoing upgrading of technology and skills.

Table 6. Quantile regression estimation-MMQR.

Variable	0.05 Quantile	0.25 Quantile	0.50 Quantile	0.75 Quantile	0.90 Quantile
Intercept	26.5234	38.0660	49.6447	48.6470	60.7169
EMP	0.3521	0.2462	0.5159	0.5309	0.1836
GDP	0.1353	0.0492	0.0559	0.2412	0.7036
INF	0.3415	1.6399	1.1226	0.6198	0.3598
FDI	6.8975	9.9326	11.8916	8.4746	6.8198
POP	−2.2149	−2.1625	−2.5562	−1.5087	−1.4605
Un_EMP	0.1326	−0.3540	−0.3755	0.1595	0.0364
INT	6.7602	4.7026	0.9007	−0.3388	−2.8955
R&D	−0.0030	−0.0911	0.0167	0.1049	0.0448

Trade has a positive impact on jobs, especially in export-oriented industries. In industries with higher employment, where widening international markets boost labor demand, this effect is particularly experienced. Yet, trade liberalization may also result in job losses, especially in low-employment sectors, as they compete with lower-wage

countries. Population growth has a number of effects on employment. It can increase the supply of labor in high-employment sectors, which can strain the labor market, particularly in nations with high population growth. Conversely, population growth can exacerbate employment shortages in low-employment sectors, particularly in economies that are facing demographic challenges such as aging populations. Unemployment hurts all quantiles of employment. Nonetheless, because work opportunities are already scarce, its impact is particularly felt in low-employment sectors (0.05 and 0.25 quantiles). The possibilities of getting employed in these fields are also diminished by high unemployment levels, which show the necessity of lowering unemployment in order to trigger the generation of new jobs (see **Table 6**).

4.5. Interpretation & discussion of results

Quantile regression analysis showed employment differentially affected by economic factors across the labor market, a connotation of such a view. GDP, for the most part, acts as a significant economic motivator at upper quantiles (0.75 and 0.90); it shows strong positive signs of employment. This means economic growth creates job opportunities more in semi-skilled labor markets or full-time permanent employment sectors with a large base of employment. To the extent that a growing economy promotes business expansion and increases demand for workers in well-established sectors, these sectors include full-time, high-skill employment. A lower quantile (0.05 and 0.25) would suggest that the impact of GDP on employment is not that strong, insinuating that economic growth does not really affect job creation in industries with low employment, usually defined by part-time or low-paying jobs. Such low-employment sectors, due to either structural issues like skill mismatch or lack of investment, may be seen as less responsive to general economic trends, adding credence to the idea that economic progress may be made in an inequitable manner. This figure shows the complexity of inflation's impact on employment; at 0.25 quantiles, it shows positive effects, implying inflation may stimulate job creation in certain low-employment sectors. Here, inflation could increase demand for certain goods and services, which would necessitate hiring additional staff. Conversely, this positivity does not hold at higher quantiles since, at 0.5, 0.75, and 0.90, inflation becomes more damaging to labor-intensive sectors, particularly those with stable, high-paying jobs. Inflationary pressures typically increase expenses for firms, decreasing profitability and possibly encouraging contraction in established industries, which may include slowing their hiring. This means that while inflation may raise demand and even generate jobs in low-wage sectors, it may end up destabilizing the traditional sectors where workers are higher-paid and privileged when it comes to job security. Particularly at 0.50 and 0.75 quantiles, Foreign Direct Investment (or FDI) appears to be very instrumental in creating jobs, which means FDI seems to create jobs within high-employment industries. Foreign Direct Investment (FDI) is typically directed toward capital-intensive industries or emerging markets with large pools of labor to be able to expand and modernize into, say, manufacturing, technology, and services [48,49]. This supports the case for foreign investments boosting the industries that are already established, thus enhancing economic growth and sustainable employment. Conversely, it seems that Foreign Direct Investment is more adept at

scaling present enterprises than it is at creating jobs in low-employment sectors like informal or small-scale industries [50,51]. The established industries, however, are felt to have terribly little FDI at the lower quantiles. Employment is negatively affected at higher quantiles (0.75 and 0.90) by interest rate (INT), suggesting that very capital expenditures matter for job creation. Generally, it is higher interest rates that hamper borrowing and investment in capital-intensive sectors such as manufacturing, real estate, and construction. As many sectors require low-cost capital for their growth and operations, high-interest rates would cause companies to reduce their investments, which would ultimately reduce job opportunities, especially in sectors of high employment [29,52,53]. Low-employment sectors, on the other hand, depend upon labor value rather than capital-investment cost, which is why higher unemployment does not have such a significant negative impact (at 0.05 and 0.25). This study emphasizes the necessity of an investor-friendly interest rate policy for job creation in various sectors with high employment generation. The impact of unfertilized unemployment is negative for employment at all quantiles but is more intense at lower quantiles. Hence, this entails that higher unemployment might directly diminish job potentials in general, much more so in low-wage sectors. This is an effect that adds to poor labor market conditions that lower job chances for low-skilled workers. A high level of unemployment provides, therefore, even fewer secure, low-wage job opportunities for them. On the other hand, influences of unemployment on employment become pronounced in relatively high-turnover industries like temporary or part-time work, where employees are more susceptible to economic change. The findings suggest the strong need for policies aimed at lowering unemployment in order to create jobs in all sectors of the economy. Innovation and integration into a global market are vital to job creation, with R&D and trade showing larger positive benefits at higher quantiles of employment. R&D expenditure usually has a positive impact on employment in high-tech sectors, especially in manufacturing, services, and technology, where innovation and technological advancement create new job opportunities [54,55]. The positive impact of R&D on employment at the higher quantiles suggests that investment in innovation is a condition for long-term economic growth and the generation of well-paying jobs in dynamic sectors. Likewise, trade has more impact on employment in R&D since international trade creates demand for goods and services and, subsequently, new markets. By opening up new global markets and fostering productivity, trade would be one of the biggest job creators for high-employment sectors, particularly in manufacturing and services [6,56].

5. Conclusion

The approach of analysis was the quantitative regression analysis for probing with respect to how different economic variables interact with employment outcomes at their different quantiles along the distributions of employment. It was found that different segments of the labor market react differently to economic conditions to which they are adapted, thus proportionality of the effects of economic factors on employment. Among others, trade and R&D, FDI, and improvements in GDP contribute to employment generation, particularly in sectors with the highest employment levels. Thus, this has been interpreted to mean that the high-skill sectors

are likely to have greater job opportunities, better job security, and relatively stable employment conditions due to factors such as improving economic growth, Foreign Direct Investment, and innovation. Most of the employment lies in these sectors, which exhibit flexible adaptation to performance and innovation in a developing economy, thus reinforcing economic growth as a major stimulant for strong job creation [57,58]. However, this whole scenario is complicated with respect to interest rates and inflation. In fact, inflation positively influenced employment in some low-employment sectors since the increased demand for goods and services as a result of inflationary pressures also increased the demand for labor in those sectors [59]. On the other hand, jobs in stable and high-wage sectors were adversely affected by inflationary pressures at higher quantiles, where job security is stronger [60]. This suggests that inflation leads to instability in well-established firms, increased production costs, and diminished purchasing power. Interest rates also had a negative correlation at upper quantiles with employment, especially in capital-intensive sectors. High borrowing costs, incurred through increases in interest rates, will stifle business development and, thus, job opportunities within capital-intensive industries such as manufacturing, real estate, and construction. These findings illustrate the need to enhance the management of these two variables in order to promote harmony across the various requirements of labor market groupings. A sustained negative correlation was found between unemployment and employment along the quantiles, the most severe effect being in low-employment sectors. This indicates even poorer employment conditions: the higher the unemployment rate, the bigger a spoiler it is for job creation. That unemployment remains a huge spoiler to job creation underscores the need for urgent, tailor-made programs for reducing unemployment rates, especially in the more vulnerable sectors. The need for tailored strategies to address the unique challenges of different labor market segments is evidently highlighted by this analysis. For instance, in high-employment sectors, jobs could be created through economically forward policies relating to investments in infrastructure, technology, and innovation. In contrast, those in low-employment sectors may benefit from further subsidized wage employment, retraining programs, or even direct labor market interventions for enhanced job security. The study furthermore emphasizes the importance of R&D and FDI in creating employment opportunities in the long run, specifically in the high-skilled sectors that are vital to the national economy. So too, low unemployment would cast a shadow of helpfulness as an economic indicator and an equally important variable for ensuring that job opportunities do not leave behind any segment of society. Ultimately, this study purports that an environment conducive to a permanent high-performing and inclusive labor market will be built only through inclusive economic policies that will embrace both high- and low-wage earners. In addition, when developing interventions, policymakers have to take care of the particularities of each employment sector so as to spur economic growth while reducing disparities regarding job access, security, and stability.

6. Policy implications

6.1. Policy implications for low-employment sectors (0.05 and 0.25 quantiles)

Low-employment sectors, which in most cases include low-paid, insecure, or irregular employment, are most affected by economic recessions. These sectors typically lack capital and infrastructure to withstand economic adversity, and therefore policies aimed at generating jobs are essential. Policy makers would have to aim job creation policy measures like subsidized wage employment, public works, and active labor market policies. These programs would provide training in skills and placement, increasing employability within higher-paying sectors. Social safety nets, such as the right to healthcare and unemployment insurance, are also necessary to assist in mitigating the direct impact of economic insecurity for lower-paid workers.

The U.S. could lengthen job retraining for workers laid off as a result of automation and globalization by increasing Trade Adjustment Assistance (TAA) to prepare new industries with new abilities. Italy could invest in hiring youth in green technologies and energy industries to decrease unemployment among the youth. Japan could address population aging by upskilling youth in the caregiving industry and encouraging firms to hire older employees.

6.2. Policy implications for high-employment sectors (0.75 and 0.90 quantiles)

High-employment sectors, such as technology, manufacturing, and finance, are characterized by stable, high-skilled jobs and high rates of economic growth. These sectors are, however, interest-rate sensitive in the sense that higher rates can translate into increased costs of capital and reduced business investment. Policymakers must prioritize innovation, foreign investment, and the development of human capital. Tax rebates for companies investing in R&D and infrastructure can offer incentives for job creation in high-skilled sectors. Granting access to finance and maintaining low interest rates is necessary for the development of capital-intensive industries.

Germany, Canada, and the UK are promising fields of development in the green transition. Green transition policies in Germany, which promote electric vehicles and renewable energy production, could result in the formation of high-skilled labor jobs. Canada could boost technology hubs and provide tax credits for R&D in artificial intelligence and clean tech. The UK could support fintech and biotech industries by providing research grants and specialized training. Additionally, providing interest rate control could catalyze the formation of employment in these high-employment-potential industries.

6.3. Limitations of the study

The empirical findings yield significant implications for policy. First among these is the promise given by such policies in increasing job opportunities in the high-employment sectors. Here, sustainable economic growth is the agenda on which all investments in technology, innovation, and infrastructure will bring dividends. Such expansion, being diversified, will uplift skill-based industries and broaden options in

the labor markets, benefiting high- and low-wage earners. Second, inflation has much stricter control because, apart from being a boost for employment in low-occupying industries, it can also wreak havoc on high-occupying industries through higher production costs and powerlessness in purchases. In controlling the harm to already established, high-wage businesses, policymakers should strive to keep inflation steady. Moreover, Foreign Direct Investment (FDI), especially for moderate- to high-employment industries, should be supported through a business-friendly environment with tax incentives, investments in cross-border activity, etc. This will develop industries that today employ an outstanding percentage of the workforce and promote job development. In addition, interest rates should be cautiously managed in rich-employment industries, particularly those needing large capital expenditures, so as not to strangulate capital investment. Policymakers should try to have growth-compromising rates not be so high that job creation is stunted in significant industries. The direct impact of unemployment bears on total outcomes in employment, so decreasing it becomes a priority. Policies aimed at job training, labor market reforms, and social support programs will go a long way in generating employment, especially in the fast-moving industries.

6.4. Future research directions

Future research can build on this study to enhance understanding of how economic conditions affect employment in different contexts by expanding the scope of the nations analyzed by including developing and low-income nations. Employing sectoral analysis at a refined level (by limiting studies to distinct areas such as manufacturing, service, and technology) would provide insights into economic conditions and implications for employment in a sectoral context and facilitate specific, meaningful policy recommendations. The potential for identifying longer-term economic policy impacts suggests turbulent or volatile shocks may relate to the dynamic nature of labor markets, including time lags or dynamic models. If informal workers had been counted in the research on official labor market policy, it may be easier to specify the impacts of formal employment; additionally, if we had measured the impact of informal employment and specifically examined the role of economic conditions in this part of the labor market, we could have better incorporated that in the analysis. The policy recommendations could be made more robust if causal linkages are investigated through causal inference techniques such as Granger tests to make explicit the relationship between economic measures and employment.

Author contributions: Concept and design, LQ; experiment, LQ; writing, LQ; guiding research, LQ; assist with writing, MA; data analysis, MA and PB; resources, HRBM; data collection, HRBM and PB; data processing, PB. All authors have read and agreed to the published version of the manuscript.

Conflict of interest: The authors declare no conflict of interest.

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