Journal of Human Security | 2025 | Volume 21 | Issue 2 | Pages 31-46
DOI: https://doi.org/10.12924/johs2025.210206
ISSN: 1835–3800

Journal of Human Security

Research Article

Are Holidays Good or Bad for the Economy? A Cross-National Evidence from 101 Countries

Muzafar Shah Habibullah[1*], Mohd Yusof Saari[2], Baharom Abdul Hamid[3], Muhammad Daaniyall Abd Rahman[4], Nur Eliya Syahira Che Rosly[5]

[1]Putra Business School, Malaysia. Email: muzafar@putrabs.edu.my
[2]Centre for Future Studies Berhad (The FUTURE), Malaysia. Email: mys@thefuture.com.my
[3]INCEIF (The International Center for Education in Islamic Finance University), Malaysia. Email: baharom@inceif.edu.my
[4]School of Business and Economics, Universiti Putra Malaysia, Malaysia. Email: daaniyall@upm.edu.my
[5]Faculty of Economics, Universiti Kebangsaan Malaysia, Malaysia. Email: eliyasyahira9597@gmail.com

***Correspondence:** muzafar@putrabs.edu.my

Submitted: 19 July 2025 | Revised: 17 October 2025 | Accepted: 30 October 2025 | Published: 24 December 2025

Abstract: The economic implications of public holidays remain inconclusive. Certain studies report that public holidays reduce the available labour supply, leading to diminished firm productivity and, subsequently, lower economic growth. Conversely, other research highlights their stimulative effect, particularly through increased private consumption and demand during holiday periods, which may support growth. This study explores these conflicting outcomes by analysing data from 101 countries. The primary model employs real GDP growth as the response variable, with explanatory variables including the number of public holidays, The analysis incorporates key macroeconomic indicators such as growth in labour productivity, increases in capital stock, tourism development, institutional governance quality, inflows of foreign direct investment, and shifts in urbanization. The initial assessment employs linear estimations through Ordinary Least Squares with heteroskedasticity-consistent standard errors, alongside Robust regression utilizing M-estimation techniques. Both methods reveal a weak linear association between public holidays and growth. We then examine a potential non-linear connection and identify an inverted U-shaped pattern: economic growth initially rises with additional public holidays, up to a certain threshold, after which it begins to decline. To validate these findings, quantile regression is applied. The analysis indicates that the optimal number of public holidays varies by growth quantile: 9 days for the 30th–40th percentiles, 10 days for the 50th–60th, 11 days for the 70th, and 12 days for the 80th–90th percentiles. Our findings recommend that governments identify a balanced number of holidays to maintain stable and sustainable economic performance.

Keywords: Economic growth, multi-country analysis, Quantile regression, public holidays, Non-linear relationship.

Introduction

The role of public holidays in influencing financial markets has long captured the attention of scholars in financial economics. The phenomenon known as the "holiday effect" challenges the foundations of efficient market theory, with consistent patterns observed around major global celebrations such as Ramadan, New Year as well as Christmas among others. Past studies identifies two principal dynamics albeit the pre-holiday effect, characterized by significantly higher returns in the days leading up to holidays—and the post-holiday effect, where increased returns are often recorded in the immediate aftermath [1]. Insights from behavioural finance attribute these patterns to shifts in investor psychology, suggesting that heightened optimism during festive periods leads investors to anticipate more favourable market outcomes [2].

Investor sentiment, which can fluctuate in response to emotional states like happiness or melancholy during festive periods, has been shown to affect stock valuations and market performance [3; 4]. Numerous empirical studies corroborate this link, demonstrating that holiday periods are associated with noticeable changes in investor sentiment [5; 6; 7]. These effects are believed to be temporary. As Liu ,Huang [8] explain, sentiment typically improves in the lead-up to holidays but diminishes if the holiday duration becomes excessive, with further declines observed once regular market activities resume.

Beyond the confines of financial markets, public holidays also exert broader economic effects. Research explicitly investigating the connection between holidays and macroeconomic growth is still relatively limited [9]. Nevertheless, holidays provide individuals with opportunities to disengage from work, allowing for participation in leisure activities that have been shown to improve both happiness and general well-being of the society. [10; 11]. According to de Bloom ,Geurts [12], short periods of relaxation and mental detachment from work responsibilities can lead to sustained improvements in both physical and psychological health. Similarly, Wang ,Wei [13] highlight that leisure activities not only enhance life satisfaction and psychological health but also alleviate occupational stress and bolster job performance—factors that collectively may contribute to higher levels of economic productivity [14; 15].

The "happy-productive worker" hypothesis, articulated by Isham ,Mair [16], suggests that employees experiencing greater well-being are generally more productive. Enhancements in both physical as well as mental health, reductions in stress due to employment environment, and engagement in wellness initiatives are all pathways through which productivity can increase. For example, empirical evidence from China reveals that leisure activities such as watching television or browsing the internet could have a more pronounced effect on subjective well-being than physically active pursuits like exercising or shopping [11]. Additionally, Wei ,Qu [17] find that activities centred on health and sports yield the greatest improvements in well-being, sequentially followed by general leisure, social and family interactions, and sedentary recreational activities.

Literature Review

The availability of skilled labour is a pivotal factor in the production process, directly influencing output capacity. Theoretically, expanding the workforce or increasing working hours should result in higher production levels. However, empirical studies indicate that extending work time can produce negative repercussions, including physical fatigue, workplace accidents, health deterioration, and erosion of social cohesion [18; 19; 20; 21]. An investigation by Cette ,Chang [18] involving 18 countries categorised under OECD revealed that when annual working hours surpassed 1,925, an increase of 1% in working hours led to a 0.9% decline in productivity. This negative effect intensified to a full 1% productivity loss beyond 2,025 hours. Similarly, Pencavel [21] found that individuals working more than 12 hours per day or exceeding 60 hours weekly faced significantly elevated risks of workplace injuries. Collewet and Sauermann [19], in a study on part-time call centre employees in the Netherlands, reported only a marginal output gain of 0.9% for each additional 1% increase in work hours. Their findings suggest this marginal return diminishes further for full-time workers, underscoring the presence of diminishing productivity returns to extended labour.

Although direct empirical links between public holidays and macroeconomic growth are relatively scarce, certain studies offer critical insights. For example, Bruno ,Lupi [22] examined data from 12 EU member states and identified heterogeneous effects: in nations such as Italy, France, and Germany, holidays were associated with negative impacts on growth, whereas in countries like Austria and Spain, they appeared to exert a positive influence. Sector-specific results were inconclusive. Extending this analysis globally, Rosso and Wagner [23] evaluated data from 222 countries across a 20-year span. Their findings suggested that public holidays tend to support national economic growth, with the most pronounced positive effects occurring in the sectors such as services and manufacturing.

Ramasamy ,Yeung [24], conducted a focused study on Hong Kong estimated, an extra public holiday could boost quarterly household consumption by approximately 0.66%, equivalent to about USD 213 per capita. Dastidar and Apergis [9] assessed the implications of holiday expansions on economic performance across 24 Indian states between 2008 and 2016. Their analysis uncovered a slight overall negative correlation between increased holidays and growth, with the most substantial adverse impacts observed in wealthier states. Similarly, Wei ,Qu [25] found an inverse association between holidays and growth in China. However, a subsequent investigation by Wei ,Qu [17] suggested, leisure time might enhance labour productivity among more advanced economies, including the United States, Japan, and China.

Traditional analyses often presumed a linear correlation between public holidays and economic growth. More recent studies, however, propose a non-linear relationship, specifically an inverted U-shaped pattern. Barrera and Garrido [26] developed a theoretical model illustrating that a modest increase in public holidays initially reduces productive workdays, potentially stifling innovation and dampening economic output. Nonetheless, as holidays encourage greater domestic tourism and consumer spending on leisure, they may stimulate innovation and resource efficiency during workdays, ultimately fostering growth. The dynamic interplay between these contrasting effects determines the optimal number of holidays that balances social welfare with sustainable economic expansion.

Leisure time associated with holidays may also stimulate creativity and innovation, indirectly boosting economic productivity. Boikos ,Bucci [27] argue that time allocated for rest and recuperation facilitates innovation by enhancing individuals' long-term performance capacity. Consequently, higher productivity often translates into elevated living standards. However, these benefits are not limitless. Min ,Roh [28] observed that while leisure-driven tourism initially spurs growth, its marginal contributions diminish as nations achieve higher levels of economic development. To sustain growth, continued investment in research and development, as well as active engagement in international trade, becomes crucial.

Empirical support for the non-linear perspective is further provided by Cui ,Wei [29], who examined data from 21 OECD nations between 1980 and 2013. Their findings indicate that while moderate amounts of leisure contribute positively to productivity, excessive leisure displaces productive labour time, resulting in reduced overall output. In a similar vein, Wang ,Wei [13] identified an inverted U-shaped association between leisure time and job performance within China's manufacturing sector. Their research showed productivity improvements up to a leisure threshold of 4.7 hours daily, beyond which performance deteriorated. Mediation analysis confirmed that this pattern is largely driven by enhancements in physical health and subjective well-being.

Methodology

To assess the impact of public holidays on economic performance within a cross-country framework, this study extends the conventional new growth theory model as follows (see [30]):

$$growth_i = \alpha_0 + \beta_j initial_{ji} + \theta_1 holiday_i + \gamma_{ki} Z_{ki} + \epsilon_i \qquad (1)$$

In this specification, $growth_i$ represents the economic growth rate, measured by the annual change in real Gross Domestic Product (GDP) for country i. The term $initial_{ji}$ captures the initial economic conditions, proxied by the level of real GDP in base years—specifically 1960, 1970, 1980, 1990, and 2000, denoted as initial1960, initial1970, and so on. The key explanatory variable, $holiday_i$, reflects the number of public holidays each year. The vector Z_{ki} consists of k control variables accounting for other macroeconomic determinants of growth. The coefficients α_0, β_j, θ_1, and γ_{ki} would be estimated, and ϵ_i is the stochastic error term, assumed to have a mean of zero and variance to be constant.

Control variables incorporated in the model encompass several key macroeconomic indicators. Labour productivity growth is captured through changes in GDP per employed person, reflecting improvements in workforce efficiency. Capital services act as a proxy for investment inputs, representing the stock of productive assets utilised in the economy. Tourism growth is measured by the rise in international tourist arrivals, indicative of demand in the service sector. Urbanisation growth is gauged by changes in the ratio of the population residing in areas considered urban, highlighting structural demographic shifts. Governance quality is proxied by the "voice and accountability" indicator, as outlined by [31], which captures citizens' ability to participate in governance and the degree of institutional openness. Finally, foreign direct investment (FDI) is represented by the share of net FDI inflows compared to Gross Domestic Product (GDP), reflecting the extent of external capital integration into domestic markets.

Convergence theory (Radelet ,Sachs [32]; Sala-i-Martin [33]) posits that countries that has comparatively lower initial GDP are likely to experience higher subsequent growth rates, suggesting that poorer nations tend to catch up with richer ones—a phenomenon referred to as β-convergence. A failure to observe this pattern may indicate the presence of structural disparities or the formation of distinct growth "clubs" across nations.

The theoretical impact of public holidays remains inconclusive. A greater number of holidays could reduce the available working days, potentially diminish firm productivity and constrain aggregate economic growth. Conversely, holidays may encourage higher levels of private consumption and boost tourism spending, thereby fostering economic expansion [9; 24; 26]. As a result, the anticipated sign of θ_1 is indeterminate and may be either positive or negative.

Regarding the other control variables (Z_{ki}), the existing literature predominantly indicates a positive relationship with economic growth. Improvements in productivity Saleem ,Shahzad [34], increased capital accumulation [35], expansion in tourism activities [36; 37; 38], higher institutional quality ([39; 40; 41; 42], growth in foreign direct investment [43; 44], and urbanisation [45; 46; 47] are all factors that typically promote stronger economic performance. Consequently, these variables are expected to exhibit positive coefficients.

Non-linear Effects of Holiday on Economic Growth

In line with the proposition by Barrera and Garrido [26], and supported by prior evidence suggesting a non-linear relationship between economic growth and public holidays, this study also estimates the following quadratic specification:

$$growth_i = \alpha_0 + \beta_j initial_{ji} + \theta_1 holiday_i + \theta_2 holiday_i^2 + \gamma_{ki} Z_i + \epsilon_i \qquad (2)$$

This formulation is designed to capture potential curvature in the relationship between holiday frequency and economic performance. Specifically, if θ_1 is positive and θ_2 is negative, this finding represents or reflects a non-linear relationship, albeit an inverted U-shaped relationship, whereby economic growth initially improves as the number of public holidays rises but begins to diminish once a certain optimal point is exceeded.

In the early stages, additional holidays may boost consumer spending on leisure and recreational activities, stimulating demand and economic output. However, beyond a certain point, excessive holidays reduce productive working hours, undermining firm-level output and overall economic growth. Hence, the net effect reflects a trade-off between beneficial leisure-induced consumption and the opportunity cost of lost labour.

Preliminary visual inspection, as illustrated in Figure 1, confirms this hypothesis. The plotted data for 101 countries reveals a non-linear trend, consistent with the theoretical expectation of Kuznet effect, whereby an inverted U-shaped relationship between the regressor and regressand, albeit, the number of public holidays and economic growth.

Method of Estimations

Employing the OLS method to approximate Equation (1) may be inappropriate, as the dataset used for this cross-country analysis is likely to exhibit heteroscedasticity. To address this, we employed robust standard errors, using the Newey-West correction procedure. This technique produces consistent standard errors even when heteroscedasticity and autocorrelation are present, thereby improving the reliability of inference.

Additionally, the dataset shows the presence of statistical outliers across multiple variables—including growth, number of holidays, capital, foreign direct investment, and urbanisation—as visualised in the boxplots presented in Figure 2. These outliers appear at the extremities of the distributions and could distort the regression estimates if not properly accounted for.

To mitigate the influence of these extreme values, we incorporate Robust regression, an alternative estimation technique designed to handle outliers more effectively. As noted by Barnett and Lewis [48], the presence of outliers can inflate error terms and lead to serious distortions in coefficient estimates and hypothesis testing, especially when standard parametric methods are applied. Such distortions compromise the accuracy and normality of the estimates [49].

M-estimation procedure developed by Huber [50], provides a robust alternative that is less sensitive to anomalous observations. This method assigns diminishing weights to influential data points, thereby improving the accuracy of parameter estimation in the presence of non-normality or influential outliers [51].

Data Sources

This study employs a cross-sectional dataset comprising 101 countries to examine the economic implications of public holidays (see Table 1). The primary year of analysis is 2019, chosen specifically to reflect conditions prior to the COVID-19 pandemic global disruptions.

The data on real GDP, foreign direct investment, labour productivity, tourism, urbanisation, as well as for the initial conditions of GDP were sourced via World Bank's World Development Indicators database. Economic growth is defined by the annual percentage variation in real GDP. Changes in productivity are represented by the growth in GDP per employed person. The tourism indicator captures the annual increase in the number of international tourist arrivals. As for the FDI, it is measured as the ratio of net FDI inflows to GDP, and urbanisation is quantified by the growth rate of the urban population's proportion relative to the overall population.

To account for initial economic conditions, we include five benchmark GDP levels initial1960, initial1970, initial1980, initial1990, and initial2000—serving as proxies for the respective years' real GDP levels.

Capital services data were sourced from the Penn World Table (version 10.0). To represent institutional quality, this study uses the "voice and accountability" indicator from the Worldwide Governance Indicators (WGI), which reflects public perceptions regarding political participation, freedom of the media, and civil liberties.

The number of public holidays per country was obtained from the "Holidays and Observances Around the World" section of TimeandDate.com (https://www.timeanddate.com/holidays/).

To ensure consistency and facilitate elasticity interpretation, all continuous variables were logarithmically transformed. For variables with zero or negative values, we applied the transformation: $log\, log\, y_i = log\left[y_i + \sqrt{(y_i^2 + 1)}\right]$, as recommended by Busse and Hefeker, thereby preserving the original sign of the variable.

Empirical Results

Descriptive statistics for all variables included in the analysis were reviewed, as presented in Table 2. On average, all variables exhibit positive mean values, indicating a dominance of positive over negative observations. In terms of economic performance, Rwanda recorded the highest real GDP growth in 2019 at 9.46%, while Zimbabwe experienced the largest contraction at -6.33%. Regarding public holidays, Sri Lanka had the most with 26 days, whereas Switzerland and Uruguay recorded the fewest, each with only 5 days. Examination of the data further reveals notable variability across most variables, as evidenced by substantial standard deviations and significant degrees of skewness and kurtosis. Seven variables—namely $initial_{1960}$, $initial_{1970}$, $initial_{1980}$, $initial_{1990}$, $initial_{2000}$, capital, and foreign direct investment—are notably skewed, while three variables, namely holidays, productivity, and urbanisation, are moderately skewed. Several series also exhibit kurtosis values exceeding 3, including growth, all initial GDP indicators, holidays, productivity, capital, tourism, and foreign direct investment. These values imply a leptokurtic distribution, characterised by heavier tails than a normal distribution. This non-normality is confirmed by the Jarque-Bera test. rejecting the null hypothesis of normality for all series except economic growth. Given these distributional characteristics—particularly the prevalence of skewness and excess kurtosis—all continuous variables were transformed into logarithmic form, a standard procedure in empirical economic research to improve distributional properties and facilitate interpretation of coefficients as elasticities [52; 53; 54].

The correlation matrix, shown in Table 3, offers additional insights into the relationships among variables. As expected under the theory of economic convergence, the initial GDP variables are negatively correlated with growth, although these relationships are not statistically significant. This suggests that while convergence effects may be present, the evidence is not robust. Among the other variables, most exhibit positive correlations with growth, but only productivity, capital, and tourism show statistically significant relationships at the 10% level. Importantly, multicollinearity does not appear to pose a serious concern, as none of the pairwise correlations among the independent variables—excluding the highly correlated initial GDP series—exceed the threshold of 0.7.

Regression results are presented in Table 4. Initial estimations were carried out using Least Square method (OLS), and diagnostic tests for heteroscedasticity and test for residual normality were applied. These tests reveal that the residuals exhibit heteroscedasticity, violating key OLS assumptions. To correct for this, the models were re-estimated using robust standard errors based on the Newey-West procedure. The final estimation results are presented via Table 4, for the augmented Solow growth model, incorporating alternative specifications of the initial GDP variables to assess convergence patterns. Across these regressions, the initial GDP measures continue to exhibit a negative association with growth; however, the coefficients do not statistical significance. The primary variable of interest—public holidays—shows a negative effect on growth, though this relationship achieves statistical weakly significant at the 10% level in Model 5. These findings suggest that an increase in public holidays may hinder economic growth, albeit with limited magnitude and robustness. Conversely, improvements in productivity, capital accumulation, tourism, institutional quality, foreign direct investment, and urbanisation consistently contribute positively to economic growth, evident with the statistically significant results in most of the model specifications.

Given the evidence of a linear relationship (though weakly) between public holidays and economic performance, a non-linear specification was also estimated. These results, shown in Table 5, include both the holiday variable and its squared term. The coefficients of the linear term and squared term exhibit the expected signs: the former is positive and the latter is negative, with both being statistically significant in Models 2 through 5. This pattern confirms a nonlinear or in other words an inverted, U-shaped relationship, where economic growth initially rises as public holidays increase, but after surpassing a certain point, additional holidays lead to a decline in growth. The estimated turning points suggest an optimal number of holidays ranging from 9 days (Model 2) to 10 days (Models 3 through 5). Furthermore, the control variables—including productivity growth, capital formation, international tourism, institutional quality, foreign direct investment, and urbanisation—retain their positive and statistically significant effects on growth in the non-linear models.

To further validate these findings, the initial GDP variables, which remained insignificant across previous estimations, were excluded, and the models were re-estimated. The revised Table 6 reports the results, with columns 2 and 3 presenting the linear and non-linear estimates derived using OLS with robust standard errors. while columns 4 and 5 report the same specifications estimated using robust regression with M-estimation. The results from Table 6 provide strong support for the non-linear model. Both estimation techniques yield highly significant coefficients for the holiday variable and its squared term, reinforcing the non-linear, inverted U-shaped relationship. The quadratic holiday term is statistically significant (1%) in all models. A redundant variable test confirms that the squared holiday term contributes significantly to the model, with the null hypothesis rejected at the 5% level. The estimated turning points fall ranging from 10 days in the OLS-robust estimates to 11 days in the robust regression results. In the OLS-robust estimations, all included explanatory variables positively and significantly influence growth. In the robust regression framework, productivity, capital, foreign direct investment, and urbanisation remain statistically significant, whereas tourism and governance do not. Overall, these findings support the hypothesis that while public holidays may stimulate growth up to an optimal point, excessive holidays can hinder economic performance.

Quantile Regressions

A notable limitation of OLS estimation is that it only reveals the influence of the explanatory variables on the expected value of the dependent variable, conditional on the regressors. To gain a more comprehensive understanding of how regressors affect the entire distribution of economic growth, we utilise quantile regression, a method introduced by [55]. This approach enables the estimated slope coefficients to vary across different quantiles of the conditional distribution, allowing the relationship between variables to differ at various points of the growth spectrum.

As a non-parametric technique, quantile regression does not impose a specific functional form on the relationship between the regressand and regressor. It is also robust to outliers, making it particularly suitable for data such as ours, where distributional irregularities are present. Estimating the model at several quantiles thus provides a fuller depiction of the conditional distribution of economic growth.

The quantile regression model is formally expressed as:

$$growth_i = Z_i'\beta_\tau + \mu_{\tau i} \qquad 0<\tau<1 \qquad (3)$$

$$Quantile_\tau(Z_i) = Z_i'\beta_\tau \qquad (4)$$

In these equations, Z_i' denotes the vector of explanatory variables defined earlier; β_τ is the vector of coefficients corresponding to the τ-th quantile of the distribution; and $\mu_{\tau i}$ is the error term. The expression $Quantile_\tau(Z_i) = Z_i'\beta_\tau$ represents the τ-th conditional quantile of growth given $Z,$. By estimating β_τ for multiple values of τ (typically ranging between 0 and 1), we obtain a detailed picture of how covariates influence economic growth at different points in its distribution.

The quantile regression coefficients are estimated by solving the following minimisation problem:

$$\hat{\beta}(\tau) = arg\ min_\beta \left[\tau \sum_{\{growth_i \geq Z_i'\beta\}} |growth_i - Z_i'\beta| + (1 - \tau) \sum_{\{growth_i < Z_i'\beta\}} |growth_t - Z_i'\beta|\right].$$

Figure 3 displays the quantile-quantile plots. The results for all the variables clearly show that none of them are normally distributed, consistent with the Jarque-Bera test outcomes reported in Table 2. Such deviations from normality justify the use of quantile regression, which provides more efficient estimation in the presence of non-normal errors and allows for the examination of heterogeneity in variable relationships—especially concerning the holiday variable.

Table 7 reports the outcomes of the quantile regression analysis. With respect to the primary variable of interest, the non-linear effect of public holidays on economic growth is not statistically significant at the 10th and 20th quantiles. This indicates that in countries facing negative or sluggish growth, changes in the number of public holidays have no substantial impact on economic performance. In contrast, from the 30th to the 90th quantiles, both the linear and squared terms for public holidays ($holiday_i$ and $holiday_i^2$) attain statistical significance, displaying the anticipated positive and negative coefficients, respectively. These results confirm the inverted U-shaped relationship (Kuznet effect), where economic growth initially gains from additional public holidays but begins to diminish once an optimal level is exceeded.

Interestingly, the estimated optimal number of public holidays increases across higher quantiles. For countries situated in the 30th and 40th quantiles, the optimal number is 9 days. This figure rises to 10 days for those in the 50th and 60th quantiles, 11 days in the 70th quantile, and 12 days in the 80th and 90th quantiles (see Figure 4). These results suggest that economies with stronger and more sustained growth can accommodate a higher number of public holidays. This pattern is consistent with the conclusions drawn by [23], who found that wealthier nations generally observe more holidays.

The analysis also uncovers variation in the influence of control variables across the distribution of economic growth. Productivity growth has a uniformly positive impact across all quantiles, with elasticity estimates spanning from 0.35 to 0.70. This implies that a 10% rise in productivity may translate into a 3.5% to 7.0% rise in economic growth. The contribution of capital services is statistically significant only at the 10th, 20th, and 90th quantiles. In contrast, growth in tourism positively affects economic output at the 20th and 90th quantiles. Governance and foreign direct investment (FDI) also display positive effects, albeit limited to specific points in the distribution—governance in the 10th and 20th quantiles, and FDI in the 40th, 50th, and 90th quantiles. Urbanisation growth contributes significantly at the 30th and 90th quantiles, highlighting its importance in more urbanised or rapidly urbanising countries. These findings are illustrated in Figure 5, which plots the quantile estimates for all regressors, revealing evident non-linearities and parameter heterogeneity across the distribution. The most prominent effects are observed for public holidays, productivity, and urbanisation, particularly from the 30th quantile onward.

Conclusion

Are public holidays detrimental or beneficial for economic growth of a Nation? Well, that was the question that we were searching answers for by analysing cross-national data from 101 countries that vary in income level, institutional quality, and geographic location. Employing an augmented Solow growth framework, the analysis incorporated various control variables—such as productivity growth, capital services, tourism inflows, governance quality, foreign direct investment (FDI), and urbanisation—to isolate the impact of public holidays on economic performance. Multiple econometric techniques were utilized, albeit Least Square method (OLS) bundled with Newey-West robust standard errors, robust regression, and quantile regression. These methods were applied to mitigate biases arising from heteroscedasticity and outliers and to account for possible variations in the impact of public holidays across different segments of the economic growth distribution.

The linear regression estimates initially suggested that public holidays had an overall weak and statistically insignificant effect on economic growth. However, once non-linear relationships were introduced by including the squared term of the holiday variable, a clear inverted U-shaped pattern emerged. This finding implies that a moderate number of public holidays may in fact promote growth, potentially due to enhanced worker productivity, improved mental health, or increased consumer spending in certain sectors such as tourism. Yet, once the number of holidays surpasses an optimal threshold, the adverse effects—such as reduced working days and lost output—begin to outweigh the benefits.

Quantile regression results reinforced these findings by demonstrating that the non-linear relationship was most robust across the middle and upper segments of the growth distribution. In countries situated in the lower quantiles—characterised by slow or negative growth—public holidays had no statistically significant effect on output. In contrast, countries with stronger growth trajectories displayed a rising optimal number of holidays, ranging from nine to twelve days depending on the quantile. This suggests that more economically advanced or resilient nations may be better positioned to absorb the productivity costs of additional holidays without sacrificing growth.

The broader results also reaffirmed the central importance of productivity, capital accumulation, and urbanisation in explaining cross-country growth variation. While tourism, governance, and FDI showed variable significance across quantiles, their roles were nonetheless noteworthy in certain contexts, further highlighting the heterogeneous nature of development processes.

These empirical findings give rise to several important policy considerations. Firstly, public holidays should not be viewed through a purely negative economic lens. Well-calibrated holiday policies may serve both economic and social goals if optimally timed and managed. Secondly, policymakers must consider national economic conditions when determining public holiday schedules. Low-growth countries may need to prioritise reforms that improve structural productivity, while high-growth countries might afford greater flexibility in holiday policy. Thirdly, public holidays should be considered part of a broader productivity-enhancing strategy that includes human capital development, infrastructure investment, and institutional strengthening. Finally, since the effects of holidays are partly shaped by local cultural, institutional, and labour market contexts, a nuanced, country-specific approach to policy design is essential.

In conclusion, this study offers new empirical evidence indicating that the nexus between economic growth and public holidays is both complex as well as non-linear. While holidays serve vital cultural and social functions, their economic consequences vary depending on national circumstances. Therefore, optimal policy requires a careful balance between economic efficiency and societal well-being, particularly for countries aiming to sustain long-term growth without undermining quality of life.

References

[1] Pinto P, Bolar S, Hawaldar IT, George A, & Meero A. Holiday effect and stock returns: Evidence from stock exchanges of Gulf Cooperation Council. International Journal of Financial Studies. 2022;10:103. Doi: https://doi.org/10.3390/ijfs10040103

[2] Dodd O, & Gakhovich A. The holiday effect in Central and Eastern European financial markets. Investment Management and Financial Innovations. 2011;8(4):29-35 https://www.businessperspectives.org/images/pdf/applications/publishing/templates/article/assets/4323/imfi_en_2011_04_Dodd.pdf

[3] Kavanagh DJ, & Bower GH. Mood and self-efficacy: Impact of joy and sadness on perceived capabilities. Cognitive Therapy and Research. 1985;9(5):507-525 https://doi.org/10.1007/BF01173005

[4] Thaler RH. The end of behavioural finance. Financial Analysts Journal. 1999;55(6):12-17 https://doi.org/10.2469/faj.v55.n6.2310

[5] Baker M, & Wurgler J. Investor sentiment and the cross-section of stock returns. The Journal of Finance. 2006;61(4):1645-1680. Doi: https://doi.org/10.1111/j.1540-6261.2006.00885.x

[6] Bialkowski J, Etebari A, & Wisniewski TP. Fast profits: Investor sentiment and stock returns during Ramadan. Journal of Banking & Finance. 2012;36(3):835-845. Doi: https://doi.org/10.1016/j.jbankfin.2011.09.014

[7] Pantzalis C, & Ucar E. Religious holidays, investor distraction, and earnings announcement effects. Journal of Banking & Finance. 2014;47:102-117. Doi: https://doi.org/10.1016/j.jbankfin.2014.05.020

[8] Liu Q, Huang M, Zhao L, & Lee WS. The dispositional effects of holidays on investor sentiment: The therapeutic and hygienic. Journal of Innovation & Knowledge. 2023;8:100358. Doi: https://doi.org/10.1016/j.jik.2023.100358

[9] Dastidar SG, & Apergis N. Holidays and economic growth: Evidence from a panel of Indian states. Economics of Transition and Institutional Change. 2020:1-18. Doi: https://doi.org/10.1111/econt.12282

[10] Wang M, & Wong MCS. Leisure and happiness in the United States: Evidence from survey data. Applied Economics Letters. 2011;18:1813-1816. Doi: https://doi.org/10.1080/13504851.2011.564123

[11] Wei X, Huang S, Stodolska M, & Yu Y. Leisure time, leisure activities and happiness in China. Journal of Leisure Research. 2015;47(5):556-576. Doi: https://doi.org/10.18666/jlr-2015-v47-i5-6120

[12] de Bloom J, Geurts SAE, & Kompier MAJ. Effects of short vacations: Vacation activities and experiences on employee health and well-being. Stress and Health. 2011;28(4):305-318. Doi: https://doi.org/10.1002/smi.1434

[13] Wang P, Wei X, Hu D, & Meng F. Does leisure contribute to the improvement of individual job performance? A field tracking study based on the Chinese manufacturing industry. Sustainability. 2022;14:6594. Doi: https://doi.org/10.3390/su14116594

[14] de Bloom J, Geurts SAE, & Kompier MAJ. Vacation (after-) effects on employee health and well-being, and the role of vacation activities, experiences and sleep. Journal of Happiness Studies. 2013;14:613-633. Doi: https://doi.org/10.1007/s10902-012-9345-3

[15] Macchia L, & Whillans AV. Leisure beliefs and the subjective well-being of nations. The Journal of Positive Psychology. 2019. Doi: https://doi.org/10.1080/17439760.2019.1689413

[16] Isham A, Mair S, & Jackson T. Worker wellbeing and productivity in advanced economies: Re-examining the link. Ecological Economics. 2021;184:106989. Doi: https://doi.org/10.1016/j.eco.2021.106989

[17] Wei X, Qu H, & Ma E. How does leisure time affect production efficiency? Evidence from China, Japan and the US. Social Indicators Research. 2016;127:101-122. Doi: https://doi.org/10.1007/s11205-015-0962-1

[18] Cette G, Chang S, & Konte M. The decreasing returns on working time: An empirical analysis on panel country data. Applied Economics Letters. 2011;18(17):1677-1682 https://doi.org/10.1080/13504851.2011.558473

[19] Collewet M, & Sauermann J. Working hours and productivity. Maastricht University; 2017.Retrieved from: https://doi.org/10.26481/umagsb.2017009

[20] Merz J, & Osberg L. Keeping in touch: A benefit of public holidays. Bonn, Germany: IZA; 2006.Retrieved from: https://ssrn.com/abstract=898594

[21] Pencavel J. The productivity of working hours. Bonn, Germany: IZA; 2014.Retrieved from: https://doi.org/10.1111/ecoj.12166

[22] Bruno G, Lupi C, Pappalardo C, & Piras G. The cross-country effects of EU holidays on domestic GDPs. Rome: Istituto Di Studi e Analisi Economica; 2006.Retrieved from: https://dx.doi.org/10.2139/ssrn.921577

[23] Rosso L, & Wagner R. Causal effect of public holidays on economic growth. 2021.Retrieved from: https://doi.org/10.2139/ssrn.3845129

[24] Ramasamy B, Yeung MCH, & Au AKM. Can holidays boost consumption? The case of Hong Kong. Journal of Public Affairs. 2008;8:281-287. Doi: https://doi.org/10.1002/pa.299

[25] Wei X, Qu H, & Ma E. A study of the effects of leisure time on China's economic growth: A neoclassic growth model. Tourism Analysis. 2010;15:663-672. Doi: https://doi.org/10.3727/108354210X12904412049857

[26] Barrera F, & Garrido N. Public holidays, tourism, and economic growth. Tourism Economics. 2017. Doi: https://doi.org/10.1177/1354816617749340

[27] Boikos S, Bucci A, & Stengos T. Leisure and innovation in horizontal R&D-based growth. Economic Modelling. 2022;107:105730. Doi: https://doi.org/10.1016/j.econmod.2021.105730

[28] Min CK, Roh TS, & Bak S. Growth effects of leisure tourism and the level of economic development. Applied Economics. 2016;48(1):7-17. Doi: https://doi.org/10.1080/00036846.2015.1073838

[29] Cui D, Wei X, Wu D, Cui N, & Nijkamp P. Leisure time and labor productivity: A new economic view rooted from sociological perspective. Economics: The Open-Access, Open-Assessment E-Journal. 2019;13:1-24. Doi: https://doi.org/10.5018/economics-ejournal.ja.2019-36

[30] Ulasan B. Cross-country growth empirics and model uncertainty: An overview. Economics. 2012;6:2012-16. Doi: https://doi.org/10.5018/economics-ejournal.ja.2012-16

[31] Kaufmann D, Kraay A, & Mastruzzi M. Governance matters VII: Governance indicators for 1996-2007. Washington, DC: The World Bank; 2008.Retrieved from: https://doi.org/10.2139/ssrn.1148386

[32] Radelet S, Sachs J, & Whang-Lee J. The determinants and prospects of economic growth in Asia. International Economic Journal. 2001;15(3):1-29 https://doi.org/10.1080/10168730100000041

[33] Sala-i-Martin X. The classical approach to convergence analysis. The Economic Journal. 1996;106(437):1019-1036 http://ideas.repec.org/a/ecj/econjl/v106y1996i437p1019-36.html

[34] Saleem H, Shahzad M, Khan MB, & Khilji BA. Innovation, total factor productivity and economic growth in Pakistan: A policy perspective. Journal of Economic Structures. 2019;8(7):1-18. Doi: https://doi.org/10.1186/s40008-019-0134-6

[35] Fischer S. Macroeconomic stability and growth. Cuadernos de Economía. 1992;29(87):171-186 https://www.jstor.org/stable/23830518

[36] Naseem S. The role of tourism in economic growth: Empirical evidence from Saudi Arabia. Economies. 2021;9(3):117. Doi: https://doi.org/10.3390/economies9030117

[37] Pablo-Romero MP, & Molina-Toucedo JA. Tourism development and Italian economic growth: The weight of the regional economies. Tourism Management Perspectives. 2013;8:28-41. Doi: https://doi.org/10.1016/j.tmp.2013.05.006

[38] Rasool H, Maqbool S, & Tarique M. The relationship between tourism and economic growth among BRICS countries: A panel cointegration analysis. Future Business Journal. 2021;7(1):1-11. Doi: https://doi.org/10.1186/s43093-020-00048-3

[39] Anyanwu JC. Factors affecting economic growth in Africa: Are there any lessons from China? African Development Review. 2014;26(3):468-493 https://doi.org/10.1111/1467-8268.12105

[40] Barro RJ. Determinants of economic growth: Implications of the global evidence for Chile. Cuadernos de Economía. 1999;36(107):443-478 https://www.jstor.org/stable/41951333
[41] Barro RJ. Determinants of economic growth in a panel of countries. Annals of Economics and Finance. 2003;4:231-274 https://down.aefweb.net/AefArticles/aef040202.pdf
[42] Burnside C, & Dollar D. Aid, policies, and growth. The American Economic Review. 2000;90(4):847-868 http://doi.org/10.1257/aer.90.4.847
[43] Bhaskara-Rao R, & Hassan G. Determinants of the long-run growth rate of Bangladesh. Applied Economics Letters. 2011;18:655-658 https://doi.org/10.1080/13504851003800760
[44] Chang C, & Mendy M. Economic growth and openness in Africa: What is the empirical relationship? Applied Economics Letters. 2012;19(18):1903-1907 https://doi.org/10.1080/13504851.2012.676728
[45] Chen M, Zhang H, Liu W, & Zhang W. The global pattern of urbanization and economic growth: Evidence from the last three decades. PLoS ONE. 2014;9(8):e103799. Doi: https://doi.org/10.1371/journal.pone.0103799
[46] Shaban A, Kourtit K, & Nijkamp P. Causality between urbanization and economic growth: Evidence from the Indian states. Frontiers in Sustainable Cities. 2022;4:901346. Doi: https://doi.org/10.3389/frsc.2022.901346
[47] Turok I, & McGranahan G. Urbanization and economic growth: The arguments and evidence for Africa and Asia. Environment & Urbanization. 2013;25(2):465-482. Doi: https://doi.org/10.1177/0956247813490908
[48] Barnett V, & Lewis T. Outliers in Statistical Data. New York: Wiley; 1994. https://www.wiley.com/en-us/Outliers+in+Statistical+Data%2C+3rd+Edition-p-9780471930945
[49] Perez B, Molina I, & Pena D. Outlier detection and robust estimation in linear regression models with fixed group effects. Journal of Statistical Computation and Simulation. 2013;84:2652-2669. Doi: https://doi.org/10.1080/00949655.2013.811669
[50] Huber PJ. Robust estimation of a location parameter. The Annals of Mathematical Statistics. 1964;35:73-101 https://link.springer.com/chapter/10.1007/978-1-4612-4380-9_35
[51] Rousseeuw PJ. Least median of squares regression. Journal of the American Statistical Association. 1984;79:871-880. Doi: https://doi.org/10.1080/01621459.1984.10477105
[52] Ehrhardt-Martinez K, Crenshaw EM, & Jenkins JC. Deforestation and the environmental Kuznets curve: A cross-national investigation of intervening mechanisms. Social Science Quarterly. 2002;83(1):226-243. Doi: https://doi.org/10.1111/1540-6237.00080
[53] McKinney LA, Fulkerson GM, & Kick EL. Investigating the correlates of biodiversity loss: A cross-national quantitative analysis of threatened bird species. Human Ecology Review. 2009;16(1):103-113 https://www.jstor.org/stable/24707741
[54] Naidoo R, & Adamowicz WL. Effects of economic prosperity on numbers of threatened species. Conservation Biology. 2001;15(4):1021-1029. Doi: https://doi.org/10.1046/j.1523-1739.2001.0150041021.x
[55] Koenker R, & Bassett G. Regression quantiles. Econometrica. 1978;46:33-50 https://doi.org/10.2307/1913643

Table 1: Lists of countries included in the study

Argentina	China	Hungary	Mexico	Saudi Arabia
Aruba	Colombia	Iceland	Mongolia	Sierra Leone
Australia	Costa Rica	India	Morocco	Singapore
Austria	Cyprus	Indonesia	Mozambique	Slovenia
Azerbaijan	Czechia	Iran, Islamic Rep.	Namibia	South Africa
Bahamas	Denmark	Ireland	Netherlands	Spain
Bahrain	Dominican Rep	Israel	New Zealand	Sri Lanka
Barbados	Ecuador	Jamaica	Nicaragua	Sweden
Belarus	Egypt, Arab Rep.	Jordan	Niger	Switzerland
Belgium	Estonia	Kazakhstan	North Macedonia	Tajikistan
Benin	Eswatini	Kenya	Norway	Thailand
Bolivia	Fiji	Korea, Rep.	Oman	Togo
Brazil	Finland	Kuwait	Panama	Trinidad and Tobago
Burkina Faso	France	Kyrgyz Republic	Paraguay	Tunisia
Cabo Verde	Georgia	Lao PDR	Peru	Turkiye
Cameroon	Germany	Lesotho	Philippines	United Kingdom
Canada	Greece	Luxembourg	Portugal	United States
Central African Rep	Guatemala	Macao	Qatar	Uruguay
Chad	Honduras	Malaysia	Russian Federation	Uzbekistan
Chile	Hong Kong	Malta	Rwanda	Zambia
				Zimbabwe

Source: Authors' compilation.

Table 2: Descriptive statistics

Variables	Mean	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Obs
growth (%)	2.40	9.46	-6.33	2.52	-0.25	3.87	4.3	101
$initial_{1960}$ USD	1.22×10^{11}	3.46×10^{12}	1.94×10^{8}	4.60×10^{11}	6.70	48.73	5581.4***	59
$initial_{1970}$ USD	1.84×10^{11}	5.19×10^{12}	3.18×10^{8}	6.48×10^{11}	6.76	51.74	7568.8***	71
$initial_{1980}$ USD	2.40×10^{11}	7.08×10^{12}	1.72×10^{8}	8.35×10^{11}	7.15	58.01	10769.1***	80
$initial_{1990}$ USD	2.97×10^{11}	9.81×10^{12}	2.87×10^{8}	1.07×10^{12}	7.75	68.19	17400.1***	93
$initial_{2000}$ USD	3.93×10^{11}	1.38×10^{13}	8.45×10^{8}	1.44×10^{12}	8.10	74.35	22530.0***	101
holiday (days)	13.34	26.00	5.00	3.97	0.92	4.49	23.7***	101
productivity (%)	0.74	6.21	-8.62	2.62	-0.65	4.59	17.6***	100
capital (index)	1.07	1.33	0.93	0.06	1.58	6.65	97.9***	101
tourism (%))	2.67	52.88	-29.16	11.18	0.44	7.07	72.1***	100
governance (index)	0.13	1.66	-1.82	1.00	-0.25	1.89	6.3**	101
fdi (%GDP)	2.44	203.65	-11.68	21.36	8.13	74.40	22565.4***	101
urban (%pop)	1.78	4.80	0.14	1.13	0.72	2.88	8.7**	101

Notes: Asterisks ***, **, * denote statistically significant at 1%, 5% and 10% level, respectively.

Table 3: Correlation matrix

	growth	$initial_{1960}$	$initial_{1970}$	$initial_{1980}$	$initial_{1990}$	$initial_{2000}$	holiday	productivity	capital	tourism	governance	fdi	urban
$initial_{1960}$	-0.0835	1											
	(-0.6326)												
$initial_{1970}$	-0.1077	0.9958***	1										
	(-0.8180)	(81.930)											
$initial_{1980}$	-0.0880	0.9866***	0.9938***	1									
	(-0.6672)	(45.722)	(67.622)										
$initial_{1990}$	-0.0581	0.9749***	0.9833***	0.9942***	1								
	(-0.4391)	(33.080)	(40.843)	(69.769)									
$initial_{2000}$	-0.0509	0.9631***	0.9729***	0.9868***	0.9965***	1							
	(-0.3851)	(27.010)	(31.786)	(46.050)	(89.409)								
holiday	0.0461	-0.0175	0.0000	0.0130	0.0500	0.0738	1						
	(0.3486)	(-0.1319)	(0.0002)	(0.0979)	(0.3776)	(0.5589)							
productivity	0.8080***	-0.0184	-0.0410	-0.0218	0.0106	0.0145	0.1257	1					
	(10.352)	(-0.1387)	(-0.3100)	(-0.1643)	(0.0803)	(0.1094)	(0.9562)						
capital	0.4893***	-0.3487***	-0.3700***	-0.3441***	-0.3085**	-0.2725**	0.2415*	0.4516***	1				
	(4.2354)	(-2.8086)	(-3.0070)	(-2.7671)	(-2.4482)	(-2.1380)	(1.8786)	(3.8209)					
tourism	0.2378*	0.1009	0.1245	0.1080	0.1273	0.1242	0.1264	0.2058	-0.0068	1			
	(1.8480)	(0.7654)	(0.9476)	(0.8198)	(0.9686)	(0.9446)	(0.9618)	(1.5874)	(-0.0515)				
governance	0.0001	0.4865***	0.4848***	0.4791***	0.4478***	0.4392***	-0.3935***	-0.1318	-0.3565***	-0.0629	1		
	(0.0004)	(4.2040)	(4.1850)	(4.1211)	(3.7812)	(3.6905)	(-3.2318)	(-1.0038)	(-2.8808)	(-0.4761)			
fdi	0.0773	-0.2927**	-0.2847**	-0.2765**	-0.2613**	-0.2511*	-0.0660	-0.0482	0.0639	-0.0388	-0.1413	1	
	(0.5852)	(-2.3107)	(-2.2423)	(-2.1721)	(-2.0437)	(-1.9582)	(-0.4996)	(-0.3646)	(0.4831)	(-0.2932)	(-1.0773)		
urban	0.2741	-0.4967***	-0.5131***	-0.5179***	-0.5015***	-0.4955***	0.2894**	0.1668	0.4998***	0.0747	-0.6225***	0.18721	1
	(2.1517)	(-4.3206)	(-4.5129)	(-4.5706)	(-4.3769)	(-4.3066)	(2.2825)	(1.2769)	(4.3569)	(0.5659)	(-6.0047)	(1.43886)	

Notes: Asterisks ***, ** and * denote statistically significant at 1%, 5% and 10% level, respectively. All variables in logarithm.

Table 4: Results of OLS-robust on the impact of holiday on economic growth

Independent variables	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	1.1895	1.9756	1.3704	1.7487	1.7516*
	(0.8938)	(1.5839)	(1.1462)	(1.5699)	(1.6791)
initial_{1960}	-0.0236				
	(-0.6518)				
initial_{1970}		-0.0210			
		(-0.5277)			
initial_{1980}			-0.0102		
			(-0.2714)		
initial_{1990}				-0.0091	
				(-0.2651)	
initial_{2000}					-0.0108
					(-0.3206)
$\text{holiday}_{\text{i}}$	-0.1112	-0.4177	-0.3338	-0.4287	-0.4103*
	(-0.4310)	(-1.5859)	(-1.3701)	(-1.5820)	(-1.6364)
$\text{productivity}_{\text{i}}$	0.6401***	0.6061***	0.5699***	0.6017***	0.6008***
	(9.1020)	(8.1360)	(7.8930)	(9.2428)	(10.269)
$\text{capital}_{\text{i}}$	3.2747*	2.5500	4.4895***	3.5465**	3.3889**
	(1.6819)	(1.3564)	(2.9315)	(2.5073)	(2.5574)
$\text{tourism}_{\text{i}}$	0.0540	0.0718*	0.0843**	0.0679*	0.0630**
	(1.2903)	(1.6738)	(2.0650)	(1.9738)	(2.0342)
$\text{governance}_{\text{i}}$	0.4989***	0.4790***	0.3827***	0.2719**	0.2782**
	(2.7852)	(2.8920)	(2.6381)	(2.2893)	(2.5883)
fdi_{i}	0.0992*	0.0786	0.1185***	0.0972**	0.0936***
	(1.6823)	(1.4851)	(2.6124)	(2.3588)	(2.6609)
urban_{i}	0.3849**	0.4689***	0.3717***	0.2759**	0.2848**
	(2.5569)	(3.1077)	(2.6326)	(2.2117)	(2.5613)
adjR^2	0.724	0.689	0.669	0.646	0.661
BPG test, $\chi^2(1)$	***[0.1064]***	***[0.0073]***	***[0.0013]***	***[0.0003]***	***[0.0001]***
Jacque-Bera, $\chi^2(1)$	[0.8573]	[0.6365]	[0.5387]	[0.3444]	[0.2745]
Obs	59	71	80	93	101

Notes: Asterisks ***, ** and * denote statistically significant at 1%, 5% and 10% level, respectively. Dependent variable is growth in real GDP (%). adjR^2 denotes adjusted R-squared. All variables are in logarithm and the estimated coefficients are elasticities.Figures in round bracket (…) are t-statistics, while figures in square bracket […] are p-values. BPG (Breusch-Pagan-Godfrey) is the test for heteroskedasticity, and Jarque-Bera is the test for the normality of the residuals in the OLS regression.

Table 5: Results of OLS-robust on the non-linear impact of holiday on economic growth

Independent variables	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	-3.1547	-3.2085	-4.1322*	-5.5854***	-5.1865***
	(-0.9505)	(-1.1276)	(-1.9344)	(-2.8497)	(-2.6514)
$initial_{1960}$	0.0009				
	(0.0230)				
$initial_{1970}$		1.06x10^{-5}			
		(0.0002)			
$initial_{1980}$			0.0131		
			(0.3474)		
$initial_{1990}$				0.0186	
				(0.5368)	
$initial_{2000}$					0.0145
					(0.4174)
$holiday_i$	3.0518	3.4178*	3.7931***	5.0616***	4.7966***
	(1.2460)	(1.7427)	(2.6795)	(3.9762)	(3.8309)
$holiday_i^2$	-0.6476	-0.7697*	-0.8424***	-1.1106***	-1.0521***
	(-1.2539)	(-1.8886)	(-2.7723)	(-4.0653)	(-3.9330)
$productivity_i$	0.6379***	0.6070***	0.5734***	0.5962***	0.5994***
	(8.9704)	(8.3177)	(8.0522)	(9.6478)	(10.600)
$capital_i$	3.3609*	2.7202	4.5105***	3.5847**	3.2960**
	(1.7539)	(1.4711)	(2.9100)	(2.5245)	(2.5021)
$tourism_i$	0.0515	0.0633	0.0783*	0.0623*	0.0560*
	(1.2005)	(1.4491)	(1.9162)	(1.8386)	(1.8365)
$governance_i$	0.4036*	0.4081**	0.3171**	0.2170*	0.2234**
	(1.7067)	(2.1814)	(2.0470)	(1.8976)	(2.1270)
fdi_i	0.1038*	0.0804	0.1181***	0.0973**	0.0912**
	(1.7965)	(1.5392)	(2.7095)	(2.4363)	(2.5220)
$urban_i$	0.3288*	0.4183***	0.3317**	0.2528**	0.2652**
	(1.9917)	(2.6685)	(2.3263)	(2.2481)	(2.6094)
$adjR^2$	0.726	0.695	0.679	0.667	0.679
BPG test, $\chi^2(1)$	***[0.0334]***	***[0.0097]***	***[0.0054]***	***[0.0038]***	***[0.0017]***
Jacque-Bera, $\chi^2(1)$	[0.4367]	[0.2099]	[0.1236]	***[0.0556]***	***[0.0491]***
Obs	59	71	80	93	101
Optimal point	-	9 days	10 days	10 days	10 days

Notes: Asterisks ***, ** and * denote statistically significant at 1%, 5% and 10% level, respectively.. Dependent variable is growth in real GDP (%). $adjR^2$ denotes adjusted R-squared. Figures in round bracket (…) are t-statistics, while figures in square bracket […] are p-values. All variables are in logarithm and the estimated coefficients are elasticities BPG (Breusch-Pagan-Godfrey) is the test for heteroskedasticity, and Jarque-Bera is the test for the normality of the residuals in the OLS regression. The optimal point is calculated as $-\hat{\theta}_1/2\hat{\theta}_2$.

Table 6: Results of OLS-robust and Robust regression on the impact of holiday on economic growth, without the initial condition

Independent variables	OLS-robust:		Robust regression M-estimation:	
	Linear	Non-linear	Linear	Non-linear
Constant	1.5038**	-4.5776***	0.8257*	-4.5467**
	(2.2908)	(-3.5477)	[1.6612]	[-2.3268]
$holiday_i$	-0.4197*	4.5816***	-0.0215	4.6175***
	(-1.6677)	(3.9922)	[-0.1142]	[2.9431]
$holiday_i^2$	-	-1.0063***	-	-0.9773***
		(-4.0883)		[-3.1167]
$productivity_i$	0.6020***	0.5980***	0.4359***	0.4898***
	(10.535)	(10.811)	[10.827]	[12.689]
$capital_i$	3.3639**	3.3309**	1.9954*	1.8155*
	(2.5846)	(2.5751)	[1.7764]	[1.6868]
$tourism_i$	0.0614**	0.0582**	0.0619***	0.0347
	(2.0465)	(1.9927)	[2.6423]	[1.5443]
$governance_i$	0.2714***	0.2342**	0.1210	0.0948
	(2.6607)	(2.4183)	[1.6341]	[1.3180]
fdi_i	0.0970***	0.0872**	0.1109***	0.1062***
	(2.7881)	(2.4581)	[2.9265]	[2.9142]
$urban_i$	0.2947***	0.2539***	0.2802***	0.2562***
	(2.8144)	(2.6602)	[3.5393]	[3.3318]
$adjR^2$ / Rw^2	0.664	0.682	0.714	0.772
Optimal point	-	10 days	-	11 days

Notes: Asterisks ***, ** and * denote statistically significant at 1%, 5% and 10% level, respectively.. Dependent variable is growth in real GDP (%). Figures in round brackets (…) and square brackets […] are t-statistics and z-statistics, respectively. $adjR^2$ denotes adjusted R-square measures goodness of fit in the OLS; while Rw^2 measures goodness of fit for the Robust regressions. All variables are in logarithm and the estimated coefficients are elasticities The optimal point is calculated as $-\hat{\theta}_1/2\hat{\theta}_2$.

Table 7: Results of the quantile regressions

Independent variables	Q(0.10)	Q(0.20)	Q(0.30)	Q(0.40)	Q(0.50)	Q(0.60)	Q(0.07)	Q(0.80)	Q(0.90)
Constant	-1.2476***	-1.7570	-3.9485*	-3.4089	-4.1403*	-4.6758**	-4.8747**	-4.4111**	-4.4607***
	(-0.3060)	(-0.7338)	(-1.7830)	(-1.5115)	(-1.7837)	(-2.0807)	(-2.1197)	(-2.4506)	(-2.8446)
$holiday_i$	1.1048	1.3204	3.9844**	3.7744**	4.4096**	5.0093**	5.1313**	4.6062***	4.7027***
	(0.2992)	(0.6551)	(2.1208)	(2.0094)	(2.2485)	(2.5844)	(2.5947)	(2.8928)	(3.3041)
$holiday_i^2$	-0.3305	-0.2751	-0.8876**	-0.8654**	-0.9718**	-1.0790**	-1.0755**	-0.9213**	-0.9407***
	(-0.3969)	(-0.6733)	(-2.3176)	(-2.2725)	(-2.3859)	(-2.5834)	(-2.5292)	(-2.5972)	(-2.9037)
$productivity_i$	0.7041***	0.6783**	0.7046***	0.6579***	0.5890***	0.4765***	0.4505***	0.3971***	0.3460***
	(7.0006)	(6.9822)	(8.3230)	(8.9671)	(5.2143)	(5.8285)	(5.9997)	(5.1281)	(4.7204)
$capital_i$	5.0113**	5.7195**	2.2321	1.9729	1.7542	2.0386	1.6585	1.8652	2.1706*
	(2.1336)	(2.0382)	(1.4040)	(1.5441)	(1.3369)	(1.5962)	(1.5012)	(1.3846)	(1.7401)
$tourism_i$	0.0581	0.1177**	0.0200	-0.0089	0.0057	0.0502	0.0163	0.0249	0.0658**
	(0.8652)	(2.2988)	(0.4744)	(-0.2729)	(0.1541)	(1.5548)	(0.5437)	(0.7587)	(2.0361)
$governance_i$	0.6247**	0.3654*	0.1575	0.1172	0.1079	0.0357	0.0835	0.0846	0.0088
	(2.4270)	(1.9760)	(1.3015)	(1.3116)	(1.0906)	(0.3862)	(0.9549)	(0.7916)	(0.0798)
fdi_i	0.0929	0.0553	0.0553	0.0972**	0.1150**	0.0504	0.0567	0.0487	0.0628**
	(0.8584)	(0.7300)	(0.7935)	(2.1363)	(2.4980)	(1.2797)	(1.5470)	(1.3924)	(2.2356)
$urban_i$	0.4101	0.0698	0.2853*	0.2797***	0.2496***	0.2061**	0.2379***	0.2713***	0.2630***
	(1.4971)	(0.4277)	(1.9686)	(2.6347)	(2.7333)	(2.4120)	(2.9426)	(3.0929)	(4.1023)
$adjR^2$	0.577	0.519	0.474	0.439	0.413	0.414	0.416	0.395	0.331
Optimal pt.	-	-	9 days	9 days	10 days	10 days	11 days	12 days	12 days

Notes: Asterisks ***, ** and * denote statistically significant at 1%, 5% and 10% level, respectively.. Dependent variable is growth in real GDP (%). All variables are in logarithm and the estimated coefficients are elasticities Figures in round brackets (…) are t-statistics. $adjR^2$ denotes adjusted R-square measures goodness of fit in the quantile regressions. The optimal point is calculated as $-\hat{\theta}_1/2\hat{\theta}_2$.

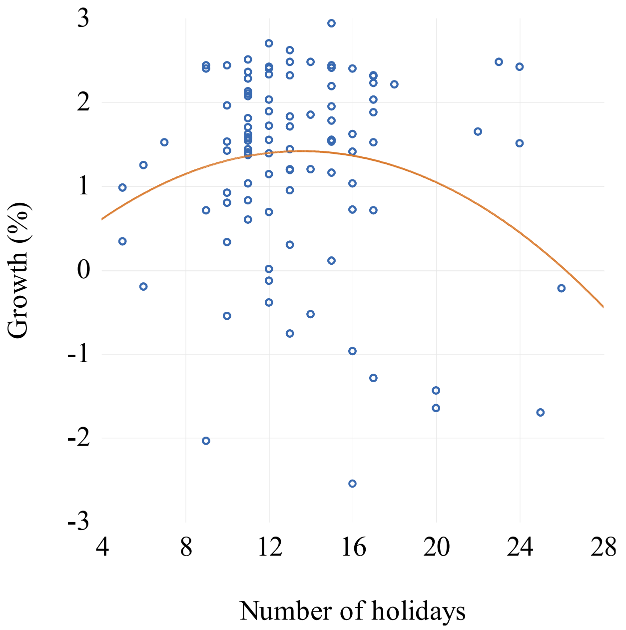

Figure 1: Non-linear relationship between holidays and economic growth

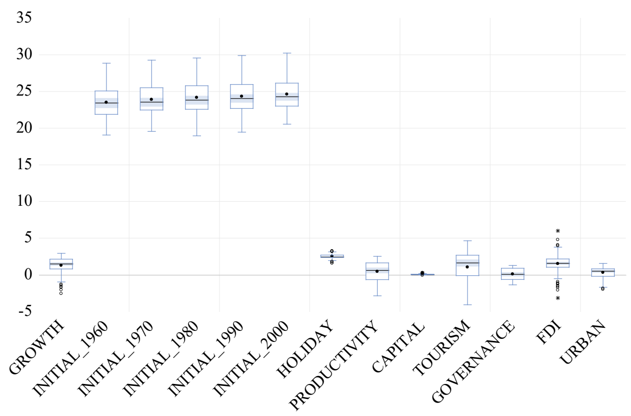

Figure 2: Boxplots of the series.

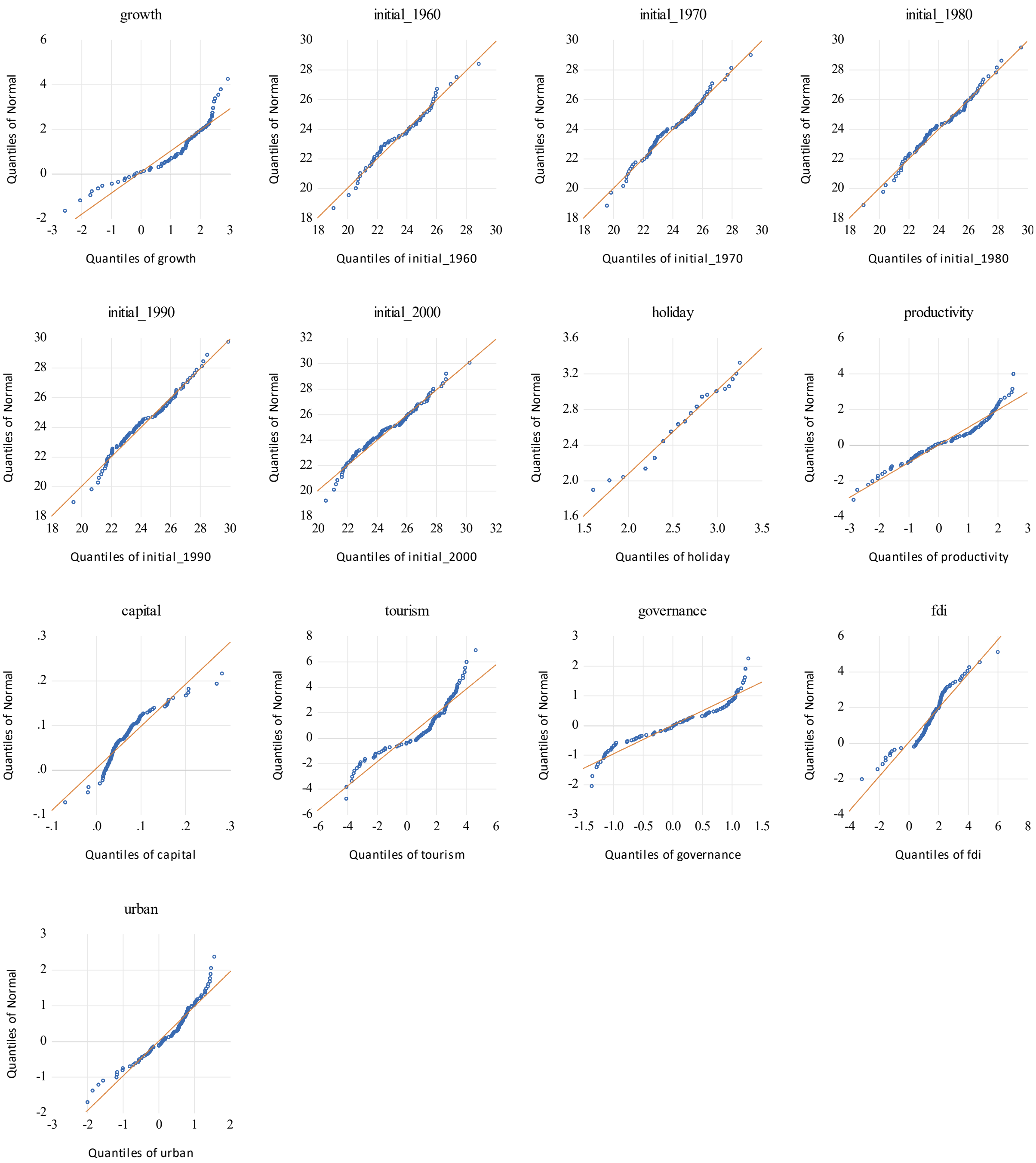

Figure 3: Quantile-quantile (Q-Q) plots.

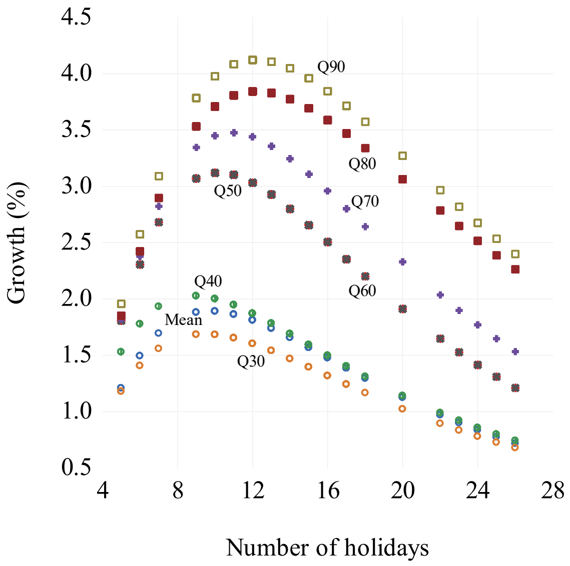

Figure 4: The optimal number of holidays with different quantiles

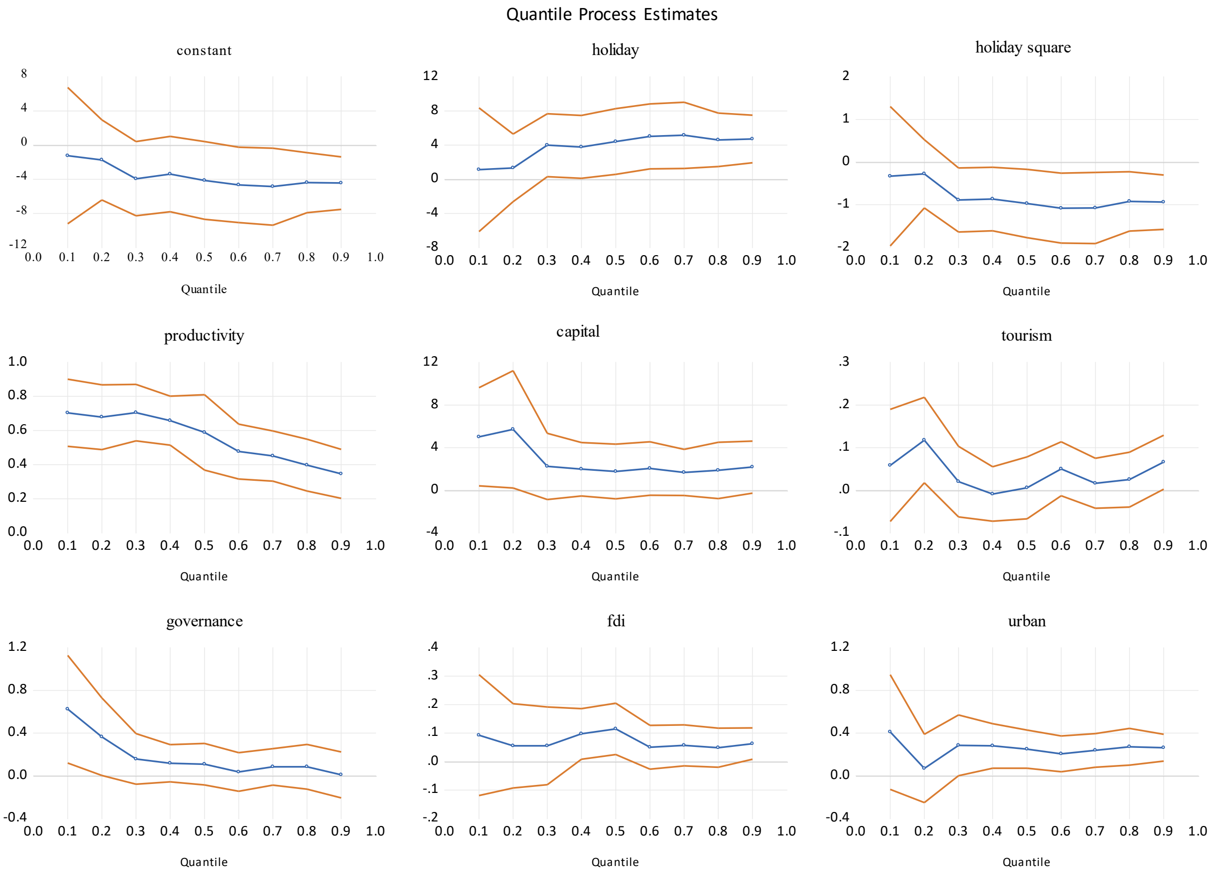

Figure 5: The quantile process estimates.