



Research article

Gender equality, education, economic growth and religious tensions nexus in developing countries: A spatial analysis approach

Asim Iqbal^a, Shafiqul Hassan^b, Haider Mahmood^{c,*}, Muhammad Tanveer^d^a Department of Economics, Division of Management and Administrative Science, University of Education, Lahore, Pakistan^b College of Law, Prince Sultan University, Riyadh, 11586, Saudi Arabia^c Department of Finance, College of Business Administration, Prince Sattam Bin Abdulaziz University, 173 Alharj, 11942, Saudi Arabia^d Department of Business Administration, Imam Mohammad Ibn Saud Islamic University, Riyadh, Saudi Arabia

ARTICLE INFO

Keywords:

Religious tensions
Gender equality
Spatial dependency
Education
Bureaucratic quality

ABSTRACT

Gender inequality is a more pronounced phenomenon in developing countries, which may be rooted in poor governance, and inadequate social and religious institutions. Therefore, this research tests the effects of religious tensions, governance, economic growth, and education on gender equality in a panel of 59 developing countries from 1995–2015. Moreover, religious tensions may have spillovers in neighboring countries in this modern age of media and globalization. Therefore, we apply Spatial Durbin and Autoregressive models to consider spatial autocorrelation in the religious tensions model. We find that both gender equality and religious tensions have spillovers in neighboring countries. Moreover, reducing religious tensions and increasing economic growth promote gender equality and have positive spillovers in neighboring countries as well. Bureaucratic quality has a positive effect on gender equality in home countries and has insignificant spillovers on gender equality in the neighboring countries. However, education could not affect gender equality in developing countries.

1. Introduction

Religious tensions and gender equality are interlinked in both developed and developing countries. Religious tensions are more prevalent in the developing world, which may affect gender rights as well. Ahmed and Brasted (2021) argued that religious tensions created unrest, instability, and division in the country. Hence, religious tensions may also be responsible for gender inequality. Gender equality does not mean that all males and females are equal in all walks of life. In some arguments about biological sex variations, it is sensible for all men and women to have different rights and responsibilities. For example, only women can be given gestation leaves from work, especially for pregnancy. However, noteworthy differences between men and women and their lifestyles in modern societies exist. These peculiarities are the source of gender inequality. Nevertheless, it cannot be claimed that women and men are the same or indistinguishable in all behaviors. For instance, there are more male firefighters than female firefighters. It requires a 72 kg mannequin removal and 45-meter drag ability (Victoria State Government, 2021). Most men can achieve this. However, it is hard for women, which inevitably makes a woman less inclined to become a firefighter. Gender equality is not meant that we must have an equal

portion of males and females in every profession. Because many tasks are not solved by women and vice versa. Hence, it is not possible that men and women must have equal participation in every field purely for the sake of equal representation.

Gender equality means that both women and men should have equal benefits from the same resources and opportunities. Hence, gender disparity is meant that males and females are not equal in terms of opportunities, social treatment, or sex-based perceptions of an individual. Gender disparity could have serious economic consequences. Because it hinders the availability of opportunities for women. In developing countries, the gender gap exists worryingly in the labor market and at the household level. These disparities are decreasing in the developed economies. However, this gap still exists in economic, social, and political participation in developing nations. It is also stated that women are not welcomed in male-dominated economic and industrial sectors, which might reduce their productivity and earnings (World Bank, 2012). Despite improvements in women's rights and labor market contributions, women still fall behind men in numerous fields, which is a source of the gender gap in developing countries (Klasen and Lamanna, 2009). Lussier and Fish (2016) argued that religion is a major source of the gender gap. They found that the gender gap in some religions is due to social attitude,

* Corresponding author.

E-mail addresses: h.farooqi@psau.edu.sa, haidermahmood@hotmail.com (H. Mahmood).<https://doi.org/10.1016/j.heliyon.2022.e11394>

Received 4 April 2022; Received in revised form 15 July 2022; Accepted 31 October 2022

2405-8440/© 2022 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

which is not explained by economic development. They found that some countries intended toward the attitude of more gender inequality. Moreover, individual social attitudes are more intensive than religious attitudes and structural inequality is responsible for such attitudes.

Naseem and Adnan (2019) investigated female labor market problems concerning religious dogma in France. They found that religious women showed low participation in the labor market, earned lower salaries, and worked the lowest hours. Hence, religious dogma reduced the full participation of females in the labor market. In addition, nationality-wise racism also reduced women's labor market participation. Davis and Gao (2020) investigated the labor market inequality based on religion and gender. Their main findings demonstrated that religious females worked lesser than non-religious females. In the gender gap, they found that men regardless of religion were happier than women. Moreover, Schnabel (2016) found that gender inequality was equally pronounced in the world's three largest religions. However, gender equality was found high in non-religious societies, and gender inequality was found high in religious societies irrespective of any religion. Hence, the religious tendency of society did matter a lot for gender inequality. Karlsen et al. (2020) investigated the ethnic, religious, and gender gap in the UK. They found downward economic mobility among some religions in developing countries. The opposite case was reported in the case of British people. Thus, religion and ethnicity were found responsible for economic inequality.

People reserve the right to get equal treatment regardless of their ethnicity, gender, age, health, class, caste, language, or any other status. In comparison, the female group is more neglected and deprived of economic, political, and social opportunities than men. Especially, gender roles are not well defined in developing nations. So, women do not have enough opportunities to participate in the economy. In general, women have less education and other opportunities. For instance, financial benefits, health facilities, ownership of assets, business partnership, participation in family decision-making, etc., are restricted in many ways. Sudarso et al. (2019) explored the educational gender inequality in Malaysia. They argued that religion shaped the man-empowered culture, which was responsible for higher school drop-out rates. Moreover, poverty as a structural pressure also became a significant hurdle in the way of gender equality, which is complemented by cultural pressure on women. Hence, both forced the women to leave schooling and participate in family-supporting activities.

Rohlinger et al. (2020) argued that gender equality is a dual discourse, and many aspects of women's lives must be improved to achieve gender equality. It includes women's education, economic participation, political involvement, and many other areas in society. Additionally, women should stay in touch with their gender roles, while working with their male counterparts, to develop a gender consciousness. Education is an essential element to improve the inclusion of women's roles in society. Hence, an increase in female education may improve women's income and societal participation. Moreover, the increase in female education tends to improve their overall living standard. In developing countries, males seem to dominate most of the economy. On the other hand, women's role is limited to taking care of the household. Hence, this gender inequality incredibly limits women's access to opportunities in developing nations (UNDP, 2009). Khurshid (2016) mentioned that women's entry into the labor market might be smoother through higher education. However, education leads to more hierarchies in the developing economies as it creates a divide between various female communal groups. Additionally, educated women are still involved in household chores, which increases their duties. For instance, they are involved in their domestic duties and professional responsibilities together. An attempt to reduce the gender gap still mostly puts women at a disadvantage. For instance, working women take both household and professional responsibilities and men are not sharing household responsibilities with women.

Women are often deprived of the decision-making process. Especially in developing countries, women have limited access to resources and are

also exposed to the risk of violence from family members. These deprivations are strongly linked to the norms and attitudes, which impede women's role in patriarchal societies and households. These circumstances have severe consequences for the health, educational, and community participation of females. Gender discrimination may contribute to health inequalities at every stage of the women's life cycle (Gupta et al., 2019). These include selective abortions, lack of sex education, low nutritional intake, limited medical care, poor re-productiveness, and menstrual-hygiene-related negligence among young girls and adult women. In developing economies, the maternal mortality rate is stubbornly high. It is partly because many births have not been performed by specialized health personnel and mostly occur at home (Graham et al., 2001). Husbands or elderly family members decide about the request for medical care for a female. Limited information about modern health facilities for childbirth limits women's access to health. In general, females spend more time at home and tend to be excluded from various societal activities. This exclusion may be exogenous in developing countries and is also responsible for the lack of information about medical facilities in the female population.

Countries with equal rights and economic opportunities for males and females are the world's wealthiest countries (Eastin and Prakash, 2009). It shows the positive relationship between the level of development and female rights. At a micro level, it is pretty challenging to show this relationship. However, it is easy to develop a relationship between women's rights and economic growth at a macro level. The prior literature has investigated the effects of Gross Domestic Product (GDP) per capita on gender equality in developing and developed countries (Forsythe et al., 2000; Kabeer and Natali, 2013). However, testing the role of religion on gender equality is scant in the existing literature (Klingorova and Havlíček, 2015; Page and Yip, 2017). Nevertheless, an extensive investigation of this relationship in developing countries is still missing to the best of our knowledge. The developed world is mostly free of any religious tensions. On the other hand, it is a more concerning phenomenon in the underdeveloped and developing world. Therefore, this present study explores the relationship between gender equality and religious tensions in a sample of 59 developing countries.

Due to increasing globalization and rapid technological advancements, various cultures and economies are now spatially integrated across borders. Globalization encouraged the emergence of multicultural societies, which evolved through economic integration, global mobility, and immigration. Due to these interlinked communities beyond borders, gender equality in one country may affect other countries' cultural and economic existence. This phenomenon gives birth to the idea of doing spatial analyses in gender-related studies. However, the available literature has somewhat ignored the spatial interdependence of gender equality and religion. Ignoring spatial dimension in the presence of statistically significant spatial dependency may lead to biased estimates (Anselin 1988). Hence, the present research cares about spatial autocorrelation in testing the relationship between religious tensions and gender equality.

2. Literature review

Gender disparities are more common in the developing world compared to the developed world. Such discrepancies occur due to poor socioeconomic conditions, low education, religious influence, culture, and social trends. Gupta et al. (2019) argued that Sustainable Development Goals (SDGs) target to promote human rights, including gender equality and health. Nevertheless, favorable health outcomes of SDGs could not be achieved due to gender inequalities. Hence, there is a need for gender equality to improve health outcomes to achieve SDGs. Dollar and Gatti (1999) explained that women are more deprived in developing countries compared to developed countries. Gender inequality in health and education is due to differences in religious preferences, civil liberty, and underlying regional classifications. These gender differences show that low investment in one gender is not a good option as it harms the

nation's overall economic growth. Therefore, societies ignoring investment in women might face a high cost by inevitably slow economic progress. [Gyimah-Brempong \(2002\)](#) argued that improving gender equality might increase women's educational attainment. Females' educational success has a series of interdependent positive externalities, e.g., betterment in children's health, decreased population growth, family planning, reproductive hygiene of the women, sustainable resources, and human capital for future generations.

[Alderman and Elizabeth \(1998\)](#) found that parents invest more in boys' health and education compared to girls. Parents think that girls' education is less likely to be monetized than boys' education. Moreover, the difference in wages between females and males also exists, and women are paid lesser per hour than men. Thus, gender disparities in education, employment, health, and income might be linked to slow economic and financial growth ([Agenor and Canuto, 2015](#)). In poor countries, women's labor participation rate is low and wage differences between females and males are high (U.N. [Women 2013](#)). There is a broad consensus among policymakers and social scientists that many gender-based policies should be initiated to harmonize gender equality ([Duflo, 2012](#)).

Gender equality has many dimensions, including economic, political, environmental, and socio-cultural. Failure to achieve economic, political, environmental, and socio-cultural equalities may be claimed due to the lack of a holistic approach and a lack of privilege given to women in asset, agency, and legitimacy. For example, it is a highly complicated process for a woman to get land ownership in China, India, and Indonesia, which puts legal, political, and social limitations on women's rights. The same applies to agricultural land, and women own only 10–12% of the global agricultural land. However, increasing women's participation in the agriculture sector would have healthy social and environmental effects. For instance, [Unay-Gailhard and Bojnec \(2021\)](#) claimed that increasing young women farmers would promote environmentally friendly farming to a greater extent compared to young men farmers. [Uma et al. \(2020\)](#) investigated the role of the gender-headed household in waste disposal in 5000 households and found that female-headed households utilized more informal refuse disposal systems compared to male-headed households. Women are also facing a lack of representation in the industry. In the developing world, there is a need to alter the governance system to improve both genders' status ([Rao, 2017](#)). Moreover, [Biswas et al. \(2014\)](#) stated that women's participation in political parties could have pleasant effects on gender equality.

In most developing countries, gender disparity is a prominent feature of societies. Literature has demonstrated that significant gender differences are associated with the poor performance of economic and business activities. Therefore, women's labor participation and economic growth are interlinked ([Klasen, 1999](#)). [Ravallion \(2014\)](#) found that economic growth generally reduces absolute poverty and increases income inequality. Moreover, the effect of economic growth on poverty was found low in the countries with high-income disparity. [Hannum and Buchmann \(2005\)](#) originated a strong relationship between gender educational disparity, labor market, and economic development. [Lagerlof \(2003\)](#) modeled talent and sex discrimination in the Nash equilibrium. He found that women's time becomes expensive because of increasing women's human capital in the general equilibrium, which may help to reduce the birth rate.

According to [Mikkola \(2005\)](#), gender equality can be promoted by the growth and development of economies. Women have a significant role in global change, and these changes bring technological advancement and advanced gadgets. These advancements have shifted the role of women from household to industry. Additionally, [Eastin and Prakash \(2009\)](#) conducted a panel analysis on 146 countries from 1982 to 2005. They indicated a cubic functional relationship between gender equality and income, known as the gender Kuznets curve based on [Kuznets \(1955\)](#). [Kabeer and Natali \(2013\)](#) also analyzed and corroborated a non-linear relationship between gender equality and economic growth. Moreover, [Seguino \(2000\)](#) claimed that the nature of the association between

growth and gender equality would be different among nations due to the diversity in economic structures.

[Boserup et al. \(1970\)](#) did a hallmark study to examine gender equality from the perspective of economic development. Economic growth initially increases gender inequalities. After touching a certain level, these disparities begin to reduce in developing economies. Gender in the economic systems is generally bidirectional and hierarchical. Both men and women might have the same economic abilities. But the existing systems promote the polarization and hierarchization of gender roles. In terms of education, religion in a community can change the way of education for both men and women. These dynamics can also pose potential threats to the educational attainment of both men and women. In some societies, religious dimensions are polarized. One religious party may support women's education while the other completely condemns it. Religious leaders are not trained enough in the religious domain, which makes things worse for women ([Marshall, 2018](#)).

[Klingorova and Havlicek \(2015\)](#) connected religion and gender inequality. They found that gender inequality was found low in the regions with the least preference for religion. [Page and Yip \(2017\)](#) surveyed young adults from different religious backgrounds. As per respondents' views, it was found that religion might promote gender equality. Therefore, any gender discrimination is the opposite of the real essence of religion. [Syed et al. \(2009\)](#) mentioned that both secularism and religion have implications for gender roles as both have pre-defined ideologies and societal roles for men and women. However, there is a need to moderate both systems. The sharp edges of their policies can be cut short, and a more gender-egalitarian structure can be developed. Religious fragmentations seem to make things more challenging as they put the social identity of genders into question. Religious fragmentations create a void in societies, which would not help to reduce gender inequality ([Chakravarty et al., 2019](#)).

The earliest literature has investigated the effects of several socio-economic and demographic determinants of gender equality. The gender disparity in education is also a prominent source of gender inequality. Nevertheless, the literature is scant on the relationship between gender disparity and religious tensions. Further, the role of governance and bureaucratic performance on gender equality is also ignored in the literature. There is a dire need for a further empirical investigation to check the religious tensions and gender equality relationship, controlling the governance, economic growth, and education in analyses. Hence, this present study investigates this issue caring spatial dependency in analysis to ensure a sound empirical contribution to existing literature.

3. Methods

Gender equality in developing countries is lower than in the developed world. This fact may be associated with poor governance and social infrastructure in developing countries. Moreover, religious tensions would also be responsible for gender disparities. For instance, [Schnabel \(2016\)](#) observed that the level of gender equality was high in non-religious societies. Hence, religious tensions may obstruct gender equality. In addition, [Ahmed and Brasted \(2021\)](#) elaborated that religious tensions are responsible for social unrest, instability, and division in the country. In the same line, [Lussier and Fish, 2016](#) argued that the gender gap is a more social phenomenon and religion is a major source of the gender gap. Moreover, the literature has corroborated that religious women have participated lesser in the labor market compared to non-religious women ([Naseem and Adnan, 2019](#); [Davis and Gao, 2020](#)). Some other empirical studies have also been investigated and found that religion has deep effects on gender equality ([Klingorova and Havlicek, 2015](#); [Page and Yip, 2017](#)). Moreover, [Rohlinger et al. \(2020\)](#) argued that education would play a significant role in improving the role of women in economic, political, and social participation, which would improve gender equality in society. In an empirical exercise, [Khurshid \(2016\)](#) found that education has increased women's participation in the labor market. In another argument, [Eastin and Prakash \(2009\)](#) claimed that

rich countries have equal economic opportunities for males and females. Hence, increasing economic growth and development may increase gender equality in a country. Moreover, Boserup et al. (1970) claimed that economic growth would generate gender inequality at a lower level of income. However, economic growth promotes gender equality at a higher level of income. Hence, level of income and economic growth are prominent determinants of gender equality. Many studies have corroborated that economic growth has helped to improve gender equality (Forsythe et al., 2000; Kabeer and Natali, 2013). In addition, Rao (2017) argued that improving governance would promote gender equality. Based on the above theoretical arguments and empirical evidence, the objective of this research is to test the effects of economic growth, religious tensions, education, and governance on gender equality in 59 developing countries. In past literature, some studies have been conducted to test the role of some of our hypothesized variables on gender equality/inequality. But a comprehensive study is still missing in the case of developing countries. Hence, the present study fills the gap in the literature and contributes to the body of literature by investigating the role of economic growth, religious tensions, education, and governance on gender equality in 59 developing countries with the help of the following model:

$$GE_{it} = \gamma_0 + \gamma_1 RT_{it} + \gamma_2 EDU_{it} + \gamma_3 BQ_{it} + \gamma_4 GDPC_{it} + u_{it} \quad (1)$$

GE_{it} is a gender equality index. An increasing index represents a higher level of gender equality and a lower level of inequality in the family, labor market, and society. RT_{it} is a religious tensions index, which reflects a single religion's dominance in the legal framework of a country. It also represents a replacement of a country's law with religious law. Hence, it shows the dominance of religion in governance. The increasing RT_{it} represents lower religious tensions in a country and vice versa. Hence, a positive sign is expected on the coefficient of RT_{it} . An increasing index of RT_{it} (decreasing religious tensions) can improve the rights of gender and may improve gender equality. EDU_{it} is a natural log of secondary school enrolments and is a proxy for education. Increasing education is expected to have a positive effect on gender equality. BQ_{it} is a bureaucracy quality index. It is a proxy of governance. Increasing BQ_{it} shows a higher bureaucracy quality with lesser government involvement. Hence, it reflects stable public policies in times of changing governments. Hence, a positive effect of BQ_{it} is expected on gender equality. Lastly, $GDPC_{it}$ is GDP per capita and is a proxy for economic growth. The increasing economic growth is expected to have a high demand for gender equality. Therefore, a positive effect of $GDPC_{it}$ is expected on gender equality. We collect data on GDP per capita and secondary school enrolments from the World Bank (2021). Data on religious tensions and bureaucracy quality are collected from PRS Group (2020). Data on gender equality are taken from the International Institute of Social Studies (2020). Gender equality is defined as equal opportunities and constraints for men and women within families, the workplace, and society (International Institute of Social Studies, 2020). Religious tensions are defined in a way that the control of society and/or governance is in the hand of a major religious group in a country, which wants to replace civil law with religious law. Moreover, it may exclude the religious beliefs of minorities' religions in political or legal processes. Bureaucracy quality is defined as the institutional strength of bureaucracy, which would resist the changes in policies because of a changing government (PRS Group, 2020). All series are collected from 1995-2015 for 59 developing countries, which are mentioned in the appendix. Due to missing observations, we take five years averages of all variables to make a balanced panel.

Eq. (1) is pooled Ordinary Least Square (OLS), and heterogeneity can be introduced in the equation's intercept by country-specific Fixed Effects (FE) and/or time-specific FE. Moreover, the countries are not standalone in gender equality policies due to excessive globalization in this modern age of communication technologies. Hence, spatial linkages are expected in the relationship between gender equality and its determinants.

Ignoring this spatial dimension would be responsible for biased results (Anselin, 1988). The existing literature is reluctant to do spatial analyses on the relationship between gender equality and its determinant. Hence, the present study aims to fill this literature gap to ensure a significant contribution to the existing body of literature. After regressing the non-spatial Eq. (1) with pooled OLS and FE models, we test the spatial dependence in the estimated equation following the methodology of Elhorst (2012). We test the possible spatial interaction across spatial units. The correlations across units might be more vital for neighbors but are weak for the units far away. This spatial dependence might be tested with the Lagrange Multiplier (LM) and LM robust tests (Anselin et al., 2008; Debarsy and Ertur, 2010). In case of the presence of statistically significant spatial dependency, we apply the Spatial Durbin Model (SDM) in the following way:

$$GE_{it} = \alpha_0 + \alpha_1 RT_{it} + \alpha_2 EDU_{it} + \alpha_4 BQ_{it} + \alpha_4 GDPC_{it} + \alpha_5 W.GE_{it} + \alpha_6 W.RT_{it} + \alpha_7 W.EDU_{it} + \alpha_8 W.BQ_{it} + \alpha_9 W.GDPC_{it} + v_{1i} + u_{1t} + e_{1it} \quad (2)$$

Eq. (2) is the SDM model, and W is a $59 * 59$ matrix that carries 1 for border-sharing countries and 0 otherwise. Moreover, W is normalized, as suggested by Elhorst (2001). The parameter of the variable multiplied by W estimates the spatial effects in neighboring countries. Error terms carry the country and time-specific effects. Eq. (2) can be regressed by FE and Random Effect (RE), and the Hausman test can be applied to select the suitability of either FE or RE. Moreover, the SDM can be tested for the null hypothesis that the SDM can be reduced to Spatial Autoregressive (SAR) or Spatial Error Model (SEM). If both hypotheses are rejected, then the SDM is the best choice. If the hypothesis "SDM can be reduced to SAR" is accepted, then SAR is the best choice. The SAR can be expressed in Eq. (3):

$$GE_{it} = \beta_0 + \beta_1 RT_{it} + \beta_2 EDU_{it} + \beta_3 BQ_{it} + \beta_4 GDPC_{it} + \beta_5 W.GE_{it} + v_{2i} + u_{2t} + e_{2it} \quad (3)$$

Eq. (3) would be regressed by FE and RE, and the Hausman test can be applied to select the suitable specification.

4. Results

Table 1 shows the results of non-spatial models. The results of non-spatial models with different possible specifications are presented to test the presence of spatial autocorrelation in the models. Nevertheless, these results are biased because LM and LM robust tests corroborate spatial lag effects in all estimated models (Anselin et al., 2008; Debarsy and Ertur, 2010). However, we discuss the major results of the regressed non-spatial models. Religious tensions and GDP per capita positively

Table 1. Non-spatial models.

Variable	Pooled OLS	FE-countries	FE-years	FE-both
RT_{it}	0.0272 (0.000)	0.0054 (0.293)	0.0279 (0.000)	0.0043 (0.357)
EDU_{it}	0.0021 (0.576)	0.0004 (0.979)	0.0003 (0.937)	-0.0433 (0.005)
BQ_{it}	0.0010 (0.906)	-0.0020 (0.886)	0.0046 (0.560)	0.0118 (0.340)
$GDPC_{it}$	0.0280 (0.000)	0.1339 (0.000)	0.0229 (0.000)	0.0003 (0.992)
LM Spatial Lag	270.806 (0.000)	121.535 (0.000)	216.624 (0.000)	89.160 (0.000)
Robust LM Spatial Lag	38.145 (0.000)	116.909 (0.000)	75.792 (0.000)	103.442 (0.000)
σ^2	0.0068	0.0031	0.0059	0.0028
R^2	0.2981	0.7621	0.4009	0.8275

Note: () contains probability values.

Table 2. SDM model.

Variables	Fixed Effects			Random Effects		
	Point	Direct	Total	Point	Direct	Total
RT _{it}	0.0196 (0.000)	0.0201 (0.000)	0.0397 (0.000)	0.0201 (0.000)	0.0264 (0.000)	0.0360 (0.000)
EDU _{it}	-0.0036 (0.364)	-0.0035 (0.258)	-0.0057 (0.519)	-0.0029 (0.462)	-0.0026 (0.647)	-0.0045 (0.696)
BQ _{it}	0.0105 (0.136)	0.0136 (0.169)	0.0223 (0.236)	0.0098 (0.096)	0.0101 (0.075)	0.0198 (0.051)
GDP _{Cit}	0.0364 (0.000)	0.0397 (0.000)	0.0518 (0.002)	0.0264 (0.012)	0.0276 (0.026)	0.0374 (0.036)
W * GE _{it}	0.2978 (0.003)			0.3687 (0.000)		
W * RT _{it}	0.0109 (0.000)			0.0088 (0.016)		
W * EDU _{it}	-0.0018 (0.225)			-0.0021 (0.461)		
W * BQ _{it}	0.0089 (0.128)			0.0102 (0.052)		
W * GDP _{Cit}	0.0101 (0.000)			0.0076 (0.013)		
R ²	0.3162			0.2645		
σ ²	0.0019 (0.000)			0.0026 (0.000)		
Log-Likelihood	296.6264			319.9641		
Wald test-spatial lag	2.42 (0.659)			1.96 (0.864)		
Wald test-spatial error	16.26 (0.003)			15.63 (0.011)		
LR test-spatial lag	3.16 (0.468)			2.89 (0.542)		
LR test-spatial error	18.41 (0.001)			22.31 (0.000)		
Hausman Test	64.02 (0.000)					

Note: () contains probability values.

affect gender equality in some estimated models. Education has a negative impact on gender equality in the FE-both model.

After confirmation of spatial effects in our model. At first, we regress the SDM to test and verify the most appropriate spatial model specification for our hypothesized model. Table 2 shows the results of SDM estimations based on Eq. (2), showing spatial and non-spatial determinants of gender equality. Four main results are reported, i.e., point estimates, direct estimates or direct marginal effects (non-spatial factors), indirect estimates or indirect marginal effects (spatial factors), and total estimates (sum of spatial and non-spatial estimates). First, the SDM is estimated with the FE and RE specifications. Then, the Hausman test is applied with H₀: RE is preferable. The result shows that H₀ is rejected at a 1% level of significance. Hence, FE is efficient for the estimation of SDM. Moreover, we apply Wald and LM tests. Both tests reject the hypothesis that “SDM can be reduced to SEM”. Hence, SEM is not appropriate for our model. On the other hand, both tests accept the hypothesis that “SDM can be reduced to SAR”. Hence, SAR is the best choice for our model. Hence, we proceed to Table 3 to interpret the results from the SAR model, which is statistically most reliable.

In Table 3, we report the estimates of the SAR with FE and RE models and apply the Hausman test with H₀: RE is preferable. The result shows that H₀ is rejected at a 1% level of significance. Hence, FE is efficient for the estimation of SAR. Therefore, SAR with FE specifications is selected for interpretation. The point estimates are subject to criticism in the prior literature, so the study discusses direct, indirect, and total effects for interpretation.

The coefficient of W * GE_{it} is positive and significant. Hence, gender equality in the home country has positive spillovers in the neighboring countries. This result corroborates that improving gender equality in terms of awareness and conception in one country may spread this awareness in the neighboring countries. Hence, the policies of gender equality in one country should be designed keeping neighboring countries in mind for an optimum effect of any gender equality policy. The direct impact (non-spatial) and indirect effect (spatial) of religious tensions index on gender equality is positive and statistically significant in developing countries. Hence, the decreasing religious tensions index (increasing religious tensions) is responsible for decreasing gender equality in the host and neighboring developing countries, and vice versa. In developing countries, the phenomenon of religious tensions is mostly high. On the other hand, gender equality is low in developing countries. So, increasing religious tensions would further put fire to the burning issue of low gender equality. Hence, urgent religious policy actions are required in developing countries to release the judicial and social system from the dominance of a single religious pressure group. This policy action may also promote the phenomenon of gender equality across society. Thus, this policy will not only reduce religious tensions but could also help in promoting the active role of women's economic, social, and political participation in the economy and society. For this purpose, the developing countries should follow the roadmap of the developed world by having lower religious tensions and higher gender equality. The developed countries are enjoying the full role of women, who are around 50% of the total population in any economy. In the same way, the developing countries should also utilize the hidden potential of the economy by activating the role of women in an economy, providing equal rights to women in society, and solving religious gender-related problems on an urgent basis.

Dollar and Gatti (1999) mentioned that women are more deprived in developing countries compared to developed countries, and religion played a significant role in promoting gender inequality. Our result of developing countries also supports their argument that religious tension is extending the gender gap in developing countries. This result is also corroborated by some other existing studies (Rwafa, 2016; Klingorova and Havlíček, 2015; Dollar and Gatti, 1999). In developing countries, civil and legal systems are mostly hijacked by a majority of the population's religion. Therefore, minorities do not have proper rights and participation in the civil systems of developing countries. Therefore, the

Table 3. SAR model.

Variables	Fixed Effects				Random Effects			
	Point	Direct	Indirect	Total	Point	Direct	Indirect	Total
RT _{it}	0.0196 (0.000)	0.0212 (0.000)	0.0122 (0.000)	0.0334 (0.000)	0.0102 (0.017)	0.0107 (0.017)	0.0035 (0.021)	0.0141 (0.015)
EDU _{it}	-0.0034 (0.315)	-0.0038 (0.291)	-0.0024 (0.343)	-0.0062 (0.305)	-0.0044 (0.411)	-0.0047 (0.378)	-0.0017 (0.392)	-0.0064 (0.379)
BQ _{it}	0.0116 (0.113)	0.0134 (0.083)	0.0082 (0.158)	0.0216 (0.103)	0.0038 (0.693)	0.0049 (0.607)	0.0017 (0.607)	0.0066 (0.606)
GDP _{it}	0.0169 (0.002)	0.0178 (0.001)	0.0105 (0.020)	0.0283 (0.002)	0.0449 (0.000)	0.0458 (0.000)	0.0154 (0.001)	0.0612 (0.000)
W * GE _{it}	0.4215 (0.000)				0.2836 (0.000)			
R ²	0.3137				0.2708			
σ ²	0.0048 (0.000)				0.0026 (0.000)			
Log-Likelihood	290.9071				307.8725			
Hausman Test	17.19 (0.004)							

Note: () contains probability values.

religious tensions obstruct gender equality in the home country and also have spillovers to the neighboring countries. Lussier and Fish, 2016 argued that religion might develop the attitude toward gender inequality. Religion is a major source of gender inequality. Hence, reducing religious tensions may improve gender equality. Moreover, Rwafo (2016) argued that religion framed the social structure in favor of males. Hence, religious tensions would accelerate gender inequality. In addition, Klingorova and Havlicek (2015) argued that gender inequality is less prominent in regions with the least preference for religion. On the other hand, the result of this present research is opposing the surveyed results of Page and Yip (2017). They found that religion was not teaching any type of gender discrimination.

The direct impact (non-spatial) of GDP per capita has a positive and statistically significant effect on gender equality. Moreover, its indirect effect (spatial) is also positive and significant. It implies that a country's better economic progress may increase gender equality and decrease the gender gaps in the home and neighboring countries. The spillovers may be expected due to the social connections among countries. Hence, the economic progress of countries would support gender equality in the home economies and neighboring countries as well, which could help improve the social outlook of a country by activating the role of women and by promoting gender equality. This result can be compared with facts of the developed and rich nations of the world, which have higher gender equality and lower religious tensions. Hence, a higher level of economic growth and development may demand a higher outlook of society by providing equal economic, social, and political rights to men and women. Hence, government policies should encourage the economic growth of developing countries by activating the full role of women in the economy and society.

In a micro-level companies' study, Escamilla-Solano et al. (2022) investigated the role of disclosure of gender policies on business profitability in 91 Spanish companies from 2016–18 and found a positive association from panel results. Hence, promoting gender equality would increase business competitiveness, profitability, and economic growth. Moreover, Ramos et al. (2020) investigated some of the inequality and poverty indices and found a greater inequality in men compared to women in Mexico. However, poverty is more pronounced in women. Moreover, a weak correlation is also found between poverty and inequality. Our study finds that governance measured by the bureaucratic quality has a positive direct effect on gender equality. However, its effect is insignificant on gender equality in indirect estimates. Therefore, we conclude that governance through the bureaucratic quality of developing countries supports gender equality in the home countries but does not have spillover effects. On the other hand, decreasing bureaucracy quality can reduce gender equality. It is claimed due to the reason that bureaucracy in developing countries is not free from the government in policymaking. Hence, developing countries' unstable governments disturb the bureaucratic quality and obstruct gender equality through frequent policy changes. Our results conclude that improving

bureaucratic quality would increase gender equality. The developing countries in our sample have a mostly downward trend in the bureaucratic quality index. Hence, these developing countries should improve bureaucratic quality by supporting bureaucratic decisions without political interference. It could help to enjoy the positive effect of bureaucratic quality on gender equality. Stewart et al. (2021) reviewed the 71 studies related to violence against women in typical gendered stereotypes and norms. 55 studies reported significant results. Particularly, legislative or policy reform helped to reduce rigid gender stereotypes. All estimated effects of education are found insignificant on gender equality. Therefore, developing countries' educational attainment is not mature enough to promote gender equality. The sample developing countries need to improve the quantity and quality of educational attainment on an urgent basis to have pleasant effects of education on gender equality. Particularly, educational institutions should promote gender equality in the attainment of education. Moreover, the syllabus in higher education should include content related to the promotion of the gender equality issue and to reduce religious tensions in the economies.

In summary, reducing religious tensions and increasing economic growth could improve gender equality in developing countries and have positive spillovers in their neighboring countries as well. However, bureaucratic quality could only improve gender equality in the home country and has insignificant spillovers in neighboring countries. Lastly, educational attainment could not affect gender equality at all. Due to financial constraints, this study has conducted an analysis of religious tensions and gender equality nexus from a macro perspective. Religious tensions have been defined as the control of one religious' group in the law-making process of a country. However, the gender equality phenomenon can have different dimensions in different sects of the same religion. Moreover, some other micro-level insights need attention to explore this topic more deeply and rigorously. Hence, a survey-based study may be conducted in future research to have a deep insight into a particular country or region regarding religious tensions and gender equality relationships, which would help in designing strategic moves to improve both religious tensions and gender equality issues in a country caring her local problems.

5. Conclusions

Religious tensions could affect the economic, social, and political conditions of any country. Hence, religious tensions could play an active role in gender equality as well. This research investigates the religious tensions and gender equality relationship, considering governance, economic growth, and education in a panel model of 59 developing countries. Due to the increasing globalization and advancement of information technologies, gender equality is a local phenomenon and may also have spatial dimensions. Therefore, we care about the spatial dependence in the model. In the empirical exercise, we find a statistically significant spatial dependency in our sample developing countries'

model. Hence, gender equality in one country has positive spillovers in neighboring countries as well. It is possible due to globalization and advancement in communication technologies. Hence, improving awareness of gender equality in any country or society would raise the role of women in the neighboring countries or societies as well. The religious tensions index shows a positive relationship with the gender equality index in local and spillover effects. Hence, increasing religious tensions (decreasing religious tensions index) are reducing gender equality in developing countries. In developing countries, religious tensions are comparatively high due to weak legal structure and compliance. Because civil and legal systems are mostly hijacked by a majority of the population's religion in developing countries. This phenomenon might raise the gender gap, which is reducing women's economic, social, and political participation in developing nations. It is not only affecting the role of women in the labor market. Nevertheless, it also affects the role of women in the household and society. Though in patriarchal societies of developing countries, the development role of women is mainly neglected. It may give a big push to the developing countries if the role of women could be adequately utilized with optimum economic, social, and political participation. Because women are about 50% of the total population of any society. Nevertheless, it is only possible by correcting religious beliefs and attitudes toward women's role in society. Therefore, there is an urgent need to look after the religious problems in developing countries to promote gender equality.

Further, economic growth is found helpful in increasing gender equality in the host and neighboring countries. Hence, economic progress could improve the social conditions of the countries by improving gender equality. The world's wealthiest countries have the highest gender equality. Hence, economic growth and development might increase the demand for better environmental and social conditions in society. Consequently, economic growth helps to change women's social and economic outlook in society and improve gender equality. Moreover, technological advancement and the adoption of information technology due to economic growth might raise women's participation in the labor market and improve gender equality. The effect of education is found insignificant. It shows that education is not well designed to promote women's role in the economy and society. Hence, there is a need to improve education to support the concept of gender equality. Lastly, the effect of bureaucratic quality on gender equality is positive. Therefore, increasing bureaucratic quality can improve gender equality. Moreover, decreasing bureaucratic quality can reduce gender equality. However, there is a negative trend in the bureaucratic quality index in most developing countries. It shows that the developing countries' bureaucracy is not free from political pressure, and it could not trace consistent policies to promote gender equality. Therefore, bureaucratic quality needs improvements in developing countries to support gender equality. The present study has faced financial limitations and used macro-level

indicators of religious tensions and gender equality in developing countries. Therefore, there is a need for further research in this area to explore the micro-level society-specific religious problems. It is possible by doing surveys in developing countries as the religious beliefs of different societies are different even in the case of the same religion. Similarly, the religious views about gender equality would also be varied from society to society and religion to religion. Even, the concept of gender equality would be different in different sects of the same religion. Hence, micro-level survey-based research would explore new insights into the topic for optimum policy implications to improve gender equality in developing countries, considering society-specific religious problems about gender discrimination.

Declarations

Author contributions

Asim Iqbal: Conceived and designed the experiments; Performed the experiments; Wrote the paper.

Shafiqul Hassan: Performed the experiments; Analyzed and interpreted the data.

Haider Mahmood: Analyzed and interpreted the data; Wrote the paper.

Muhammad Tanveer: Contributed reagents, materials, analysis tools or data.

Funding statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data availability statement

Data will be made available on request.

Declaration of interest's statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

Acknowledgements

The authors are thankful to governance and policy design research lab (GPDRL), Prince Sultan University for providing APC for this publication.

Appendix

Country	Religion of majority of population	Country	Religion of majority of population	Country	Religion of majority of population
Albania	Islam	Honduras	Christianity	Pakistan	Islam
Algeria	Islam	India	Hinduism	Panama	Christianity
Armenia	Christianity	Indonesia	Islam	Papua New Guinea	Christianity
Bangladesh	Islam	Iran	Islam	Paraguay	Christianity
Bolivia	Christianity	Iraq	Islam	Peru	Christianity
Botswana	Christianity	Jamaica	Christianity	Romania	Christianity
Brazil	Christianity	Jordan	Islam	Senegal	Islam
Cameroon	Christianity	Kazakhstan	Islam	Sierra Leone	Islam
China	Buddhism	Kenya	Christianity	South Africa	Christianity
Colombia	Christianity	Malawi	Christianity	Sri Lanka	Buddhism
Congo	Christianity	Malaysia	Islam	Tanzania	Christianity

(continued on next column)

(continued)

Country	Religion of majority of population	Country	Religion of majority of population	Country	Religion of majority of population
Costa Rica	Christianity	Mali	Islam	Thailand	Buddhism
Cote d'Ivoire	Christianity	Malta	Islam	Togo	Buddhism
Dominican Republic	Christianity	Mexico	Islam	Tunisia	Islam
Ecuador	Christianity	Moldova	Christianity	Turkey	Islam
Egypt	Islam	Mongolia	Buddhism	Uganda	Christianity
El Salvador	Christianity	Morocco	Islam	Ukraine	Christianity
Ghana	Christianity	Mozambique	Christianity	Vietnam	Secular
Guatemala	Christianity	Nicaragua	Christianity	Yemen	Islam
Guinea	Christianity	Niger	Islam		

References

- Agenor, P.-R., Canuto, O., 2015. Gender equality and economic growth in Brazil: a long-run analysis. *J. Macroecon.* 43, 155–172.
- Ahmed, I., Brasted, H., 2021. Recognition and dissent: constitutional design and religious conflict in Pakistan. *J. Contemp. Asia* 51 (2), 351–367.
- Alderman, H., Elizabeth, K.M., 1998. Gender differences in parental investment in education. *Struct. Change Econ. Dynam.* 9 (4), 453–468.
- Anselin, L., 1988. *Spatial Econometrics: Methods and Models*. Springer, Netherland.
- Anselin, L., Le Gallo, J., Jayet, H., 2008. Spatial panel econometrics. In: Matyas, L., Sevestre, P. (Eds.), *The Econometrics of Panel Data*. Springer-Verlag, Berlin, pp. 625–660.
- Biswas, A., Bang, T.J., Mitra, A., 2014. Gender equality and economic growth: is it equality of opportunity or equality of outcomes? *Fem. Econ.* 21 (1), 110–135.
- Boserup, E., 1970. *Woman's Role in Economic Development*. Allen & Unwin, London.
- Chakravarty, S., Fonseca, M., Ghosh, S., Kumar, P., Marjit, S., 2019. Religious fragmentation, social identity, and other-regarding preferences: evidence from an art factual field experiment in India. *J. Behav. Exp. Econ.* 82, 101451.
- Davis, L., Gao, J., 2020. Preferences or patriarchy: why do religious women work less? *Soc. Indic. Res.* 147 (1), 287–310.
- Debarys, N., Ertur, C., 2010. Testing for spatial autocorrelation in a fixed-effects panel data model. *Reg. Sci. Urban Econ.* 40, 453–470.
- Dollar, S., Gatti, B., 1999. Gender inequality, income, and growth: are good times good for women? Policy Research Report on Gender and Development. In: Working Paper Series No. 1.
- Duflo, E., 2012. Women empowerment and economic development. *J. Econ. Lit.* 50 (4), 1051–1079.
- Eastin, J., Prakash, A., 2009. Economic development and gender equality: Is there a gender Kuznets curve?. In: Paper Presented at the 50th Annual Convention of the International Studies Association, February 15–18 New York.
- Elhorst, J.P., 2001. Dynamic models in space and time. *Geogr. Anal.* 33 (2), 119–140.
- Elhorst, J., 2012. Matlab software for spatial panels. *Int. Reg. Sci. Rev.* 35 (4), 1–17.
- Escamilla-Solano, S., Paule-Vianez, J., Blanco-González, A., 2022. Disclosure of gender policies: do they affect business performance? *Heliyon* 8 (1), e08791.
- Forsythe, N., Korzeniewicz, R.P., Durrant, V., 2000. Gender inequalities and economic growth: a longitudinal evaluation. *Econ. Dev. Cult. Change* 48 (3), 573–617.
- Graham, W., Bell, J., Bullough, C., 2001. Can skilled attendance at delivery reduce maternal mortality in developing countries? In: De Brouwere, V., van Lerberghe, W. (Eds.), *Safe Motherhood Strategies: A Review of the Evidence*, Studies in Health Services Organisation and Policy, 17. ITGPress, Antwerp, pp. 97–129.
- Gupta, G., Oommen, N., Grown, C., Conn, K., Hawkes, S., Shawar, Y., et al., 2019. Gender equality and gender norms: framing the opportunities for health. *Lancet* 393 (1), 2550–2562.
- Gyimah-Brempong, K., 2002. Corruption, economic growth, and income inequality in Africa. *Econ. Govern.* 3 (3), 183–209.
- Hannum, E., Buchmann, C., 2005. Global educational expansion and socioeconomic development: an assessment of findings from the social sciences. *World Dev.* 33 (3), 333–354.
- International Institute of Social Studies, 2020. *Indices of Social Development*. International Institute of Social Studies, Hague.
- Kabeer, N., Natali, L., 2013. Gender equality and economic growth: is there a win-win? IDS Working Paper No. 417.
- Karlsen, S., Nazroo, N.J., Smith, N.R., 2020. Ethnic, religious and gender differences in intragenerational economic mobility in England and Wales. *Sociology* 54 (5), 883–903.
- Khurshid, A., 2016. Domesticated gender (in) equality: women's education and gender relations among rural communities in Pakistan. *Int. J. Educ. Dev.* 51, 43–50.
- Klasen, S., 1999. Does gender inequality reduce growth and development? Evidence from cross-country regressions. In: *The Policy Research Report on Gender and Development Working Paper Series No. 7*. World Bank Group, Washington, D.C.
- Klasen, S., Lamanna, F., 2009. The impact of gender inequality in education and employment on economic growth: new evidence for a panel of countries. *Fem. Econ.* 15 (3), 91–132.
- Klingorova, K., Havlicek, T., 2015. Religion and gender inequality: the status of women in the societies of world religion. *Morav. Geogr. Rep.* 23 (2), 2–11.
- Kuznets, S., 1955. Economic growth and income inequality. *Am. Econ. Rev.* 45 (1), 1–28.
- Lagerlof, N.-P., 2003. Gender equality and long-run growth. *J. Econ. Growth* 8 (4), 403–426.
- Lussier, D.N., Fish, M.S., 2016. Men, Muslims, and attitudes toward gender inequality. *Politics and Religion* 9 (1), 29–60.
- Marshall, K., 2018. Global education challenges: exploring religious dimensions. *Int. J. Educ. Dev.* 62 (1), 184–191.
- Mikkola, A., 2005. Role of Gender equality in Development: a Literature Review. Department of Economics, University of Helsinki and HECER.
- Naseem, J., Adnan, W., 2019. Being a second generation Muslim woman in the French labour market: understanding the dynamics of (visibility of) religion and gender in labour market access, outcomes and experiences. *Res. Soc. Stratif. Mobil.* 61, 79–93.
- Page, H.-J., Yip, A.K.-T., 2017. Gender equality and religion: a multi-faith exploration of young adults' narratives. *Eur. J. Wom. Stud.* 24 (3), 249–265.
- PRS Group, 2020. *International Country Risk Guide*. PRS Group, New York.
- Ramos, M.E., Gibaja-Romero, D.E., Ochoa, S.A., 2020. Gender inequality and gender-based poverty in Mexico. *Heliyon* 6 (1), e03322.
- Rao, N., 2017. Assets, agency, and legitimacy: towards a relational understanding of gender equality policy and practice. *World Dev.* 95, 43–54.
- Ravallion, M., 2014. Income inequality in the developing world. *Science* 344, 851–855.
- Rohlinger, D., Olsen, A., Hewitt, L., 2020. Dualing discourse: democracy, gender equity, and discursive politics in rural Morocco. *Wom. Stud. Int. Forum* 81 (1), 1–20.
- Rwafa, U., 2016. Culture and religion as sources of gender inequality: rethinking challenges women face in contemporary Africa. *J. Lit. Stud.* 32 (1), 43–52.
- Schnabel, L., 2016. Religion and gender equality worldwide: a country-level analysis. *Soc. Indic. Res.* 129 (2), 893–907.
- Seguino, S., 2000. Gender inequality and economic growth: a cross-country analysis. *World Dev.* 28 (7), 1211–1230.
- Stewart, R., Wright, B., Smith, L., Roberts, S., Russell, N., 2021. Gendered stereotypes and norms: a systematic review of interventions designed to shift attitudes and behaviour. *Heliyon* 7 (4), e06660.
- Sudarso, S., Keban, P.E., Mas'udah, S., 2019. Gender, religion and patriarchy: the educational discrimination of coastal Madurese women, East Java. *J. Int. Wom. Stud.* 20 (9), 1–12.
- Syed, J., Ozbilgin, M., Torunglu, D., Ali, F., 2009. Rescuing gender equality from the false dichotomies of secularism versus sharia in Muslim majority countries. *Wom. Stud. Int. Forum* 32 (2), 67–79.
- Uma, K.E., Nwaka, I.D., Nwogu, M.U., Obidike, P.C., 2020. What are the triggers of household decision-making on waste disposal choices? A gender differentiated analysis. *Heliyon* 6 (12), e05588.
- Unay-Gailhard, I., Bojnec, S., 2021. Gender and the environmental concerns of young farmers: do young women farmers make a difference on family farms? *J. Rural Stud.* 88, 71–82.
- UNDP, 2009. *Measuring Inequality: Gender-Related Development Index (GDI) and Gender Empowerment Measure (GEM)*. United Nations Development Program, Washington, DC.
- Victoria State Government, 2021. *Firefighting Task 11: Crew Member Rescue*. <https://fi.refighter.vic.gov.au/fitness-preparation/physical-aptitude-test/exercises-for-individual-pat-tasks/firefighting-task-11-crew-member-rescue/>.
- U.N. Women, 2013. *Annual Report (2011–12): Gender equality and Women's Empowerment*. 32. United Nations Entity for Gender Equality and the Empowerment of Women, New York.
- World Bank, 2012. *World Development Report 2012: Gender equality and Development*. The World Bank, Washington, D.C.
- World Bank, 2021. *World Development Indicators*. The World Bank, Washington, D.C.