

3. Determinants and Benefits of WTO Membership: Do peace indicators reveal linkages between WTO and peace?

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ABSTRACT

This chapter demonstrates empirically that there is a reciprocal positive relationship between trade and peace, by illustrating that the physical state of peace and the structural elements of peace contribute to a government's WTO membership, while WTO membership of the government also contributes to achieving "sustainable" peace. While achieving peace through reduced armed conflicts may be an important purpose and outcome of increased trade through WTO membership, building sustainable peace is more significant in establishing a favourable environment for sustained economic growth.

The chapter also shows that not only WTO membership but longer duration of WTO membership contributes further to improving the state of peace in economies. A comparative analysis of governments that became WTO members in the earlier phases versus newly acceding members demonstrates that those governments with a longer duration in WTO membership have stronger conditions that are necessary for sustaining peace and achieving good governance in the long run.

1. Introduction

While cross-border trade alone cannot guarantee peace, it can bring economic stability and promote peace within a country. On the other hand, peaceful relations between economies can promote trade as well. Such a positive correlation between trade and peace is an element of the fundamental logic that has brought the current multilateral trading system to life. The WTO has helped to bring peace to the world economy that once reeled from the devastations of the two world wars and the Great Depression.

The WTO has emphasized the role of WTO accessions as a means to bring economic growth and development to developing and least-developed economies, as WTO membership can contribute to advancing peace and security in the member and its surrounding region to the benefit of the world economy as a whole. Economic restructuring and institutional reforms carried out during the process of WTO accession improve the acceding governments' social and economic system and facilitate economic growth and development, which further serve for the attainment of "sustainable" peace. Many newly acceding governments to the WTO are or were fragile and conflict-affected. The WTO accession process can help these economies achieve national reform goals by adding external pressure requirements or demands while providing technical assistance to help carry out domestic restructuring that will improve the economies' institutional quality.

This study attempts to empirically demonstrate that there is a reciprocal positive relationship between trade and peace by showing that the physical state of peace and the structural elements of peace contribute to a government's WTO membership. It also shows that WTO membership contributes to achieving "sustainable" peace. Becoming a member of the WTO system enables economies to build and maintain peace, by assisting in the development of elements like a well-functioning government, preventing and combatting corruption, a sound business environment, free flow of information, and good relationships with neighbouring countries.

While achieving peace through reduced armed conflicts may be an important purpose and outcome of increased trade through WTO membership, building sustainable peace is more significant in establishing a favourable environment for sustained economic growth. Interestingly, while most of the elements that contribute to sustainable peace serve as meaningful determinants of WTO membership for economies that become new WTO members, several elements appear to reveal a stronger linkage with the duration of WTO

membership. In other words, a long-term commitment to the rules of the multilateral trading system through WTO membership can be considered to be a pathway to achieving sustainable peace, in particular by encouraging/facilitating a better business environment and good governance.

The chapter is organized as follows: Section 2 provides a literature review of the existing work on the relationship between trade and peace, and the research hypotheses for showing the relationship between WTO membership and peace. Section 3 presents the empirical specification and methodology for our estimation model and the results of the analysis. Section 4 includes several case studies to support our empirical analysis. Section 5 concludes.

2. WTO and peace

2.1 Relationship between trade and peace

While a number of existing works show the positive relationship between trade and peace, few previous studies have tried to reveal any linkage between WTO membership and peace.

The positive impact of trade on peace has been shown by quite a number of previous studies. For example, McDonald (2004) shows that free trade, rather than trade alone, reduces military conflict between countries. Malkawi (2007) argues that trade guarantees peace, as strengthening trade ties between countries helps them open up economically and politically, and enhances cross-cultural understanding. Hegre et al. (2010) demonstrated that trade promotes peace since violence has substantial costs, and that the size of nations and the distances separating them influence both trade and conflict.

Lee and Pyun (2009) demonstrated that interdependence in bilateral trade and openness in global trade promotes peace, also arguing that the peace-promoting effects of bilateral trade integration are significantly higher for countries that are likely to experience more conflicts. Martin et al. (2008) explain that the probability of military conflict escalation is lower for countries that trade more bilaterally because of the opportunity cost due to the loss of trade gains associated with conflict. They also claim that countries more open to trade have a higher probability of war, as multilateral trade decreases bilateral dependence and the opportunity cost of bilateral conflict.

On the other hand, Long (2008) illustrates the relationship between peace and trade by demonstrating the negative impact of conflict on trade,

specifically showing that mere expectations of armed conflict decrease bilateral trade between countries, as firms may face higher transportation, transaction, and production costs of trade even when conflict is merely a possibility.

There are also studies that capture the reciprocal effects between trade and peace to address the endogeneity problem. According to Keshk et al. (2004), there is stronger evidence that conflict reduces trade than the claim that trade reduces conflict. However, Hegre et al. (2010) have demonstrated, using simultaneous equations to capture the reciprocal effects of trade and conflict and taking into account exogenous factors such as country sizes and relative distances, that trade does promote peace and that conflict contemporaneously reduces trade.

While there is existing research on the impact of GATT or WTO membership on trade volumes, previous research on the relationship between WTO membership and peace is almost non-existent. For example, Subramanian and Wei (2006) have shown that the WTO has had a strong positive impact on trade, but with uneven results depending on the economy's scope of participation and outcome in trade liberalization negotiations. Tomz et al. (2007) demonstrated that GATT membership substantially increased trade of both members and non-member participants, compared with economies outside the agreement. Rose (2004) contradicts these findings by claiming there is little evidence that members inside the GATT and WTO trade more than economies outside the organization.

Our research contributes to existing literature by providing an empirical analysis of the reciprocal positive relationship between WTO membership and peace. Not only is the physical state of peace estimated, using the Global Peace Index (GPI)², but we also investigated the structural elements of maintaining peacefulness by using the Positive Peace Index (PPI).³ The results demonstrate that there is a positive relationship between WTO membership and peace, and that several factors which contribute to sustainable peace show stronger improvement with a longer duration of WTO membership.

2.2 Research hypotheses for WTO membership and peace

Using the aforementioned peace indicators, this chapter aims to show the relationship between peace and WTO membership to determine which factors enable or push governments to join the WTO. The expectation is that better conditions of safety and security, lower levels of

conflict, and less militarization contribute to building and sustaining peace, and accordingly, those economies with better scores on these indexes are more likely to attain or maintain WTO membership.

Preliminary results have shown that, while governments that are less exposed to internal conflict have joined the WTO, governments that have recently become WTO members are mainly those that have been undergoing or experienced war or internal conflict. These results seem to imply that the process of WTO accession itself is being perceived as a means to contribute to terminating or improving the conflict situation and to address the dire economic situation caused by prolonged conflict.

Based on these preliminary observations, we have established two types of hypotheses for our empirical analysis. First, we try to identify which elements among the indicators of peace substantially contribute to a government's decision to pursue WTO membership, with particular attention to both the physical and structural elements of peacefulness. Second, we try to understand whether WTO membership leads to more sustainable peace in the economy, with particular attention to the duration of WTO membership. The following are the two hypotheses explained so far:

H1: The state or level of peace in a government affects the government's WTO membership.

H2-1: WTO membership affects the state or level of peace in a government.

H2-2: The duration of WTO membership contributes to achieving sustainable peace in a government.

3. Empirical analysis

3.1 Empirical methodology and data

The empirical estimations used to test our hypotheses are based on the simultaneous effects between the "WTO" variables (WTO membership and duration of membership) and the "peace" variables (GPI, PPI, and respective sub-indicators), as shown in Table A4. The first estimation model focuses on the determinants of WTO membership by analyzing the effects of the level of peace (i.e. GPI and PPI) on WTO membership. We then analyze the benefits of WTO membership by estimating the effect of WTO membership (plus duration of membership) on improving sustainable peace.

Since these simultaneous effects cause the endogeneity problem, we used the 2SLS (two-stage

least squares) method with instrument variables. In the first WTO equation, the “log of GDP per capita” is used as an instrument variable for the peace variables (i.e. GPI, PPI, and sub-indicators of GPI and PPI). The GDP per capita is negatively correlated with the GPI and PPI variables (-0.55 and -0.80, respectively), but not correlated with the WTO membership variable (0.09). This is based on the expectation that the income level of each government improves the level of peace in the economy, while not affecting WTO membership.

In the second peace equation, “average distance from ROW (rest-of-world)” is used as an instrument variable for the “WTO” variables. The distance variable shows a relatively higher correlation with the WTO variables (-0.16) than the peace variables (-0.04 and 0.07 for GPI and PPI, respectively). This is based on the premise that economies that share borders may be involved in more trade, thus increasing the need to rely on the WTO regime.

Other control variables are used to consider economic size (GDP), economic infrastructure for trade (Logistics Performance Index, LPI) and interdependence with other countries (number of regional trade agreement (RTA) partners) as common elements for both the WTO and peace equations.⁴ Table 3.1 summarizes the descriptions and sources of the variables used.⁵

3.2 Empirical results

Determinants of WTO membership

The results in Table A5 show the impact of the level of physical peace on a government's WTO membership. In addition to the GPI in general, all GPI sub-indicators (“security”, “militarization”, and “conflict”) are shown to be statistically significant as determinants of WTO membership. It appears that “militarization” has the greatest impact on WTO membership, implying that the less a government spends its budget on military assets, the more likely it is for the government to become a WTO member.

Table 3.1 Data descriptions and sources		
Data	Description	Source
WTO membership	Whether a government has attained and maintained WTO membership from 1995 to 2019	CEPII gravity data
WTO duration	Duration of WTO membership between 1995 and 2019	CEPII gravity data
GPI	GPI (level of peacefulness) from 2008 to 2019, score ranging from 0 (most peaceful) to 5 (least peaceful)	GPI by the IEP
PPI	PPI (ability to maintain peace) from 2009 to 2019, score ranging from 0 (highest in ability to sustain peace) to 5 (lowest in sustaining peace)	PPI by the IEP
Economic factors		
ln GDP	Log of GDP (current US dollar) from 1995 to 2019	World Bank indicator
ln GDP per capita	Log of GDP per capita (current US dollar) from 1995 to 2019	World Bank indicator
LPI	LPI from 2008 to 2019. Higher score means better logistic performance ranging from 1 to 5	World Bank indicator
Political factor		
Democracy	Capturing the regime authority spectrum ranging from -10 (hereditary monarchy) to +10 (consolidated democracy)	Polity IV project
Interdependence factor		
No. of RTA partners	Number of RTA partner countries, by year, from 1995 to 2019	CEPII gravity data
Geographic factor		
Average distance from ROW	Log of average distance from ROW	CEPII gravity data

As for other variables, when the government is a larger economy, more democratic, more distant from other countries, and has more RTA partner countries, it has a higher tendency to join the WTO. Economic infrastructure as represented by LPI becomes statistically significant only when estimated with “militarization”. This is because LPI shows a high correlation with “security” and “conflicts”, unlike “militarization”, which causes the multi-collinearity problem and makes them statistically insignificant.

The results in Table A6 show that the level of peace estimated with the PPI also has a significant impact on WTO membership.⁶ In addition to the PPI in general, all PPI sub-indicators also significantly contribute to WTO membership.

The impact on WTO membership seems to be highest in the following order: “free flow of information”, “good neighbour relations”, “government functioning”, “acceptance of rights of others”, “low level of corruption”, “high level of human capital”, “sound business environment”, and “equitable resource distribution”. This implies that, among the various elements for sustaining peace, open societies where information can flow freely within and across national borders, economies that engage more closely with their neighbours, and economies with more efficient governance capabilities and low levels of corruption are more likely to maintain WTO membership.

Effect of WTO membership on peace

The results in Table A7 show the impact of WTO membership on improving the state of peace in governments. In particular, “militarization” and “conflict” show statistically significant results, implying that WTO membership is associated with less spending on military budget and less exposure to military conflicts. These results are understandable, since the expected increase in trade after obtaining WTO membership may lead to a reduction in the military budget, and more spending on trade-related infrastructure and industries. Such a reduction in military spending would naturally lead to less involvement in military conflicts, and a higher level of peacefulness in the economy.

As for other variables, it appears that a larger economy (“GDP”) deteriorates the state of peace in a government, while higher income levels (“GDP per capita”) improve peace. The former result supports previous literature arguing that a nation’s size indicates both opportunity and willingness to use force (Hegre et al. 2010). As the economy develops and builds better infrastructure for trade, leading to more RTA partner countries, the government’s level of peace further improves.

The results in Table A8 show the impact of WTO membership on sustainable peace as measured by the PPI. Most sub-indicators of the PPI are statistically significant, indicating an improvement in the level of peacefulness after WTO membership. In particular, WTO membership had a more significant impact on improving the conditions which contribute to “sustainable peace” in the following order: “good neighbour relations”, “free flow of information”, “low level of corruption”, and “acceptance of the rights of others”. However, WTO membership showed no impact on improving the economy’s “business environment” and “level of human capital”.

Considered together with the impact of PPI indicators on WTO membership (as shown in Table A6, WTO Equation II), the results show that “good neighbour relations” and “free flow of information” are the most influential determinants of WTO membership. We have also attempted to analyze the benefits of WTO membership by providing estimation results using “duration of WTO membership” as the independent variable by estimating the impact of “number of years of WTO membership” on establishing conditions for achieving sustainable peace.

Benefits of WTO membership

We analyzed not only the impact of WTO membership on achieving peacefulness, but also the impact of the duration of WTO membership (number of years after becoming a WTO member) in order to address the causal relationship between WTO membership and the peace indicators.

As shown in Table A9,⁷ the results similarly show that the sub-indicators of the PPI can be improved in the following order: “acceptance of others’ rights”, “low level of corruption”, “free flow of information”, “well-functioning government”, and “sound business environment”. The longer the duration of WTO membership, the better the state of peacefulness for economies in general, except for the results estimated with “equitable resources”, “human capital”, and “neighbour relations”.

The results are slightly different from the results of Peace Equation II in Table A8, which showed a strong impact of WTO membership on “good neighbour relations” in addition to “free flow of information” and “corruption”. In other words, unlike when estimated with “WTO membership”, consideration of the duration of WTO membership shows that WTO membership does not have an impact on improving relations with neighbouring countries but does have a stronger impact on building a more sustainably peaceful society

through “acceptance of rights of others”, improving governance and transparency through “low level of corruption”, and building more open societies through “free flow of information”.

4. Case study: effect of WTO accession on peace

Since the launch of the WTO in 1995, 36 governments have become new members, with 24 currently undergoing accession negotiations.⁸ A number of recent cases of WTO accession have involved economies with a degree of centrally planned decision-making, economies that were formerly part of the Soviet Union, or were experiencing or continue to experience civil wars or internal conflicts. Since these governments are often not fully prepared to embrace market-based systems, they typically experience long periods of negotiations, during which their governments must carry out domestic reforms

and restructuring in order to comply with WTO rules and procedures. The governments listed in Table A3 acceded to the WTO since 1996.

As shown in Tables 3.2 and 3.3,⁹ WTO accession contributes to sustainable peace in new WTO members, although the correlation coefficients of WTO accession are smaller than those of WTO membership. This implies that the relationship between peace and sustained WTO membership may be larger than that for newly acceding WTO members.

As shown in Tables 3.4 and 3.5, different types of WTO membership (not a member of WTO; WTO membership since 1995; WTO accession after 1995) have different impacts on the GPI and the PPI. While the effects of the peace indexes are not much different from those in Tables 3.2 and 3.3 (larger scores for WTO membership than for WTO accession or non-WTO member), the change in scores during the 2009-2018 period for the different types of WTO membership is distinctive.

Table 3.2	Pairwise-correlation between the WTO and the Global Peace Index	
	WTO membership	WTO accession
GPI	-0.35	-0.22
Security	-0.26	-0.20
Militarization	-0.23	-0.20
Conflict	-0.36	-0.17

Source: Compiled by the authors.

Note: As a lower score indicates better state of peace, negative correlation means that WTO membership or WTO accession improves the government's state of peace.

Table 3.3	Pairwise-correlation between the WTO and the Positive Peace Index	
	WTO membership	WTO accession
PPI	-0.31	-0.26
Government function	-0.29	-0.09
Corruption	-0.32	-0.07
Business environment	-0.32	-0.12
Resources	-0.09	-0.08
Rights	-0.30	-0.07
Free information	-0.41	-0.03
Human capital	-0.17	-0.12
Neighbour relations	-0.42	-0.07

Source: Compiled by the authors.

Note: As a lower score indicates a better state of peace, negative correlation means that WTO membership or WTO accession improves the government's state of peace.

Table 3.4	Average score and change rate of the Global Peace Index by WTO membership type			
	2009	2014	2018	Change in score from 2009 to 2018
Not a member of the WTO	2.404	2.436	2.489	3.43%
WTO membership from 1995	1.961	1.954	1.960	-0.07%
WTO accession after 1995	2.123	2.080	2.116	-0.33%

Source: Compiled by the authors.

Note: As a lower score indicates a better state of peace, a negative change rate means an improvement in the state of peace.

Table 3.5	Average score and change rate of the Positive Peace Index by WTO membership type			
	2009	2014	2018	Change in score from 2009 to 2018
Not a member of the WTO	3.665	3.655	3.619	-1.29%
WTO membership from 1995	2.816	2.784	2.752	-2.33%
WTO accession after 1995	3.272	3.175	3.133	-4.45%

Source: Compiled by the authors.

Note: As a lower score indicates a better state of peace, a negative change rate means an improvement in the state of peace.

In the case of the GPI, the state of physical peace for non-members deteriorates over the period, while it improves for WTO members and newly acceding governments, with slightly more improvement in the state of peace for newly acceding governments. The results are similar in the case of the PPI,¹⁰ showing that improvement in the state of structural peace is most evident for newly acceding governments.

These results generally show that economies that are members of the WTO have shown greater improvement in their physical and structural state of peace than non-members. Results further show that governments that have newly acceded to the WTO have shown more improvement in their state of peace than existing WTO members. However, the duration of WTO membership also appears to impact the improvement of governments' state of peace. The following case studies show that, among the newly acceded governments, the longer the duration of their membership, the greater the improvement in their structural state of peace.

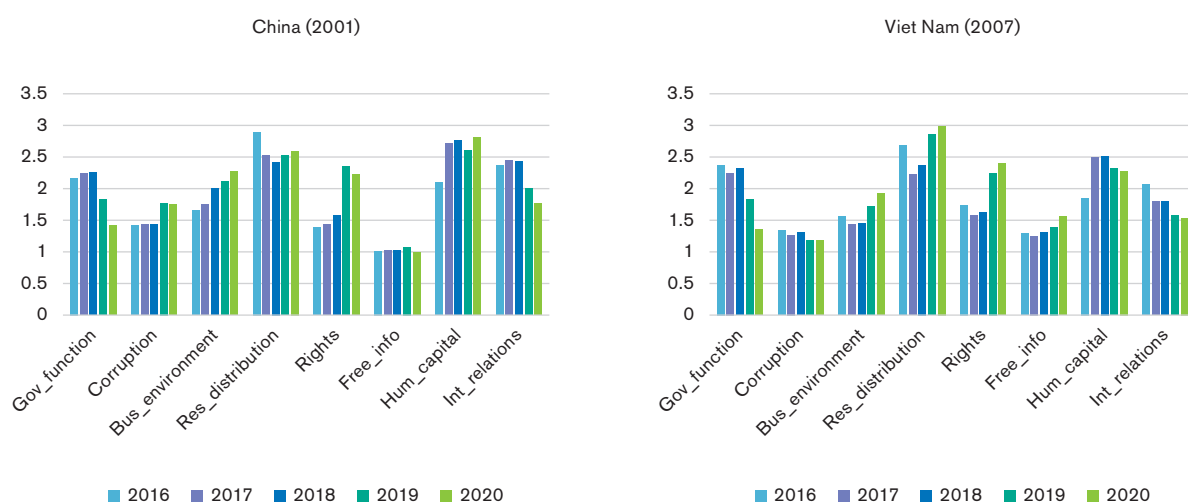
We have examined the cases of China (which obtained WTO membership in 2001), Viet Nam (2007), Lao People's Democratic Republic (Lao PDR) (2013), and Tajikistan (2013) in order to compare actual cases of improvement in the level of sustainable peace, as measured by PPI scores. These selected countries represent not only the different duration periods of WTO membership but were also centrally planned

economies or economies that have undergone long periods of civil war or internal conflict during and after WTO accession.

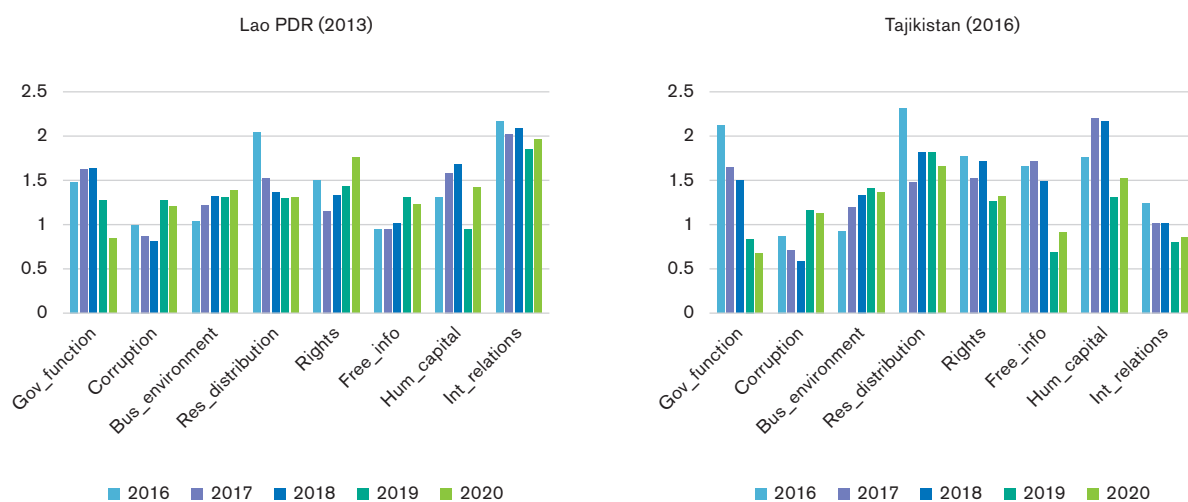
Figure 3.1 depicts the scores of the PPI sub-indicators for China and Viet Nam,¹¹ which became WTO members in an earlier phase of WTO accession (2001-2010). Over the measured period (2016-2020), China showed an improvement in indicators of the level of corruption, business environment, acceptance of rights, and level of human capital. Viet Nam, which obtained WTO membership more than five years after China, showed improvement in the areas of sound business environment, equitable resource distribution, acceptance of rights of others, and free flow of information.

Figure 3.2 depicts the PPI scores in each of the eight pillars for Lao PDR and Tajikistan, which joined the WTO more recently than China and Viet Nam. Both Lao PDR and Tajikistan show generally similar trends. They both exhibit improvements in the areas of corruption and business environment, while Lao PDR shows more improvement in acceptance of rights and free flow of information. Continuing similarities between the countries include worsening trends in the areas of government functioning, resource distribution and international relations.

However, when compared to the PPI scores for China and Viet Nam, the range of scores for Lao PDR and

Figure 3.1 Positive Peace Index scores (2016-2020) for China and Viet Nam

Source: Compiled by the authors.

Figure 3.2 Positive Peace Index scores (2016-2020) for Lao PDR and Tajikistan

Source: Compiled by the authors.

Tajikistan generally does not exceed two on the PPI score, which are lower than those for China and Viet Nam. This suggests that those countries that have been WTO members longer have higher PPI scores, thus supporting the analysis results in the section on Benefits of WTO membership.

5. Conclusion

This study has provided empirical evidence for a reciprocal positive relationship between peace and WTO membership. First, we confirm that the physical

state of peace and the structural elements of peace contribute to a government's WTO membership. Interestingly, while most of the elements for sustainable peace serve as meaningful determinants of WTO membership, several elements appear to have a stronger linkage. Among the elements of physical peacefulness, "militarization" had the greatest impact on a government's WTO membership, implying that the less a government spends on military assets, the more likely it is to maintain its WTO membership.

Furthermore, among the various elements contributing to sustainable peace, open societies where information can flow freely within and across national borders, economies that engage more closely with their neighbours, and economies with more efficient governance capabilities and lower levels of corruption were more likely to maintain WTO membership. Also, WTO membership had a significant impact on building sustainable peace, especially through establishing "good neighbour relations", enabling "free flow of information" and by restraining corruption.

We have also demonstrated that the longer the duration of a government's WTO membership, the better the state of peacefulness. However, unlike

when estimated with simple "WTO membership", the consideration of the "duration of WTO membership" showed that WTO membership does not have an impact on improving relations with neighbours. Rather, it demonstrates a stronger impact on building more open societies through "free flow of information", improving governance and transparency through "low level of corruption", and building a fairer society through "acceptance of the rights of others".

Finally, a comparative examination of governments that joined the WTO in the earlier phase (2001-2010) against governments that acceded in the latter phase (2011-2020) demonstrates that those governments with a longer duration of WTO membership have higher scores in the factors/conditions necessary for sustaining peace and achieving good governance in the long run. These observations are consistent with the results from the empirical analysis, which leads to the conclusion that there is indeed a positive relationship between WTO membership and peace, not only with regards to the physical state of peace, but also in terms of the structural institutions required for achieving sustainable peace that help the governments achieve further economic growth and prosperity.

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Note

The data that support the findings of this chapter were derived from the following resources available in the public domain:

1. Global Peace Index: <https://www.visionofhumanity.org/maps/#/>
2. Positive Peace Index: <https://www.visionofhumanity.org/maps/positive-peace-index/#/>
3. GEPIII Gravity: http://www.cepii.fr/CEPII/en/bdd_modele/bdd_modele.asp
4. GDP, GDP per capital, Logistics Performance Index: World Bank Indicators
5. Polity IV project: <https://xmarquez.github.io/democracyData/reference/polityIV.html>

Appendix 1: Peace Index

Table A1. Global Peace Index (GPI) and GPI sub-indicators			
GPI indicators	Ongoing Conflicts	Safety & Security	Militarization
Sub-indicators	Number and duration of internal conflicts	Level of perceived criminality in society	Military expenditures as a percentage of GDP
	Number of deaths from external organized conflict	Number of refugees and internally displaced people as percentage of population	Number of armed services personnel per 100,000 people
	Number of deaths from internal organized conflict	Political instability	Volume of transfers of major conventional weapons as recipient (imports) per 100,000 people
	Number, duration, and role in external conflicts	Political terror scale	Volume of transfers of major conventional weapons as supplier (exports) per 100,000 people
	Intensity of organized internal conflict	Impact of terrorism	Financial contribution to UN peacekeeping missions
	Relations with neighbouring countries	Number of homicides per 100,000 people	Nuclear and heavy weapons capabilities
		Level of violent crime	Ease of access to small arms and light weapons
		Likelihood of violent demonstrations	
		Number of jailed population per 100,000 people	
		Number of internal security officers/police per 100,000 people	

Source: IEP's GPI Report (2020).

Table A2.	Positive Peace Index (PPI) indicators		
PPI indicators	Sub-indicators		
Well-functioning government	Democratic political culture	Judicial interdependence	Revenue collection and service delivery
Sound business environment	Ease of Doing Business Index	Index of Economic Freedom	GDP per capita
Low levels of corruption	Factionalized elites	Corruption Perception Index	Control of corruption
High levels of human capital	Secondary school enrolment	Scientific publications	Youth Development Index
Free flow of information	Freedom of the Press Index	Mobile phone subscription rate	World Press Freedom Index
Good relations with neighbours	Hostility to foreigners	Number of visitors	Regional integration
Equitable distribution of resources	Inequality-adjusted life expectancy	Social mobility	Poverty gap
Acceptance of the rights of others	Empowerment Index	Group grievance rating	Gender Inequality Index

Source: IEP's Positive Peace Report (2020).

Table A3.	Economies which acceded to the WTO between 1996 and 2022 ¹²				
Acceding economy	Year of accession	Years of negotiations	Acceding economy	Year of accession	Years of negotiations
Ecuador	1996	3Y(years) 4M(months)	Nepal	2004	14Y 10M
Bulgaria	1996	10Y 1M	Cambodia	2004	9Y 10M
Mongolia	1997	5Y 3M	Saudi Arabia	2005	12Y 5M
Panama	1997	5Y 11M	Viet Nam	2007	12Y
Kyrgyz Republic	1998	2Y 8M	Tonga	2007	11Y 8M
Latvia	1999	5Y 2M	Ukraine	2008	14Y 5M
Estonia	1999	5Y 8M	Cabo Verde	2008	8Y
Jordan	2000	6Y 3M	Montenegro	2012	7Y 2M
Georgia	2000	3Y 11M	Samoa	2012	13Y 10M
Albania	2000	7Y 9M	Russia	2012	19Y 1M
Oman	2000	4Y 5M	Vanuatu	2012	17Y 1M
Croatia	2000	7Y 1M	Lao PDR	2013	15Y
Lithuania	2001	7Y 3M	Tajikistan	2013	11Y 8M
Moldova	2001	7Y 7M	Yemen	2014	13Y 11M
China	2001	14Y 9M	Seychelles	2015	19Y 9M
Chinese Taipei	2002	9Y 4M	Kazakhstan	2015	19Y 9M
Armenia	2003	9Y 2M	Liberia	2016	8Y 7M
North Macedonia	2003	8Y 4M	Afghanistan	2016	11Y 7M

Source: WTO.

Appendix 2: Empirical specification and results

To test our hypotheses based on the simultaneous equations as shown in Table A4, we used the 2SLS (two-stage least squares) method in our empirical estimation. For each main independent variable, predicted values such as $\widehat{Peace}$ and $\widehat{WTO}$ are used in the second stage, and are estimated with instrument variables and other control variables in the first stage. In the first WTO equation, “log of GDP per capita” is used as an instrument variable for the peace variables (i.e. GPI, PPI, and sub-indicators of GPI and PPI). In the second peace equation, “average distance from ROW” is used as an instrument variable for the “WTO” variables (i.e. WTO membership and WTO

duration of membership). In order to check robustness, we conducted an instrument test to confirm whether “log of GDP per capita” and “average distance from ROW” are suitable instrument variables on the basis of significant F-statistics results.¹³

Since “WTO membership” is a binary variable, we used the probit estimation method when the dependent variable is “WTO membership”. As for the dependent variables for “peace”, Ordinary Least Squares (OLS) analysis is used. More specifically, we used OLS in the first stage and probit in the second stage for the “WTO equation”, while using probit in the first stage and OLS in the second stage for the “peace equation”.

Table A4.	Empirical specification and variables	
1 st hypothesis (WTO equation)		
1 st stage: $Peace_i = \alpha + \beta_1 IV_i + \beta_2 \ln GDP_i + \beta_3 LPI_i + \beta_4 \text{No. of RTA partners}_i + \varepsilon_i$		
2 nd stage: $WTO_i = \alpha + \beta_1 \widehat{Peace}_i + \beta_2 \ln GDP_i + \beta_3 LPI_i + \beta_4 \text{No. of RTA partners}_i + \beta_5 \text{Democracy}_i + \beta_6 \ln \text{average Dist from ROW}_i + \varepsilon_i$		
2 nd hypothesis (Peace equation)		
1 st stage: $WTO_i = \alpha + \beta_1 IV_i + \beta_2 \ln GDP_i + \beta_3 LPI_i + \beta_4 \text{No. of RTA partners}_i + \beta_5 \text{Democracy}_i + \beta_6 \ln \text{average Dist from ROW}_i + \varepsilon_i$		
2 nd stage: $Peace_i = \alpha + \beta_1 \widehat{WTO}_i + \beta_2 \ln GDP_i + \beta_3 LPI_i + \beta_4 \text{No. of RTA partners}_i + \beta_5 \ln GDPcap_i + \varepsilon_i$		
	WTO equation	Peace equation
Dependent variable	WTO membership, WTO duration of membership	GPI & PPI
Independent variable – Instrument variables	$\widehat{Peace}$: GPI & PPI – Log of GDP per capita	$\widehat{WTO}$: membership & duration of membership – Log of average distance from ROW
Other control variables	ln GDP LPI Number of RTA partners Democracy	ln GDP LPI Number of RTA partners
Estimation methodology	2SLS 1 st stage: OLS 2 nd stage: probit	 1 st stage: probit 2 nd stage: OLS

Table A5. Impact of Global Peace Index indicators on WTO membership (WTO Equation I)				
Dependent variable	WTO membership			
2SLS: OLS – probit	(1)	(2)	(3)	(4)
$\widehat{GPI}$	-2.537***			
$\widehat{Security}$		-2.205***		
$\widehat{Militarization}$			-31.628***	
$\widehat{Conflict}$				-1.660***
Log of GDP	0.327***	0.259***	2.815***	0.296***
LPI	0.031	-0.206	-2.513**	0.385
Democracy	0.106***	0.106***	0.106***	0.106***
No. of RTA partners	0.039***	0.040***	-0.042	0.041***
Average distance from ROW	4.456***	4.456***	4.456***	4.456***
Constant	-39.906***	-37.882***	-19.529*	-42.803***
Obs.	717	717	717	717
R ²	0.485	0.485	0.485	0.485

Note: * denotes statistical significance at 10%, ** at 5%, and *** at 1% level.

Table A6.	Impact of Positive Peace Index indicators on WTO membership (WTO Equation II)								
Dependent variable	WTO membership								
2SLS: OLS – probit	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\widehat{PPI}$	-1.000***								
$\widehat{\text{Government Functioning}}$	-1.445***								
$\widehat{\text{Corruption}}$	-1.006***								
$\widehat{\text{Business Environment}}$	-0.848***								
$\widehat{\text{Equitable Resources}}$	-0.740***								
$\widehat{\text{Rights}}$	-1.056***								
$\widehat{\text{Free Flow of Information}}$	-1.808***								
$\widehat{\text{Human Capital}}$	-0.903***								
$\widehat{\text{Neighbour Relations}}$	-1.683***								
Log of GDP	0.118**	0.125**	0.169***	0.084*	0.024	0.181***	0.190***	0.004	0.378***
LPI	0.433	-0.118	0.054	0.371	0.933***	0.492	0.383	0.718**	-0.337
Democracy	0.106***	0.106***	0.106***	0.106***	0.106***	0.106***	0.106***	0.106***	0.106***
No. of RTA partners	0.039***	0.041***	0.042***	0.043***	0.041***	0.039***	0.031***	0.038***	0.027***
Average distance from ROW	4.456***	4.456***	4.456***	4.456***	4.456***	4.456***	4.456***	4.456***	4.456***
Constant	-39.5***	-36.7***	-38.9***	-39.2***	-40.3***	-40.5***	-38.2***	-38.4***	-39.8***
Obs.	717	717	717	717	717	717	717	717	717
R ²	0.485	0.485	0.485	0.485	0.485	0.485	0.485	0.485	0.485

Note: * denotes statistical significance at 10%, ** at 5%, and *** at 1% level.

Table A7.	Impact of WTO membership on Global Peace Index (GPI) (Peace Equation I)			
Dependent variables	GPI	Security	Militarization	Conflict
2SLS: probit – OLS	(1)	(2)	(3)	(4)
$\widehat{\text{WTO}}$ membership	-0.625***	0.174*	-1.059***	-1.340***
Log of GDP	0.129***	0.111***	0.096***	0.181***
Log of GDP per capita	-0.132***	-0.146***	-0.017*	-0.203***
LPI	-0.324***	-0.607***	0.037	-0.227***
No. of RTA partners	-0.001***	-0.002***	-0.002***	-0.00004
Constant	1.426***	2.279***	1.075***	0.555***
Obs.	1,712	1,712	1,712	1,712
R ²	0.525	0.555	0.205	0.455

Note: * denotes statistical significance at 10%, ** at 5%, and *** at 1% level.

As a robustness check in estimating the effect of WTO membership duration on peace improvement, we have used additional estimation methods: 2SLS, General Method of Moments (GMM) and IV Random Effect. The results show that the sub-indicators of the PPI can be improved in the following order: “acceptance of others’ rights”, “low level of corruption”, “free flow of information”, “well-functioning government” and “sound business environment” when estimated with 2SLS, GMM, and 2SLS only with 2018 data. As for the panel data analysis (IV Random Effect), the

order is changed to: “low level of corruption”, “free flow of information”, “acceptance of others’ rights”, “well-functioning government” and “sound business environment”. Taking all the results together, we could conclude that the longer the government has been a member of the WTO, the more the WTO system has helped to reduce levels of corruption, build a more open society through the free flow of information, and improve conditions for building a fairer society through acceptance of the rights of others.

Table A8.	Impact of WTO membership on Positive Peace Index (PPI) (Peace Equation II)								
Dependent variables	PPI	Government function	Corruption	Business environment	Resources	Rights	Free information	Human	Neighbour relations
2SLS: probit – OLS	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\widehat{\text{WTO member}}$	-0.341***	-0.349**	-0.515***	-0.103	-0.339*	-0.498***	-0.806***	0.120	-1.160***
Log of GDP	0.110***	0.083***	0.163***	0.088***	0.022	0.167***	0.107***	-0.008	0.230***
Log of GDP per capita	-0.326***	-0.226***	-0.324***	-0.383***	-0.439***	-0.309***	-0.182***	-0.358***	-0.197***
LPI	-0.597***	-0.789***	-0.960***	-0.823***	-0.158**	-0.499***	-0.294***	-0.413***	-0.711***
No. of RTA partners	-0.004***	-0.002***	-0.001	0.0003	-0.003***	-0.004***	-0.006***	-0.006***	-0.009***
Constant	3.589***	4.449***	4.175***	4.546***	3.781***	2.487***	2.894***	5.024***	2.269***
Obs.	1,429	712	712	712	712	712	712	712	712
R ²	0.755	0.775	0.774	0.882	0.723	0.682	0.584	0.826	0.681

Note: * denotes statistical significance at 10%, ** at 5%, and *** at 1% level.

Table A9.	Impact of WTO duration of membership on the Positive Peace Index (Peace Equation III)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variables	Government function	Corruption	Business environment	Equitable resources	Rights	Free information	Human capital	Neighbour relations
Estimation method: IV 2SLS								
$\widehat{\text{WTO duration}}$	-0.025***	-0.043***	-0.017***	-0.012*	-0.046***	-0.041***	-0.001	-0.011
R ²	0.752	0.739	0.883	0.698	0.591	0.573	0.824	0.684
Estimation method: IV GMM								
$\widehat{\text{WTO duration}}$	-0.025***	-0.043***	-0.017***	-0.012*	-0.046***	-0.041***	-0.001	-0.011
R ²	0.752	0.739	0.883	0.698	0.591	0.573	0.824	0.684
Estimation method: IV Random Effect								
$\widehat{\text{WTO duration}}$	-0.030***	-0.048***	-0.017**	-0.007	-0.043***	-0.047***	0.004	0.013
R ²	0.6941	0.6689	0.859	0.7047	0.5938	0.5681	0.8236	0.5549
Obs.	712	712	712	712	712	712	712	712
Estimation method: IV 2SLS only with 2018 data								
$\widehat{\text{WTO duration}}$	-0.031***	-0.046***	-0.024***	-0.018	-0.060***	-0.046***	-0.017	-0.016
Obs.	145	145	145	145	145	145	145	145
R ²	0.792	0.764	0.89	0.713	0.528	0.531	0.780	0.712

Note: * denotes statistical significance at 10%, ** at 5%, and *** at 1% level. Coefficients of other variables are not reported.

The empirical results from Table A5 to Table A9 are estimated with different numbers of observations (due to missing values of variables used in each estimation) as follows:

Table A10.	Number of economies and time period used in each estimation		
	Observations	Number of countries	Time period
Tables A5 & A6	717	72	2008-2019
Table A7	1,712	157	2008-2019
Table A8	1,429	157	2009-2018
Tables A8 & A9	712	154	2015-2019

Endnotes

- 1 Hyo-young Lee is Associate Professor at the Korea National Diplomatic Academy and Jaeyoun Roh is Associate Professor at Yeungnam University.
- 2 The GPI has been annually published by the non-affiliated IEP since 2008, providing quantitative measurement of the level of “peacefulness” for more than 160 economies around the world. As shown in Table A1, the GPI is comprised of three lower-level indicators such as the level of societal safety and security, the extent of ongoing domestic and international conflict, and the degree of militarization.
- 3 More recently, since 2016, the IEP has published the PPI which measures the internal quality of institutions and domestic systems that contribute to building sustainable peace and economic development within the country. “Positive peace” refers to the attitudes, institutions, and structure that create and sustain peaceful societies, and is described as an optimum environment for human potential to flourish. As shown in Table A2, the eight indicators of positive peace as measured by the PPI are: well-functioning government, sound business environment, low levels of corruption, acceptance of the rights of others, high levels of human capital, good relations with neighbours, free flow of information, and equitable distribution of resources.
- 4 As a determinant of WTO membership, political factors such as “democracy” were the most influential, which showed the highest correlation with “WTO membership” (0.55). The “democracy” variable is not used as a control variable in the peace equation due to very high correlation with the WTO variables (i.e. WTO membership, WTO duration of membership, and their predicted values), which should cause the collinearity problem.
- 5 The CEPII gravity dataset consists of 248 economies from 1948 to 2019. However, the WTO variables are limited to the period from 1995 to 2019, and LPI data are available for only six years (2007, 2010, 2012, 2014, 2016 and 2018). GPI data are limited to 163 economies from 2008 to 2018 and PPI data are limited to 163 economies from 2009 to 2018 in our data. In our empirical estimations, we utilize aggregated data, due to the limitation of available data. The number of economies and period used in each empirical analysis are summarized in Table A10. As the dataset is not a balanced panel and there are not enough observations, we utilized cross-section data in our empirical estimations.
- 6 The results of other control variables are the same as in Table A5.
- 7 Among the results estimated with the GPI sub-indicators and WTO duration of membership, the estimation with “militarization” is not converged, meaning that the duration of WTO membership does not affect the level of militarization statistically. Since other results are similar to those estimated with “WTO membership”, we do not report them separately.
- 8 At the time of writing, Comoros and Timor-Leste had not yet become WTO members. Comoros and Timor-Leste became the 165th and 166th WTO members on 21 and 30 August 2024, respectively, raising to 38 the total number of members which joined the WTO pursuant to Article XII of the Marrakesh Agreement and bringing to 22 the number of ongoing accessions.
- 9 We do not report the empirical results for the newly acceding WTO members (“WTO accession”), since they have shown to be statistically insignificant, presumably due to the small number of observations.
- 10 According to the Positive Peace Report (2022), all regions (except for the North American region) have shown improvements in their PPI scores during 2009-2020. The improvements were greatest in the order of: Asia-Pacific region, Russia and Eurasia region, and South Asia region.
- 11 The PPI scores used in this section have been recalculated to depict improvement in scores more intuitively (higher scores refer to better conditions in each sub-indicator area).
- 12 See endnote 8. At the time of writing, Comoros and Timor-Leste had not yet become WTO members.
- 13 F-statistics results were above 65 for all “WTO” and “Peace” variables. A widely used rule of thumb is that F-statistics lower than 10 indicate weak instruments (Cameron and Trivedi, 2010).