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Language Barriers Impact on Trade Disputes: Evidence from the WTO Trade Disputes Cases

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Abstract: *This study examines the impact of language barriers on trade disputes using a panel data set of 129 countries and 565 trade dispute cases from the World Trade Organization (WTO) spanning the years 1995 to 2018. The language barrier index is employed as a metric to assess the extent of language barriers between trade nations, while the panel probit model is utilized for conducting the empirical analysis. The empirical evidence indicates that language barriers exert a substantial and favorable impact on trade disputes. Language obstacles in trading countries have been found to heighten the probability of trade disputes, indicating that language barriers contribute to increase trade costs and hamper bilateral trade relations. Moreover, the Armington model is employed to elucidate the theoretical aspects of the impact of language barriers on trade disputes, with trade costs serving as the mediating factor. The findings of the study also validated the notion that linguistic barriers contribute to an elevated likelihood of trade disputes. This study presents empirical findings regarding the influence of linguistic barriers on trade disputes. Additional investigation can be undertaken to examine the impact of language competency on trade disputes, given the substantial role that language plays in the realm of international trade.*

Keywords: *Trade Disputes, Trade Conflicts, Language Barriers, Language Barrier Index, Linguistic distance, WTO, Armington Model*

1. Introduction

Language constraints pose a significant challenge in international trade conflicts, as trade partners strive to effectively explain their desires and obtain crucial information pertaining to policies and regulations. Trading countries face challenges in accurately identifying each other's trade legislation and guidelines due to variations in languages, norms, and attitudes (Korneliussen & Blasius, 2008). Misunderstanding (Gokan et al., 2019) and haziness of information (Konara, 2020) about trade rubrics, procedures create ambiguity, increase trade costs and hamper trade relationships. Besides, communication incapability arises when countries have no similarity in their spoken as well as official languages. Language dissimilarity cause uncertainty, a lack of detail, and a loss of trust in countries embroiled in trade disputes (Sun et al., 2023). Due to linguistic barriers, governments must employ people to perform a trade dispute resolution process that increases trade costs. World Trade Organization (WTO) members with

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language diversity are more likely to participate in trade disputes; therefore, it is time to study the language components of trade disputes, which have yet to be investigated.

Recent research has devoted considerable attention to the significance of language barriers to trade in light of declining tariffs and transportation expenses (Deltas & Evenett, 2020; Y. Li & Sai, 2020; Šaban & Schmidt, 2021). Language barriers intuitively increase costs due to communication gaps, flawed information, vagueness (Guiso et al., 2016), doubt, and misunderstanding (Y. Li & Sai, 2020). The study of Fink et al. (2005) and Gokan et al. (2019) define communication and information costs incurred from language barriers negatively affect trade-related activities such as understanding local market conditions, consumer preferences, navigating foreign regulations and standards, and accurate translation of shipping documents, customs declarations, and other logistical paperwork. Firms find it difficult to understand the export market rules and regulations due to language barriers. Language barriers can impose high costs on bilateral trade between countries that do not share any common language, either an official language or a widely spoken foreign language in terms of communication and information. Language constraints impact contract terms, trade rules, negotiations, and dispute resolution (Maggi & Staiger, 2018; Melitz & Toubal, 2014; Šaban & Schmidt, 2021; Wilkinson, 2009) . Language barriers in international trade are an important but frequently overlooked aspect that might affect trade dispute participation and outcomes. Addressing these hurdles can improve parties' participation and outcomes in international trade disputes.

The purpose of the study is to investigate the impact of language barriers in international trade disputes. This study employs a comprehensive dataset of 129 countries, 8,256 country pairs, and 565 WTO trade conflict cases from 1995 to 2018. The language barrier in international trade refers to communication issues that develop as a result of language disparities between individuals or organizations from various nations. These hurdles can include issues understanding, interpreting, and effectively expressing information, which can lead to misconceptions and misinterpretation, eventually affecting the success of commercial transactions and relationships. To measure the language barriers between trading partners, use Language barrier index (LBI) developed by Lohmann (2011), which reflects no similarities in the major official languages. Using panel probit regression, it is shown that the language barrier has a positive effect on trade disputes at the 1% significance level. The average marginal probability effects suggest that countries having language barriers with trading partners have an average 0.17% greater likelihood of trade disputes. The additional estimations further support these findings and therefore act as a robustness check.

Thus, the Armington model (Armington, 1969) is used to describe the theoretical background of the impact of language barriers on trade disputes considering trade costs as the channel. Trade costs arise from language barriers have tariff equivalent impact on trade and deteriorate the trade relationship that leads to

disputes. Trade flows are subject to trade costs which increase price of related goods as well reduce trade volume. Due to language differences, exporting countries face extra costs such as language barriers raise contact and information costs, and countries face difficulties in communication. Therefore, the language barriers hypothesis is proposed to explain this positive relationship between language barriers and trade disputes. This study makes a distinctive contribution to the field by concentrating on the often-overlooked influence of language barriers on participation in WTO trade disputes. It is the first study to thoroughly explore this impact, offering a fresh perspective on the difficulties encountered by member nations that do not speak English. The findings add to theories of international trade law by emphasizing the importance of language in legal involvement and dispute settlement.

The rest of the article is organized as follows: Section 2 discusses the related literature review. Section 3 explains the theoretical frameworks and hypotheses. Section 4 describes the data used and the research methods applied. Section 5 presents the empirical analysis with robust checks. Section 6 discusses major findings, policy implications, contributions, limitations, and future research areas. Finally, Section 7 describes the concluding remarks.

2. Literature Review

The literature on trade disputes emphasizes the significance of effective communication and negotiation skills in resolving conflicts (Kitenge & Lahiri, 2022; Kruse & Willumsen, 2020; Medda-Windischer & Carlà, 2022). Language barriers often hinder the comprehension of legal frameworks and documentation involved in trade disputes (Alam & Mostafiz, 2022), leading to misunderstandings and misinterpretations (Selmier & Oh, 2013; Zhou & Wei, 2016). Manger & Peinhardt, (2017) highlights that disputed parties with limited language proficiency may struggle to express their arguments effectively, placing them at a disadvantage in negotiations and outcomes. Cohen (2020) found that language barriers can result in misinterpretations of contractual terms, legal documents, and trade regulations. This miscommunication escalates into disputes when parties have different understandings of their rights and obligations (Brutger & Marple, 2023). Zhou & Wei (2016) emphasized that clear communication is essential for effective negotiation. Language barriers impede the negotiation process, making it difficult for parties to reach mutual agreements or settlements before disputes escalate to formal trade dispute mechanisms (Medda-Windischer & Carlà, 2022; Wilkinson, 2009). Similarly, Garcia (2018) points out that the availability and quality of translation and interpretation services can impact the participation of parties in trade disputes. High-quality translations are crucial for understanding legal documents, submitting accurate claims, and presenting cases effectively. Additionally, Chua (2019) emphasizes that language barriers affect the choice and effectiveness of legal representation. Disputed parties may find it challenging to engage with lawyers who are proficient in the relevant languages and legal systems, potentially putting them at

a disadvantage in dispute resolution processes (Cremades & Madalena, 2008). For a developing country like Bangladesh, which relies significantly on international trade, understanding the impact of language barriers is essential for enhancing its trade dispute participation and outcomes (Khan, 2018).

The WTO operates in three official languages: English, French, and Spanish (Selmier & Oh, 2013). Parties from countries where these languages are not widely spoken may face additional challenges in fully participating in dispute settlement proceedings (Davey, 2017; Wilkinson, 2009). Similar issues arise in regional trade agreements and bilateral treaties where the dispute resolution mechanisms may operate in specific languages that are not the mother tongue of one or more parties involved (Mavroidis, 2021; Zhou & Wei, 2016). Language barriers in international trade are a significant yet often overlooked factor that can influence the participation and outcomes of trade disputes (Smith, 2004; Whalley, 2010). Understanding the impact of these barriers is crucial for policymakers, businesses, and legal practitioners involved in international trade (Wilkinson, 2009). Language barriers can manifest in various forms, including misunderstandings in contract terms, misinterpretation of trade regulations, and challenges in negotiations and dispute resolutions (Maggi & Staiger, 2018; Melitz & Toubal, 2014; Šaban & Schmidt, 2021; Wilkinson, 2009). Addressing these barriers can improve the participation and outcomes of parties involved in international trade disputes. This paper examines the impact of language barriers in trade disputes.

3. Theoretical Frameworks and Hypothesis

3.1 Basic Model

This study uses the Armington model (Armington, 1969) to describe how linguistic barriers affect trade conflicts by using trade costs as a channel (Bajzik et al., 2020). Consequently, consider a world in which two nations speak distinct languages from one another. Every worker provides one unit of labor inelastically and spends their earnings on both imported and domestically produced, differentiated products. Languages significantly impact all marketable products. A Constant Elasticity of Substitution (CES) utility function describes the preferences of the representative agents that populate each nation. Preferences are given by

$$U_j = \left(\sum_{i=1}^{n} \psi_{ij}^{1-\sigma/\sigma}\, C_{ij}^{\sigma-1/\sigma}\right)^{\frac{\sigma}{\sigma-1}} \text{..... (1)}$$

Where C_{ij} is the demand for product i in country j; $\psi_{ij} > 0$ is an exogenic penchant parameter $\sigma > 1$ is the elasticity of substitution between products from countries. The allied consumer price index as follows

$$P_j = \left(\sum_{i=1}^{n} \psi_{ij}^{1-\sigma}\, P_{ij}^{1-\sigma}\right)^{\frac{1}{1-\sigma}} \qquad \text{..... (2)}$$

Where P_{ij} is the price of product i in country j.

International trade between nations is prone to trade costs. To sell one unit of a

product in country *j*, companies from country i must ship $\tau_{ij} \geq 1$ units, with τ_{ii} = 1. For there to be no arbitrage opportunities, the price of product i in country *j* must be equal to $P_{ij} = \tau_{ij} P_{ii}$ .The domestic price $P_{ii}$of product i, in turn, can be expressed as a function of country i's total income, *Yi,* and its endowment P_{ii} = *Yi/Qi*. Combining the two previous expressions can get

$$P_{ij} = \frac{Y_i \tau_{ij}}{Q_i} \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Let X_{ij} denote the total value of country *j*'s imports from country i. Given CES utility, bilateral trade flows satisfy

$$X_{ij} = \left(\frac{\psi_{ij} P_{ij}}{P_j}\right)^{1-\sigma} E_j \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where $E_j = \sum_{i=1}^{n} X_{ij}$ is country *j*'s total expenditure. Combining equations (2)–(4), can obtain

$$X_{ij} = \frac{(Y_i \tau_{ij})^{1-\sigma} \chi_{ij}}{\sum_{l=1}^{n} (Y_l \tau_{lj})^{1-\sigma} \chi_{lj}} \; E_j$$

Where $\chi_{ij} = \left(Q_i \big/ \psi_{ij}\right)^{\sigma-1}$, In order to prepare further analysis, consider $\varepsilon \equiv \partial \ln\left(\frac{X_{ij}}{X_{jj}}\right) / \partial ln \tau_{ij}$ denote the elasticity of imports relative to domestic demand, $\frac{X_{ij}}{X_{jj}}$,with respect to bilateral trade costs τ_{ij} , holding income levels fixed. We will refer to ε as the *trade elasticity*. In the Armington model it is simply equal to $\sigma - 1$. Using the previous notation, can rearrange the expression above as

$$X_{ij} = \frac{(Y_i \tau_{ij})^{-\varepsilon} \chi_{ij}}{\sum_{l=1}^{n} (Y_l \tau_{lj})^{-\varepsilon} \chi_{lj}} \; E_j \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

In a competitive equilibrium, budget constraint and goods market-clearing imply $Y_i = E_i$ and $Y_i = \sum_{i=1}^{n} X_{ij}$, respectively, for both countries. Together with equation (5), these two conditions imply

$$Y_i = \sum_{j=1}^{n} \frac{(Y_i \tau_{ij})^{-\varepsilon} \chi_{ij}}{\sum_{l=1}^{n} (Y_l \tau_{lj})^{-\varepsilon} \chi_{lj}} \; Y_j \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Trade costs arise from language barriers:

Now consider costs that arise from language barriers have tariff equivalent impact on trade and deteriorate the trade relationship. Trade flows are subject to trade costs which increase price of related products as well reduce trade volume. Due to language differences, exporting countries face extra costs. Then the price of good i is

$$P_{ij} = \frac{Y_i \tau_{ij} \theta_{ij}}{Q_i} \quad \ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Given CES utility, the value of bilateral trade flows is this given by the following gravity equation

$$X_{ij} = \frac{(Y_i \tau_{ij} \theta_{ij})^{-\varepsilon} \chi_{ij}}{\sum_{l=1}^{n} (Y_l \tau_{lj} \theta_{lj})^{-\varepsilon} \chi_{lj}} \; E_j \quad \ldots\ldots\ldots\ldots\ldots\ldots (8)$$

In the competitive equilibrium,

$$Y_i = \sum_{j=1}^{n} \frac{(Y_i \tau_{ij} \theta_{ij})^{-\varepsilon} \chi_{ij}}{\sum_{l=1}^{n} (Y_l \tau_{lj} \theta_{lj})^{-\varepsilon} \chi_{lj}} \; Y_j \quad \ldots\ldots\ldots\ldots\ldots\ldots (9)$$

Here, θ_{ij} is treated as a cost by the producer and hence from the firm's perspective a θ_{ij} works exactly like an iceberg trade cost.

Welfare:

In the Armington model, changes in real consumption only depend on the change in the relative price of imported versus domestic products P_j^M / P_{jj} (where $P_j^M = \left[\sum_{i \neq j} P_{ij}^{1-\sigma}\right]^{1/1-\sigma}$ is the constituent of the price index related with imports, which depends on the share of expenditure on domestic products λ_{jj} and the elasticity of substitution σ thus changes in real consumption

$$U_j = (d\ lnE_j - d \ln P_{jj}) + (d \ln \lambda_{jj}/(1-\sigma))$$

The definition of the trade elasticity $\varepsilon \equiv \sigma - 1$ and get from the above equation

$$d\ lnU_j = -d \ln \lambda_{jj} / \varepsilon$$

Welfare changes due to trade costs:

$$U_j = \lambda_{jj}^{-1/\varepsilon}$$

Due to costs arise from language barriers increase in trade costs. The welfare significances of large changes $\tau_{ij}\ to\ \tau_{ij}\ \theta_{ij}$ can be inferred by integrating

$$\widehat{U_j} = \hat{\lambda}_{jj}^{-1/\varepsilon}$$

This establishes that for any change in trade costs, two statistics—the trade elasticity ε, and the changes in the share of expenditure on domestic goods λ_{jj}—are sufficient to infer welfare changes.

Possible proposition: A decrease in trade elasticity points to rising trade expenses. The chance of trade conflicts is increased by trade costs.

1. As no extra trade costs

$\varepsilon = 1$, Countries have no possibility to involve in trade disputes

2. As costs arise due to language barriers, increase in trade costs

$\varepsilon < 1$, Countries possibility to involve in trade disputes increase.

Trade elasticity is a measure of how trade flows react to fluctuations in trade costs. The increase in trade costs caused by language barriers reduces trade elasticity, making trade flows less responsive to changes in these costs. This suggests the presence of significant trade barriers. Trade distortions can potentially result in the initiation of complaints and trade disputes. There is a strong correlation between trade costs, trade elasticity, and trade disputes (Hübler & Herdecke, 2020; Kim, 2021). Trade disputes between countries can often arise

due to the presence of high trade costs. The costs of trade have a direct impact on trade disputes, often resulting in the implementation of tariffs or other trade barriers (Zheng et al., 2023). Trade flows become less responsive to changes in costs due to the increase in expenses, which in turn reduces trade elasticity. The importance of the reduced-form trade elasticity in calculating aggregate gains from trade has been emphasized in recent research on trade gains (Arkolakis et al., 2012). By using observable changes in trade policy, it is possible to accurately estimate the relationship between changes in trade flows and changes in trade costs (Afiyati, 2022; Garfinkel et al., 2015). This provides a straightforward method to determine trade elasticity. To summarize, the interconnectedness of trade costs, trade elasticity, and trade disputes significantly influences the international trade landscape. The interconnectedness of global trade dynamics becomes evident when changes in one aspect have a ripple effect on others, showcasing their complexity.

3.2 Hypothesis

The term "language barrier" in international trade refers to communication issues that develop as a result of language disparities between individuals or organizations from various nations (Lohmann, 2011). These hurdles can include issues understanding, interpreting, and effectively expressing information, which can lead to misconceptions and misinterpretation, eventually affecting the success of commercial transactions and relationships (Abuarqoub, 2019; Harzing & Feely, 2008). The figurative meaning of the word "language barrier" is the difficulty that individuals or groups may have communicated due to the fact that they speak different languages, or even dialects (Lameli et al., 2015). Misunderstandings caused by a lack of common language can impede the development of meaningful relationships, which in turn can cause hostility, aggression, hurt feelings, and the loss of precious time, energy, resources, and even lives (Fidrmuc & Fidrmuc, 2016; Taylor & Bain, 2008).

Trading countries' ongoing participation in trade disputes with partners having language dissimilarity raise the concern about the importance of languages as member countries' participation in WTO trade disputes settlement affected by their people language skills (Wilkinson, 2009). Countries with dissimilar languages face challenges to understand WTO rules and regulations. A country having language barriers with trade partners often initiate a trade complaint or involve in trade disputes due to improper communication, misunderstanding, information costs, ambiguity, and uncertainty (Casella, 1998; Zhang et al., 2020). Langugae barriers continuously increase trade costs.

Language barriers between trading countries significantly influence their probability to participate in trade disputes. In general, language barriers between countries are a basis of indistinctness that is deteriorating bilateral trade ties. Language barriers intuitively increase trade costs due to communication gaps, flawed information (Carsten et al., 2005), vagueness (Guiso et al., 2016), doubt, and misunderstanding (Yanxi & Sai, 2020). As, countries with language barrier don’t comprehend each other cultural values, beliefs and customs, consider

foreign culture to be harmful and create threat for their national culture. The language barrier is the emblem of cultural difference. The studies indicate that countries often raise the issue of trade protectionism to those countries with whom they have language barriers (Canto & Wiese, 2018; Fouda, 2012). Countries with language barriers often involved in trade, as dependencies increase in foreign products, they feel a threat to lose their national culture, these feelings are more acute when they have language barriers. Language barriers are very significant issue during trade disputes as countries face challenges to communicate and to get essential information regarding policies or regulations. Due to language barriers, norms and values create difficulties for trading countries to properly recognize each other's trading views and perceptions (Korneliussen & Jörg, 2008).

Language obstacles exacerbate misunderstandings (Toshitaka et al., 2019) create uncertainty and ambiguity of information, generate uncertainty and ambiguity in comprehending trade norms and regulations (Konara, 2020) escalate trade expenses, and contribute to trade conflicts. Hence, put forth the subsequent hypothesis:

Hypothesis 1: Language barriers (LB) increase the likelihood of trade disputes between nations.

4.Data and Methodology

4.1 Variables and Data

From 1995 to 2018, a comprehensive collection of data on the language barriers and trade disputes between WTO members was used, with 8,256 country pairs from 129 WTO members and 565 dispute cases. Data collected from the WTO trade disputes database on each country pairs participation in a trade dispute. The multi-plaintiff cases were divided into several bilateral cases, all involving the same defendant country (WTO, 2019). Thus, define Trade Dispute (TD) as a binary variable that takes the value of one if country i is involved in at least one dispute with country j in the year t.

This paper employs the language barrier index as a proxy of language barriers, which uses the main official languages. The language barrier index (LBI) for a country pair is calculated using World Atlas of Languages' language data, which gives 2650 languages data (Lohmann, 2011). The $LBI_{i,j}(i,j = 1,2,\ldots.129)$ takes 1 if country i and country j have no shared language features in terms of official language, otherwise 0. LBI takes one specifies that the two countries have greater language differences. The two languages are identical, and one means two languages have no features in common (e.g., Brazil -Indonesia). Table A in the appendix describes the trade disputes and language barriers data of country pairs from 1995 to 2018.

In this study, control variables are employed to examine country-level economic and trade features, including GDP, FTA, trade, and the trade freedom index. Therefore, the economic growth of a country may be assessed by utilizing the

variable $GDP_{i,t}$,while the relative market size can be measured by employing the GDP ratio $GDP_{i,t}/GDP_{j,t}$. The Free Trade Agreement (FTA) is utilized to assess the extent to which FTA contributes to the mitigation of trade disputes. The trade freedom index ($TFI_{i,t}$) is a commonly employed indicator for assessing a country's trade policy. Thus, utilize the GDP data from the World Bank, the FTA data from the WTO database, and the trade freedom index obtained from 'The Index of Economic Freedom by The Heritage Foundation and The Wall Street Journal'. Trade, denoted as ($Trade_{i,j,t}$), represents the aggregate value of both exports and imports. The data for trade is obtained from World Integrated Trade Solution (WITS) database.

The descriptive statistics are presented in Table 1. Given that TD can assume a binary value of either 1 or 0, a mean value of 0.0044 signifies that, on average, 0.44 percent of member nations of the World Trade Organization (WTO) were involved in at least one trade dispute between the years 1995 and 2018. Based on the data presented in Table 1, the mean value of LBI is 0.4145, suggesting that 41.45 percent of WTO members encounter language obstacles while communicating with their trade counterparts.

Table 1. Summary of descriptive statistics

Variable	Obs.	Mean	Median	Std. Dev.	Min	Max
$TD_{i,j,t}$	173,960	0.0044	0	0.0578	0	1
$LBI_{i,j}$	173,960	0.4145	0	0.4950	0	1
$TFI_{i,t}$	173,960	1.8509	1.8943	0.2661	1.1209	4.1427
$Trade_{i,j,t}$	173,960	4.5975	4.7572	1.6097	-0.4948	8.8238
$FTA_{i,j,t}$	173,960	1.3309	1.0096	7.6141	-860.6950	980.7872
$GDP_{i,t}$	173,960	3.9946	4.1357	0.6183	2.0525	4.9472
$GDP_{i,t}/GDP_{j,t}$	173,960	1.1381	1.1017	0.3002	0	11.0900

4.2 Research Method

Due to a binary dependent variable, this study empirically evaluates the impact of language barriers on the occurrence of trade disputes using the panel probit regression model. To be more precise, suppose that the likelihood country i be engaged in a trade dispute with the country j in a year t stated as follows,

$$\text{Prob}(TD_{i,j,t} = 1|LBI, controls = \phi(\beta_0 + \beta_1 LBI_{i,j} + \gamma controls_{i,j,t} + \varepsilon_{i,j,t}) \quad (1)$$

Where LBI is language barrier index, controls are the vector of country-level control variables. $\varepsilon_{i,j,t}$ is an error term capturing unobserved components. βs and γs are the parameters to be measured. Hence, the present study aims to investigate the impact of language barriers on trade disputes by analyzing the average marginal probability effects.

5. Empirical Analysis

5.1 Base Regression Results

Discuss the empirical findings in this section. The findings of the panel probit model are shown in Table 2, and the results substantially validate the hypothesis. The empirical findings of model (1) and model (2) show that, at the 1% significance level, the likelihood of a trade conflict is substantially positively linked to language barriers. Language obstacles make trading partners more inclined to dispute trade. This finding supports the hypothesis that having language barriers upsurges the likelihood of trade battles.

Table 2: Panel probit model Regression Results

Model	(1)	(2)
Dependent	TD	TD
$LBI_{i,j}$	0.4387*** (0.0268)	0.2303*** (0.0652)
log($TFI_{i,t}$)		-0.6476*** (0.1806)
log ($Trade_{i,j,t}$)		0.6493*** (0.0395)
log($GDP_{i,t}$)		-0.5283*** (0.0665)
$GDP_{i,t}/GDP_{j,t}$		0.4588*** (0.1603)
$FTA_{i,j,t}$		-0.6719*** (0.0126)
Constant	-4.9865*** (0.2126)	-4.5273*** (0.3276)
Observations Country –Pairs	173,960 8,097	173,960 8,097

Notes: Parentheses indicate robust standard errors by country pair. ***/**/* indicate 1%, 5%, and 10% significance.

Table 2 illustrates the impacts of the controls, which are predominantly consistent with the existing body of research. At a significant level of 1%, there exists a negative correlation between the trade freedom index ($TFI_{i,t}$) and trade conflicts. The results align with economic intuition, suggesting that a more liberal trade policy and less trade protectionism serve as deterrents to trade disputes (Kitson & Michie, 1995). Additionally, these policies appear to decrease the probability of trading partners engaging in trade disputes (Oatley, 2017). There is a positive correlation between trade ($Trade_{i,j,t}$) and trade disputes at a statistically significant level of 1%. This indicates that increased trade leads to a

higher occurrence of trade conflicts. Multiple contemporary literature sources indicate that an increase in bilateral commerce is positively correlated with a higher probability of trade disputes (Bown, 2004; H. Horn et al., 1999).

The presence of Free Trade Agreements ($FTA_{i,j,t}$) exhibits a statistically significant negative correlation with trade conflicts, with a significance level of 1%. The Free Trade Agreement (FTA) serves to mitigate trade disputes between trading partners and promote the adoption of trade laws that are less restrictive, as well as the exemption of trade barriers (M. Kitson & Michie, 1995) The likelihood of countries engaging in trade disputes is reduced when they have Free Trade Agreements (FTAs) with their trading partners (T. Li & Qiu, 2021).

$GDP_{i,t}$ measures total production, which represents the scale of a country's international market. Table 2 shows a negative relationship between, $GDP_{i,t}$ and trade conflicts. Trade has inevitably slowed due to trade tensions or disputes, as well as the country's economic development. Slow economic development has been adversely correlated with trade tensions because it dampens the country's business relations and trade flows (Bown & Reynolds, 2015; Karim et al., 2022). Table 2 further illustrate a statistically substantial and positive association between GDP ratio $GDP_{i,t}/GDP_{j,t}$ and trade disputes at a level of 1%. The economic instinct behind this finding comes from the theory of power. Guzman & Simmons (2005) and later, Bown & McCulloch (2009) state that a country with a bigger market seems to hold greater economic strength and can handle trade disputes better.

5.2 Probability Effects

Additionally, this study undertakes the estimation and presentation of the average marginal probability effects of language barriers (LBI) in Table 3, intending to investigate its economic implications on trade disputes. In comparison to the typical values of TD (0.44%), the average marginal likelihood effects of LBI on TD are statistically and economically significant, with a value of 0.0017. Countries that experience language barriers (LBI) with their trading partners have an average increase of 0.17 percent in the risk of trade conflicts, as indicated by the probability impact. The results of the probability effect for LBI validate the hypothesis regarding linguistic barriers.

Table 3: The probability effects of LBI on TD

Model	(1)
Dependent	TD
$LBI_{i,j}$	0.0017*** (0.0005)
log($TFI_{i,t}$)	-0.0046*** (0.0014)
log ($Trade_{i,j,t}$)	0.0047*** (0.0004)

log($GDP_{i,t}$)	-0.0038*** (0.0005)
$GDP_{i,t}/GDP_{j,t}$	0.0033*** (0.0012)
$FTA_{i,j,t}$	-0.0045*** (0.0000)
Observations Country –Pairs	173,960 8,097

Notes: Parentheses indicate robust standard errors by country pair. ***/**/* indicate 1%, 5%, and 10% significance.

5.3 Robustness Tests

5.3.1 Different Models

The number of confrontations varies greatly between partner countries. Simultaneously, not all WTO members are engaging in trade disputes. This study estimates the Poisson model to examine the frequency of conflicts and count characteristics of trade dispute data. Given the rarity of the TD instance, estimate the rare event logistic model for the robustness test. Table 4 shows the average likely outcome of LBI based on the Poisson model and the rare event logistic model. The empirical data show that LBI has a significant and favorable impact on trade conflicts at a 1% level. The average probability effects implying that LBI has an influence on TD are 0.0019 and 0.0016, respectively, and are consistent with the base results in Table 3.

In many cases, the dependent variable has the value 0 because a country does not typically have long-term trade disputes with numerous countries. The zero-inflated Poisson model (ZIP) was used to solve the problem of unneeded zeros. The ZIP regression findings are shown in Table 4, and they are consistent with the base results. Use a dummy, Major Trading Partners, as the inflated characteristic, which indicates whether or not the two countries are major trading partners. The assumption is that even if countries are big trading partners, language constraints have a negative impact on their trade connections. The ZIP results show that LBI has a substantial positive influence on trade conflicts at a 1% significance level, and the average probability impacts of LBI on TD is 0.0024. Other explanatory factors produce results that are equivalent to those obtained in the baseline model, indicating that unnecessary zeros are unlikely to be included in the study.

Table 4: Probability Effects with Different Models

	Poisson Model	Rare-Event Logistic Model	Zero-Inflated Poisson Model
Model	(1)	(1)	(1)
Dependent	TD	TD	TD
$LBI_{i,j}$	0.0019*** (0.0003)	0.0016*** (0.0005)	0.0024*** (0.0007)
log($TFI_{i,t}$)	0.0045*** (0.0006)	0.0063*** (0.0009)	0.0053*** (0.0010)
log ($Trade_{i,j,t}$)	0.0043*** (0.0002)	0.0046*** (0.0004)	0.0046** (0.0014)
log($GDP_{i,t}$)	-0.0023***	-0.0038***	-0.0033***
	(0.0004)	(0.0006)	(0.0013)
$GDP_{i,t}/GDP_{j,t}$	0.0013*** (0.0004)	0.0028** (0.0006)	0.0046** (0.0023)
$FTA_{i,j,t}$	-0.0052*** (0.0014)	-0.0052*** (0.0014)	-0.0069*** (0.0025)
Observations Country –Pairs	173,960 8,097	173,960 8,097	173,960 8,097

Notes: Parentheses indicate robust standard errors by country pair. ***/**/* indicate 1%, 5%, and 10% significance.

5.3.2 Different Subsamples

The United States and the European Union exert significant influence on international trade due to their status as the world's largest economies and their substantial trade volume with other nations. The United States and the European Union are the primary actors in the World Trade Organization's trade dispute settlement body (Cai, 2020; Goulard, 2020; Pencea, 2019). To mitigate the potential impact of outliers, it is recommended to rerun the panel probit regression models for the two sub-samples listed below. Conduct a sample that excludes the United States and the European Union. The consequences of average marginal likelihood are presented in Table 5. According to the findings shown in Table 5, the absence of the United States and European Union (EU) results in average probability effects of LBI on TD of 0.0010 and 0.0011, respectively. These effects are statistically significant at the 1% level. The empirical findings demonstrate a high level of robustness, as evidenced by the data presented in Table 3.

Table 5: Probability Effects with different subsamples

	Without US	Without EU
Model	(1)	(1)
Dependent	TD	TD
$LBI_{i,j}$	0.0010*** (0.0005)	0.0011*** (0.0004)
log($TFI_{i,t}$)	-0.0039*** (0.0002)	-0.0037*** (0.0010)
log ($Trade_{i,j,t}$)	0.0041*** (0.0004)	0.0039*** (0.0005)
log($GDP_{i,t}$)	-0.0039*** (0.0005)	-0.0038*** (0.0007)
$GDP_{i,t}/GDP_{j,t}$	0.0038*** (0.0011)	0.0032*** (0.0010)
$FTA_{i,j,t}$	-0.0044*** (0.0010)	-0.0043*** (0.0020)
Observations Country –Pairs	170,969 7,880	169,004 7,230

Notes: Parentheses indicate robust standard errors by country pair. ***/**/* indicate 1%, 5%, and 10% significance.

5.3.3 Proxy Measure of Language barrier

Furthermore, as a proxy for language barrier measurements, this paper employed linguistic distance, which was calculated using the algorithm available at http://www.elinguistics.net/,to ensure robustness. Many scholars have questioned the adequacy of an official language binary measure (Egger & Toubal, 2016; Melitz & Toubal, 2014). In recent years, some measurements of linguistic distance have been added to the gravity model (Visser, 2019; Vlasenko, 2020). Linguistic distance is a measure of the differences between two languages or language variations. It is a linguistic term that quantifies the degree of similarity between languages using numerous linguistic variables such as vocabulary, grammar, phonetics, and syntax (Isphording & Otten, 2013). Table 6 displays the average likely outcome of linguistic distance (LD). The empirical results reveal that LD has a considerable and positive impact on trade conflicts at the 1% level. The average probability effects imply that LD increases TD likelihood by an average of 0.15%, which is consistent with the base values in Table 3. This finding further demonstrates that language barriers, whether measured by the language barrier index or linguistic distance, have a considerable favorable impact on trade conflicts.

Table 6: Probability Effects with Proxy measure

Model	(1)
Dependent	TD
$LD_{i,j}$	0.0015*** (0.0002)
log($TFI_{i,t}$)	-0.0024*** (0.0002)
log ($Trade_{i,j,t}$)	0.0052*** (0.0001)
log($GDP_{i,t}$)	-0.0037*** (0.0005)
$GDP_{i,t}/GDP_{j,t}$	0.0032*** (0.0002)
$FTA_{i,j,t}$	-0.0043*** (0.0001)
Observations Country –Pairs	173,960 8,097

Notes: Parentheses indicate robust standard errors by country pair. ***/**/* indicate 1%, 5%, and 10% significance.

6. Discussion

Using a panel probit model, this paper finds that language barriers have a significant and positive impact on the trade dispute participation of WTO members, with a significance level of 1%. The empirical findings show that language barriers increase the likelihood of a trade dispute. Specifically, a one-unit increase in language barriers increases the likelihood of trade disputes by 0.17%. A plausible explanation for this could be that language barriers contribute to misinterpretations of legal texts, oral proceedings, and difficulties in accessing relevant case law and precedents (Kruse & Willumsen, 2020; Oh et al., 2011). Consequently, this results in a higher likelihood of initiating disputes and poorer outcomes when disputes are pursued. These findings align with Smith (2004), Whitaker et al., (2008), and L. Zhou & Wei (2016) who identified similar barriers in regional trade agreements. However, this study expands on these insights by applying them to the global context of the WTO. The findings indicate that member states with limited English proficiency encounter significant challenges in comprehending complex legal documentation and effectively participating in dispute resolution processes (Chiswick & Miller, 2005; Taylor & Bain, 2008). Furthermore, these findings suggest that language barriers not only affect individual member states but also undermine the overall effectiveness and fairness of the WTO dispute settlement system (Simões, 2017). Addressing these barriers is crucial for enhancing global trade justice.

6.1 Policy implications:

The key findings of this study have important policy implications for the WTO dispute settlement body and member states. Firstly, it is crucial for the organization to implement more robust multilingual support systems to address the impacts of language barriers on participation in WTO trade disputes (Miwa, 2021; Simões, 2017). The WTO should provide comprehensive translation services for all official documents and during dispute settlement proceedings to ensure linguistic accessibility for all member states (Chua, 2019). Essential steps include establishing a multilingual help desk to assist member states in navigating the dispute settlement process and introducing language training programs for representatives of member states to improve their proficiency in the WTO's working languages (Sauter, 2012). The WTO could also partner with international language service providers to develop a pool of certified translators and interpreters specialized in trade law (Mavroidis, 2021). Additionally, allocating funding for language training programs and providing incentives for participation would be beneficial. Implementing these measures would likely result in more equitable participation in trade disputes, higher quality dispute resolutions, and a more inclusive and effective WTO dispute settlement system.

The findings of this study suggest several policy implications for WTO member states. Member states facing language barriers can focus on high-quality translation and interpretation services to overcome language barriers (Balogh & Jámbor, 2018). Developing comprehensive training programs to improve proficiency in WTO languages among trade officials and legal practitioners is essential (Islam, 2017). These programs should focus on legal and technical English relevant to international trade. Creating and distributing multilingual legal resources and guides on WTO dispute processes can aid non-native speakers and empower businesses and legal professionals with the necessary knowledge and tools to participate effectively in trade disputes (Zitawi & Abdel Wahab, 2014) Furthermore, utilizing Artificial Intelligence-based translation and interpretation tools can provide real-time language support during negotiations and hearings (Kitenge & Lahiri, 2022). Investing in technological solutions can bridge language gaps more efficiently and cost-effectively.

6.2 Contribution

This paper makes a unique contribution to the literature by focusing on the often-overlooked impact of language barriers on participation in trade disputes within the WTO. It is the first study to systematically investigate this impact, providing a new perspective on the challenges faced by member states that do not speak English. The findings contribute to theories of international trade law by highlighting the critical role of language in legal participation and dispute resolution. In practical terms, this research offers actionable insights for the WTO and member states on how to enhance participation and fairness in dispute settlements. Additionally, this study lays the groundwork for future research on language barriers in other international organizations and suggests further exploration of digital translation tools to facilitate trade dispute participation.

6.3 Limitations and Future Research Area

This study has limitations due to its exclusive focus on WTO disputes where English is the primary language. As a result, it may not fully reflect the linguistic diversity and challenges experienced by member states that use other languages. These limitations could impact the applicability of our findings to non-English contexts and other international trade organizations. For future research, it would be valuable to investigate language barriers in other international trade organizations and assess the efficacy of digital translation tools and multilingual support systems. Additionally, conducting longitudinal studies would enable us to gain a deeper understanding of the long-term effects of language training programs on dispute participation.

7. Conclusion

This study examines the effect of language barriers in trade disputes. Using a comprehensive data set consists of 8,256 country pairs of 129 countries and 565 WTO trade dispute cases from 1995 to 2018, evidenced that the language barrier had a substantial and positive effect on trade conflicts. When trading partners face linguistic hurdles, it is more likely that confusion, distrust, misinterpretation, ambiguity, facts, and communication expenses will occur, increasing overall trade costs. The Armington model is used to explore the relationship between trade expenses associated with linguistic barriers, trade elasticity, and trade disputes. The empirical findings imply that linguistic barriers considerably enhance the likelihood of international trade conflicts. Furthermore, the findings show that trading nations with linguistic distance suffer greater challenges comprehending international trade laws and practices, as well as communication and negotiation issues, and are more likely to engage in trade disputes with trading partners.

This study further provides key policy ramifications for the WTO dispute settlement body and member states, emphasizing the need to address language barrier issues through multilingual support systems, language training programs, and high-quality translation services. The fundamental contribution of this study is to empirically highlight the impact of linguistic barriers on trade disputes. Given the importance of language in international trade, more study is required to investigate the impact of language proficiency on trade disputes.

Disclosure Statement

There is no potential conflict of interest.

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APPENDIX

Table A. Country-pairs with Trade Disputes and Language Barrier Index (1995-2018)

Country-Pairs	No. of Trade Disputes Cases	LBI	Country-Pairs	No. of Trade Disputes Cases	LBI
US-China	38	1	Colombia-US	1	1
US-Korea	20	1	Greece-China	1	1
US-Brazil	15	1	Bangladesh-India	1	1
EU-China	15	1	Costa Rica-US	1	1
US-Japan	11	1	Croatia-Hungary	1	1
Mexico-US	10	1	Cuba-Australia	1	1
EU-Russia	8	1	Czech Republic-Poland	1	1
Japan-Korea	7	1	Dominican Republic-Australia	1	1
EU-Korea	7	1	Egypt-Thailand	1	1
EU-Japan	7	1	Egypt-US	1	1
Argentina-Brazil	6	1	Egypt-Pakistan	1	1
Japan-Canada	6	1	Honduras-Australia	1	1
EU-Indonesia	6	1	Hong Kong-Turkey	1	1
Brazil-Canada	5	1	Hungary-Slovak Republic	1	1
Mexico-China	5	1	Hungary-Czech Republic	1	1
EU-Thailand	5	1	Hungary-Romania	1	1
Australia-India	4	1	Hungary-Turkey	1	1
Australia-Indonesia	4	1	Hungary-Argentina	1	1
Canada-China	4	1	Hungary-Australia	1	1
China-Japan	4	1	Hungary-Canada	1	1
France-US	4	1	Hungary-New Zealand	1	1
Germany-US	4	1	Hungary-Thailand	1	1
Greece-US	4	1	Hungary-US	1	1
Indonesia-Korea	4	1	Indonesia-Vietnam	1	1
New Zealand-Indonesia	4	1	Indonesia-Brazil	1	1
Norway-US	4	1	Indonesia-Chinese Taipei	1	1
Pakistan-Indonesia	4	1	Indonesia-Japan	1	1
Pakistan-US	4	1	Indonesia-South Africa	1	1
Russia-US	4	1	Indonesia-Argentina	1	1

Country-Pairs	No. of Trade Disputes Cases	LBI	Country-Pairs	No. of Trade Disputes Cases	LBI
Spain-US	4	1	China-Italy	1	1
Thailand-Turkey	4	1	Ukraine-Australia	1	1
Ukraine-Armenia	4	1	Chinese Taipei-US	1	1
Vietnam-US	4	1	Chinese Taipei-India	1	1
Mexico-China	4	1	Chinese Taipei-EU	1	1
Chile-US	3	1	Chinese Taipei-Canada	1	1
Peru-Brazil	3	1	Switzerland-India	1	1
EU-Norway	3	1	Srilanka-Brazil	1	1
Belgium-US	3	1	Slovak Republic-Switzerland	1	1
Turkey-US	3	1	Romania-US	1	1
South Korea-Canada	3	1	Portugal-US	1	1
EU-Turkey	2	1	Philippines-Brazil	1	1
EU-Pakistan	2	1	Philippines-Thailand	1	1
Costa Rica-Trinidad & Tobago	2	1	Philippines-Korea	1	1
Spain-US	2	1	Poland-Thailand	1	1
Russia-Japan	2	1	Poland-Slovak Republic	1	1
Pakistan-EU	2	1	Poland-India	1	1
Japan-Brazil	2	1	Moldova-Ukraine	1	1
Japan-China	2	1	Morocco-Turkey	1	1
Colombia-Thailand	1	1	Netherlands-India	1	1
Malaysia-US	1	1	Netherlands-Brazil	1	1
Mexico-Venezuela	1	1	New Zealand-India	1	1
Mexico-Brazil	1	1	Pakistan-South Africa	1	1
Japan-India	1	1	Japan-Thailand	1	1
Japan-Argentina	1	1			

Source: Author's own accumulation from WTO Trade Disputes Data and World Atlas Language Data.