

APPLYING BERTOPIC MODELLING ON UNITED NATIONS GENERAL DEBATES 1970-2016 DATASET TO IDENTIFY ECONOMIC DEVELOPMENT AND DEMOCRACY ISSUES¹

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ABSTRACT

This article applies topic modeling to examine the discussion on economic development and democracy in United Nations General Debates over time and finds their spread across different countries. To achieve that aim, this article uses openly available debate transcripts from 1970 to 2016 to explore how distributed economic development and democracy are in the debates. Then, this article identifies the key themes of economy and democracy discussed throughout these debates using BERTopic as the topic modeling framework. By doing that, this article provides insights into the extent to which United Nations member states articulate economic progress with democracy based on common keywords and their patterns from the topic modeling. The main finding is that the intertwining between economic development and democracy issues emerges as the comprehensive development agenda became more prominent, such as the Millennium Development Goals (MDGs) in 2000 and their transition to Sustainable Development Goals (SDGs) in 2015. That contributes to knowing how economy and democracy emerge as a concern in the United Nations, the biggest platform for multilateral diplomacy.

Keywords: BERTopic; Topic Modelling; United Nations General Debates

ABSTRAK

Artikel ini menerapkan pemodelan topik untuk mengulas diskusi perkembangan ekonomi dan demokrasi dalam Debat Umum Perserikatan Bangsa-Bangsa dari waktu-waktu dan penyebarannya di berbagai negara. Untuk mencapai tujuan tersebut, artikel ini menggunakan transkrip debat yang tersedia secara terbuka dari 1970 hingga 2016 untuk mengeksplorasi distribusi perkembangan ekonomi dan demokrasi dalam debat tersebut. Kemudian, artikel ini mengidentifikasi tema-tema utama ekonomi dan demokrasi dalam debat tersebut menggunakan BERTopic sebagai kerangka pemodelan topik. Dengan melakukan itu, artikel ini menyajikan temuan-temuan terkait ruang lingkup negara anggota Perserikatan Bangsa-Bangsa mengartikulasikan kemajuan ekonomi dengan demokrasi berdasarkan kata-kata kunci umum dan pola-pola berdasarkan pemodelan topik. Temuan utamanya adalah bahwa keterkaitan antara isu pembangunan ekonomi dan demokrasi muncul ketika agenda pembangunan komprehensif menjadi lebih menonjol, seperti Millennium Development Goals (MDGs) pada tahun 2000 dan transisinya Sustainable Development Goals (SDGs) pada tahun 2015. Temuan tersebut berkontribusi pada pembelajaran terkait kemunculan ekonomi dan demokrasi sebagai hirauan dalam Perserikatan Bangsa-Bangsa yang merupakan platform diplomasi multilateral terbesar.

Kata-Kata Kunci: BERTopic; Debat Umum Perserikatan Bangsa-Bangsa; Pemodelan Topik

INTRODUCTION

The association between economic development and democracy has been a central

debate for research in political science. Many view increasing incomes as related to the creation of democratic values in a country, while others lean toward economic development to support the

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existing democracy, not creating democracy. (Paldam, 2024; Tian, Sim, Yan, & Li, 2020; Treisman, 2020; Brownlee & Miao, Why Democracies Survive, 2022; Xuereb, Wohl, Stefaniak, & Elgar, 2021; Menocal, 2021) Meanwhile, some researchers find many cases of high levels of development in a country without democratizing. (Raun, 2023; Sima & Huang, 2023; Gerring, et al., 2021) On the other hand, many find that inequality is the key to weakening democratization in many countries. (Dorsch & Maarek, 2020; Leipziger, 2024; Policardo & Carrera, 2020) Moreover, some argue that a strong middle class is essential for economic development to support democracy. (Ivlevs, 2023; Huszár & Berger, 2022; Rosenfeld, 2020) Last, many researchers consider globalization the main factor associating economic development with democracy. (Macedo, Martins, & Jalles, 2021; Guze, Arslan, & Acaravci, 2021; Mohammadi, Boccia, & Tohidi, 2023; Roy, Basu, & Dong, 2021; Bergh & Kärnä, 2021)

Besides those debates, the association between economic development and democracy has been a political narrative in global institutions such as the United Nations (UN). For example, the Sustainable Development Goals (SDGs) highlight the importance of good governance, the rule of law, and active participation in institutions for economic development. (Diefenbach, 2020; Barbier & Burgess, 2021; Hope Sr., 2019) These elements are crucial for achieving all development goals in a country. (Nikzad, 2021; Malito, Umbach, Savoia, & Hulme, 2020; Reverte, 2022; Massey, 2022) Furthermore, many UN agencies add democratic governance as the key to deciding their economic assistance programs. (Dingwerth, Schmidtke, & Weise, 2020; Lee, Kim, & Jho, 2022; Maekawa, 2024) In addition, programs to support electoral systems, civil society, judicial reform, and public accountability are often framed as developmental tools by the UN. (Sinclair, 2020; BLAIR, UN Peacekeeping and the Rule of Law, 2021; BLAIR, DI SALVATORE, & SMIDT, UN Peacekeeping and Democratization in Conflict-Affected Countries, 2023; Browne & Weiss, 2021; Canton, 2021)

In political communication, analyzing political narratives has many techniques from manual coding to automated ones, with the recent one being BERTopic. (Mendonça & Figueira, 2024; Egger & Joanne, 2022; Achmann & Wolf,

2023) It is a topic modeling framework using advanced language models called transformers to understand the context and meaning of words, in addition to the frequency of the words. (George & Sumathy, 2023) With that feature, BERTopic allows for analyzing how narratives develop over time and across different actors. (Liu & Wan, 2024)

Because of that, the main question proposed in this article is to what extent do the UN member states associate economic progress with democratic governance based on the patterns from the topic modeling? This research applies BERTopic as the topic modeling framework to provide insights into the extent to which United Nations member states associate economic progress with democratic governance based on common keywords and their patterns from the topic modeling.

METHODS

The dataset for this research is transcriptions of general debates at the United Nations from 1970 to 2016, provided by Baturo et al.. (Baturo, Dasandi, & Mikhaylov, 2017). The main consideration to utilize that dataset is how the format and structure allow for easier preprocessing and integration during the analysis stage. However, the dataset has its limitations as it only covers up to 2016. The dataset includes the text of each country's statement from the general debate. Then, the two tools used in this research to help analyze the dataset are Google Colab and ChatGPT. Google Colab is a cloud-based tool that provides free access to implement BERTopic. (Nelson & Hoover, 2020) Meanwhile, ChatGPT is used to assist with code generation. (Scoccia, 2023) That is because the author is not a programmer. Below is the general description of the code, while the link to the complete source code is in the appendix.

For data analysis, the first step is running a code to preprocess UN General Debate speeches for topic modeling. It installs and imports necessary libraries to clean each speech by normalizing the text, removing non-ASCII characters, tokenizing, eliminating stopwords, and lemmatizing. The cleaned text is stored in a new column and saved to a new file. The second step is extracting keywords for topic modeling. The code also starts with installing and importing necessary libraries to normalize the text, eliminate

stopwords, and lemmatize. Then, the code counts the frequencies of the words to identify the 50 most frequent and meaningful words for economic development and democracy.

The final step is performing topic modeling using BERTopic. It begins by installing and importing the necessary libraries and loading the cleaned speech data. Then, each speech is converted into numerical vectors to make clustering topics more effective. Next, the code runs the clustering algorithm, while seed words are defined to guide the topic modeling process. After that, the code fits the text and embeddings and assigns each document to a topic. The top 5 topics are identified, along with their most frequent keywords. The code also produces three types of visualizations: topic distribution, top countries per topic, and top years per topic. The code saves the visualization as PNG.

RESULTS AND DISCUSSION

Economic Development Topics in United Nations General Debates

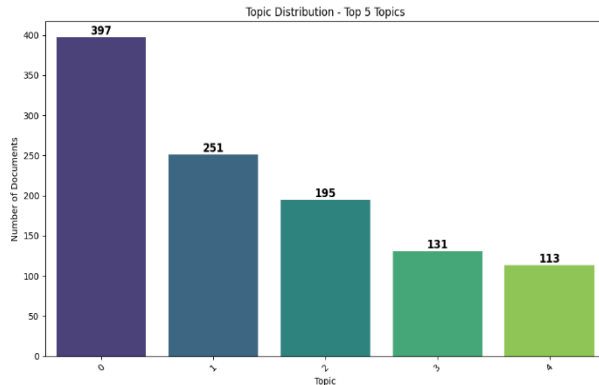


Figure 1. Topic Distribution for Top 5 Economic Development Topics

Figure 1 show how often the discussion of economic development in UN General Debates. Topic 0, with 397 statements, stands out as the most discussed. That shows it is significant in the debates. Topic 1 comes next with 251 statements. That indicates it is also the main topic, but not as much as Topic 0. Topic 2 has 195 statements, which shows it has a moderate level of importance. Then, Topic 3 has 131 statements, and Topic 4 has 113. These two topics are less discussed but still

noticeable in the dataset as the top 5 of economic development topics.

Topic 0 of Economic Development: SDGs and Pacific Island Nations

Table 1. Keywords for Topic 0 of Economic Development

No	Keyword	No	Keyword
1	Sustainable	6	Financial
2	Change	7	Nation
3	Goal	8	Programme
4	Development	9	Growth
5	Poverty	10	World

Topic 0 focuses on sustainability, development, and global initiatives based on how keywords like “sustainable,” “development,” and “growth” appeared in the debates (See Table 1). Furthermore, the keywords “poverty” and “financial” suggest broader economic aspects around poverty alleviation and financial inclusion. Meanwhile, the keywords “nation” and “world” suggest a global governance perspective and the need for international cooperation to solve current challenges. Additionally, the appearance of the keyword “program” indicates specific initiatives for fostering development and transformation. It is most likely the context of the keyword “program” is the UN SDGs because the SDGs aim for a more equitable and sustainable future.

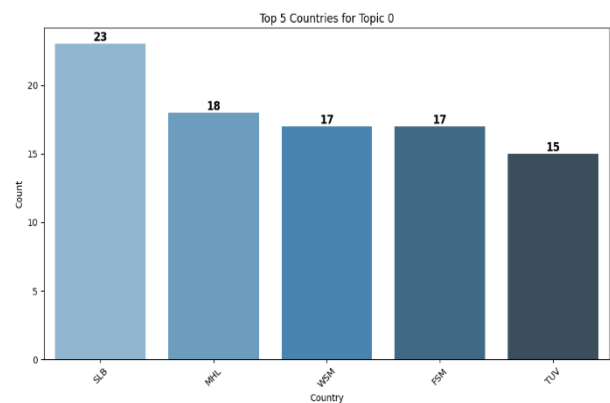


Figure 2. Top 5 Countries for Topic 0 of Economic Development

The top 5 countries for Topic 0 in Figure 2 are the Solomon Islands (SLB), Marshall Islands (MHL), Samoa (WSM), Micronesia (FSM), and Tuvalu (TUV). That highlights the link between economic development and Pacific Island nations. As Small Island Developing States (SIDS), these countries face urgent challenges such as

geographical isolation and climate change vulnerability. (Uitto, Kohlitz, & Todd, 2017; Thompson, 2022) The top 10 keywords in Topic 0, such as “sustainable”, “development”, “growth”, “poverty”, “financial”, and “nation”, point to discussions on sustainable economic policies and poverty reduction strategies of the top 5 countries in Topic 0. Their presence in the top 5 suggests the debates on economic resilience, financial aid, and international partnerships in the dataset.

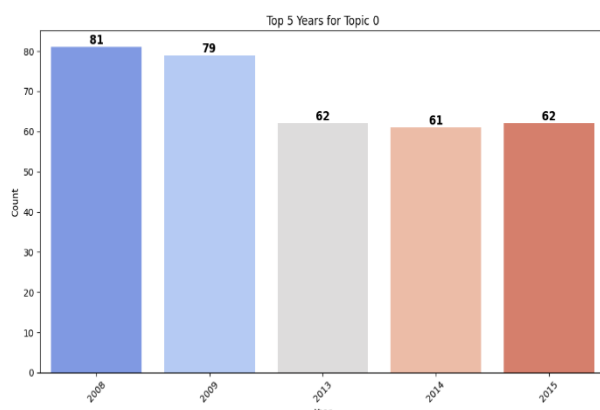


Figure 3. Top 5 Years for Topic 0 of Economic Development

From Figure 3, the temporal distribution of Topic 0 shows peak years in 2008, 2009, 2013, 2014, and 2015. That indicates heightened discussions on economic development in Pacific Island nations. Furthermore, the 2008–2009 period aligns with key global economic events. At that time, the global financial crisis affected most countries, especially the trade and aid-dependent countries. (Jayaraman, 2011) That period also prompted debate on economic stability and poverty reduction in countries like the Solomon Islands and Tuvalu. (Leal Filho, Otoara Ha’apio, Lütz, & Li, 2020) Meanwhile, the resurgence from 2013 to 2015 coincided with the global push for the SDGs and increased focus on climate resilience and development programs for SIDS. (Uitto, Kohlitz, & Todd, 2017)

Topic 1 of Economic Development: Economic Policy of African Nations

Table 2. Keywords for Topic 1 of Economic Development

No	Keyword	No	Keyword
1	Economic	6	People
2	Nation	7	World
3	Development	8	Organization
4	Country	9	Government
5	New	10	Process

Keywords in Table 2 suggest Topic 1 revolves around economic development and its institutional processes, both at national governments and global organizations. Keywords “economic,” “development,” “nation,” “country,” and “world” are supporting that theme. In addition, the keywords “government” and “organization” indicate that statements within the debates may focus on state-led economic planning, policy implementation, and the role of international institutions. Meanwhile, the keywords “new” and “process” may suggest the planned mechanisms by the government or organization to implement economic development. That may include industrialization, modernization, and economic reforms. The keyword “people” may point to economic development themes around the general population of a country.

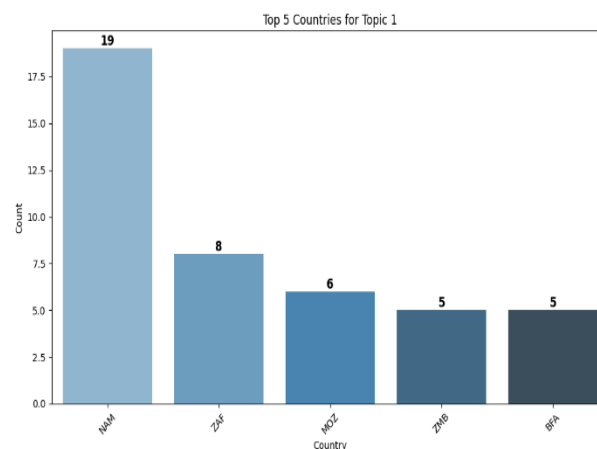


Figure 4. Top 5 Countries for Topic 1 of Economic Development

The top 5 countries for Topic 1 are Namibia (NAM), South Africa (ZAF), Mozambique (MOZ), Zambia (ZMB), and Burkina Faso (BFA) (See Figure 4). In contrast to Topic 0, Topic 1 indicates a regional focus on economic development within Africa. These countries represent diverse economic landscapes ranging from resource-rich economies to emerging markets and developing nations. (Adika, 2020) South Africa is shifting to trade and investment, while countries like Namibia, Mozambique, Zambia, and Burkina Faso are more on resource-based economies. (Neethling, Kleynhans, & Mncayi, 2023; Khambule, 2024) The top 5 countries in Topic 1 suggest that the debates are around

economic planning, industrial policies, and international efforts for the growth of African economies.

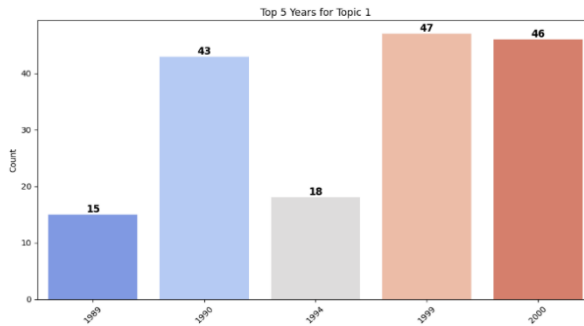


Figure 5. Top 5 Years for Topic 1 of Economic Development

The temporal distributions of Topic 1 highlight peak years in 1989, 1990, 1994, 1999, and 2000 as shown in Figure 5. That period was pivotal for political and economic changes in Namibia, South Africa, Mozambique, Zambia, and Burkina Faso. Namibia gained independence in 1990, which started its determination for developmental and industrial processes. (Hope, 2021) In South Africa, the shift from apartheid led to democratic elections in 1994 and new policies aimed at fairness and economic growth. (Neethling, Kleynhans, & Mncayi, 2023) Mozambique, Zambia, and Burkina Faso embraced economic liberalization in the 1990s by moving towards market-driven economies. (McMillan, Welch, & Rodrik, 2003) They also tried to restructure its economy as part of broader African economic development.

Topic 2 of Economic Development: Advancing SDGs

Table 3. Keywords for Topic 2 of Economic Development

No	Keyword	No	Keyword
1	Sustainable	6	World
2	Poverty	7	Human
3	Life	8	Development
4	Nation	9	Process
5	New	10	Goal

Topic 2 resolves on sustainability, human development, and reducing global poverty based on the keywords from Table 3. The keywords “sustainable,” “development,” “goal,” “nation,” and “world” suggest a connection to SDGs, which cover global efforts on sustainability and development. Besides that, the keywords

“poverty” and “human” show that Topic 2 represents statements of helping people in need for food and improving their overall human well-being from the datasets. In addition, Topic 2 has “life” as the keyword that may focus on people and their basic needs. Meanwhile, the keywords “process” and “new” suggest an interest in the methods and policies that promote sustainable changes.

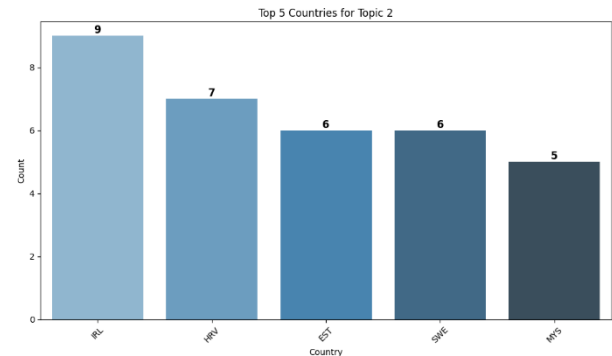


Figure 6. Top 5 Countries for Topic 2 of Economic Development

The top 5 countries for Topic 2 are Ireland (IRL), Croatia (HRV), Estonia (EST), Sweden (SWE), and Malaysia (MYS). Based on recent studies, these countries have prioritized sustainability and human development in their policies. Sweden leads in sustainability with strong environmental policies and social welfare programs. (Dwyer, 2024) Croatia, Ireland and Estonia have achieved rapid growth by balancing sustainability and social initiatives. (Skvarciany, Lapinskai, & Stasytyt, 2023) In addition, Estonia is known for its governance innovation on digital economy and digital sustainability. (Dorjnyambuu, 2023) Malaysia as the only Southeast Asia country in the Topic 2 promotes sustainability through its Vision 2020 initiative with the aims to reduce poverty and enhance social welfare. (Jamilah, Suriati, Mahadevan, Alin, & Oana, 2024)

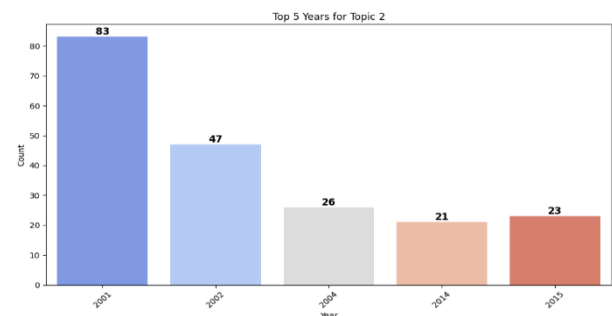


Figure 7. Top 5 Years for Topic 2 of Economic Development

Figure 7 shows the temporal distribution of Topic 2 peaked in 2001, 2002, 2004, 2014, and 2015. The distribution highlights the early 2000s and the mid-2010s as the two key periods. In the early 2000s, countries like Ireland, Croatia, Estonia, Sweden, and Malaysia implemented development and poverty reduction policies because of the UN Millennium Development Goals (MDGs). It was an early global effort to promote economic growth while keeping in balance with human well-being. The renewed interest in Topic 2 in 2014 and 2015 may suggest a transition period when the introduction of the UN SDGs, the update for the MDGs. (Rosenbaum, 2015)

Topic 3 of Economic Development: Developmental Issues of African Nations

Table 4. Keywords for Topic 3 of Economic Development

No	Keyword	No	Keyword
1	Development	6	Organization
2	Country	7	World
3	Sustainable	8	Poverty
4	Programme	9	Change
5	Nation	10	Economic

Topic 3 has keywords such as “development,” “organization,” “country,” and “world”. The keywords might suggest Topic 3 focuses on global development through international organizations to support economic and social progress. The most likely organizations are the United Nations Development Programme (UNDP), World Bank, and International Monetary Fund (IMF) because the keywords imply Topic 3 resolves around economic stability, sustainability, and poverty reduction. In contrast to Topic 2, with keywords around poverty and human development, Topic 3 highlights policy-driven changes at a global scale based on the presence of the keyword “change.” Topic 2, in other words, is more concerned with human well-being and sustainability.

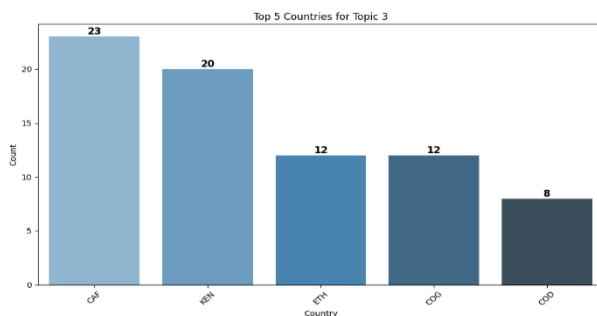


Figure 8. Top 5 Countries for Topic 3 of Economic Development

The Central African Republic (CAF), Kenya (KEN), Ethiopia (ETH), Congo (COG), and the Democratic Republic of the Congo (COD) are the top 5 countries in Topic 3 (See Figure 8). These countries face significant challenges to sustainable development and economic growth. However, they still aim to develop the economy. The Central African Republic deals with political instability. (Khromov & Nakunne Yandoko, 2024) Next, Ethiopia focuses on infrastructure and industrialization as it seeks a more inclusive economy. (Albagoury, 2016) Meanwhile, Kenya is progressing in technology and agriculture but still faces issues like inequality. (Diyammi, 2025) Both Congo and the Democratic Republic of the Congo have rich natural resources but face political unrest and environmental problems. (Imasiku, Thomas, & Ntagwirumugara, 2020)

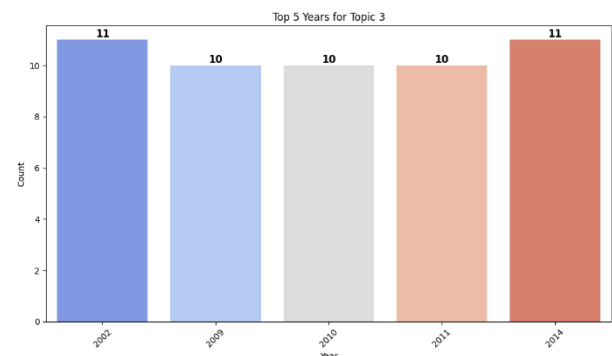


Figure 9. Top 5 Years for Topic 3 of Economic Development

Figure 9 shows the top 5 years for Topic 3 are 2002, 2009, 2010, 2011, and 2014. That temporal distribution also corresponds to significant global and regional efforts in economic development and reduction of poverty, just like the previous Topic 2. In 2002, international organizations like the UN and World Bank put more effort into poverty reduction programs with the MDGs. Then, the transition from MDGs to SDGs for longer-term development sustainability in 2014. However, Topic 3 and Topic 2 are still different. Topic 3 focuses on African nations facing economic development challenges, while Topic 2 is about leading sustainability and human development cases.

Topic 4 of Economic Development: More on Advancing SDGs

Table 5. Keywords for Topic 4 of Economic Development

No	Keyword	No	Keyword
1	Human	6	Change
2	Nation	7	Institution
3	World	8	Development
4	Life	9	Poverty
5	New	10	People

Based on the keywords in Table 5, Topic 4 may lean more on how promoting human well-being, improving people's lives, and changes in global or national institutions are important parts of economic development. In addition, reducing poverty is still a prominent theme in Topic 4. Compared with previous topics, Topic 4 is similar to Topic 2 based on the presence and arrangement of the keywords like “human,” “poverty,” “nation,” “life,” and “development.” Therefore, Topic 2 may also highlight advancing SDGs as the main program for a broader context of economic development and show a clear approach that promotes overall progress in the global and national levels.

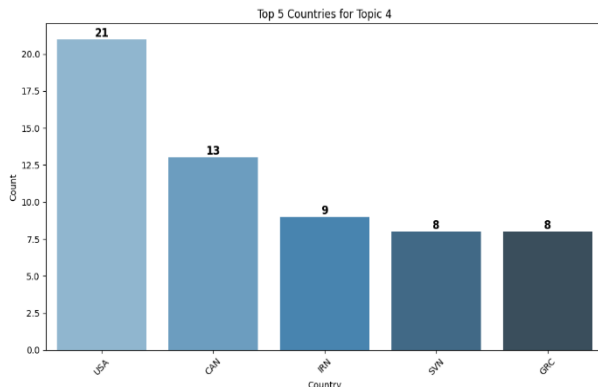


Figure 10. Top 5 Countries for Topic 4 of Economic Development

The top 5 countries for Topic 4 are the United States (USA), Canada (CAN), Iran (IRN), Slovenia (SVN), and Greece (GRC) (See Figure 10). Those countries have different conditions and approaches to economic development. Developed countries like the United States and Canada may focus their statements for the debates on government systems and policies to improve well-being because they have a track record for that. (Haveman & Wolfe, 2000; Bhuiyan, 2017) Iran has faced economic effects from the sanctions imposed after 2006, while Greece had issues

during the Eurozone crisis, which resulted in changes to its economy. (Farzanegan & Batmanghelidj, 2023; Challoumis & Eriotis, 2024) Meanwhile, Slovenia is a developing economy that has effectively adopted human-centered policies after its period of socialism. (Bob Hancké, 2007)

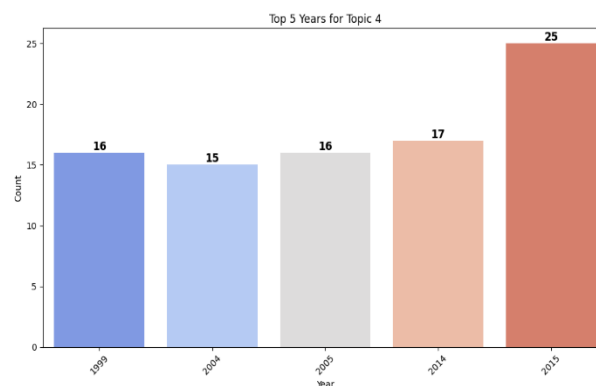


Figure 11. Top 5 Years for Topic 4 of Economic Development

From Figure 11, the top 5 Years for Topic 4 are 1999, 2004, 2005, 2014, and 2015. In general, these years correspond to significant global discussions on poverty reduction, institutional restructuring, and governance challenges, without exception in the United States, Canada, Iran, Slovenia, and Greece. However, the presence of these years always overlaps with the top 5 years of previous topics. For example, 2014 and 2015 marked a global transition as the SDGs replaced the MDGs, just like in Topic 2 and 3. Therefore, the mention of these years across various topics shows that economic development discussions connect multiple areas for the global sustainability.

Key Inferences from the Findings on Economic Development Topics in United Nations General Debates

The findings reflect the main challenges and priorities for global development goals and local vulnerabilities, as that period marked a regional focus on sustainable development, poverty reduction, and climate change problems in small island developing states (SIDS). The findings also highlight the main actors that will provide a better response to those vulnerabilities and guide the achievement of a more comprehensive development. Reports from the World Bank (2016) and the Commonwealth Secretariat (2017) show the emergence of major

global initiatives, such as the Millennium Development Goals (MDGs) and the lead-up to the Sustainable Development Goals (SDGs), to emphasize core issues in the SIDS.

In addition to that, the temporal distributions in the findings align with preparations for the 2014 Third International Conference on SIDS in Samoa and related national reports focused on sustainable development, economic growth, and poverty alleviation (Commonwealth Secretariat, 2017; Stumpf & Chesire, 2018). That in return created common keywords as the narratives on economic development in policy documents and academic literature on that topic. Therefore, the recurring keywords across the topics show the emphasis on the central challenges, policy responses, and international focus on sustainable development and poverty reduction in small Pacific island states during a critical period of global and regional change.

Democracy Topics in United Nations General Debates

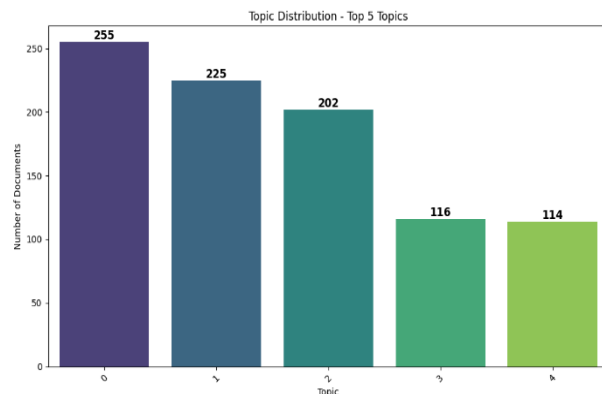


Figure 12. Topic Distribution for Top 5 Democracy Topics

Figure 12 shows a noticeable topic distribution, with some topics appearing more often than others. Topic 0 is the most prominent in the datasets, with 255 statements. That also indicates Topic 0 is a key theme for democracy in the debates. Next, Topic 1 follows with 225 statements, and Topic 2 with 202 statements. These two topics are also important because both topics have around 200 statements. But not as frequent as Topic 0. Meanwhile, Topic 3 has 116 statements, and Topic 4 has 114. These topics occur less often in the datasets as Topics 0, 1, and 2, with no more than 200 statements.

Topic 0 of Democracy: Political Transition in the African Nations

Table 6. Keywords for Topic 0 of Democracy

No	Keyword	No	Keyword
1	Economic	6	Government
2	Country	7	People
3	Assembly	8	Social
4	Process	9	Political
5	World	10	Election

From Table 6, the presence of keywords “economic,” “country,” and “government” suggest that Topic 0 represents statements around the relationship between economic conditions and how the government deals with that. That may be about the issues in those sectors. Table 6 also shows the keywords “assembly” and “process” may emphasize the role of institutions like parliaments in a government. Meanwhile, the keyword “world” suggests international issues or conditions. Then, the keywords “people,” “social,” and “political” highlight the importance of societal engagement. In other words, citizen involvement. Finally, the keyword “election” may represent the election process as part of the democratic process in many countries.

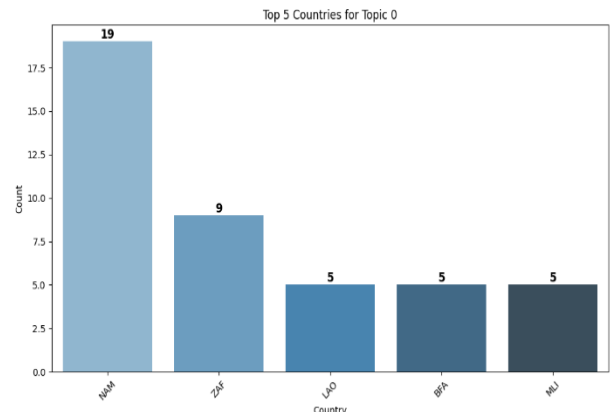


Figure 13. Top 5 Countries for Topic 0 of Democracy

Namibia (NAM), South Africa (ZAF), Lao People’s Democratic Republic (LAO), Burkina Faso (BFA), and Mali (MLI) are the top five countries in Topic 0 (See Figure 13). Those countries are emerging democracies with very different current situations, especially on economic and political issues. Namibia and South Africa are two relatively stable democracies compared to the rest. (Etieyibo, 2020) The countries are featuring electoral systems that support economic growth. Still, they have issues with public participation.

(Hartmann, 2009) Burkina Faso and Mali highlight political transitions and challenges. That is because of coups and many fluctuations in democracy. (Akwei, Machar, & Mnyandu, 2023) Meanwhile, Lao illustrates governance in a single-party system with guided economic policies and limited public participation. (Cai, 2024)

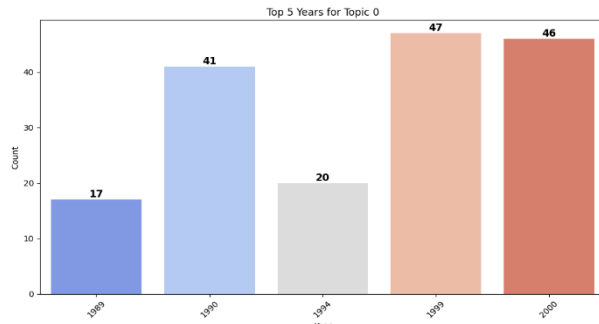


Figure 14. Top 5 Years for Topic 0 of Democracy

1989, 1990, 1994, 1999, and 2000 are the top 5 years for the Topic 0 (See Figure 14). These years were significant for political change around the world. That is because these years mark key events like democratic transitions, constitutional changes, and elections that impacted political participation and governance at the end of the Cold War in 1989 and 1990. For example, Namibia gained independence in 1990 and established a democratic system. In addition, South Africa began to move away from apartheid. 1994 was a significant year for South Africa as it held its first democratic elections, which led to Nelson Mandela becoming the first black president. (Coombes, 2003)

Topic 1 of Democracy: Political Events in the Middle East

Table 7. Keywords for Topic 1 of Democracy

No	Keyword	No	Keyword
1	People	6	Many
2	Right	7	Political
3	Law	8	Freedom
4	Assembly	9	World
5	Principle	10	Government

Table 7 shows the keywords for Topic 1. The top 3 keywords in Topic 1 are “people,” “rights,” and “law”. Compared to the previously discussed Topic 0, which emphasizes political transformation, Topic 1 leans more toward people's rights and participation within democratic

systems. Furthermore, the keywords “assembly” and “principle” may highlight the fundamental values of democratic government by pointing out the role of legal frameworks in public participation. In addition, the keywords “political” and “freedom” point to individual and collective rights. Therefore, Topic 1 may lean more on civil liberties and political activism than Topic 0. However, both topics have the same scope based on the keyword “world.”

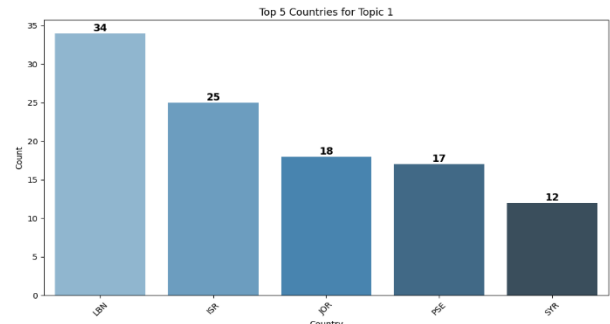


Figure 15. Top 5 Countries for Topic 1 of Democracy

The top 5 countries in Topic 1 are from the Middle East. Lebanon (LBN), Israel (ISR), Jordan (JOR), Palestine (PSE), and Syria (SYR) (See Figure 15). These countries share a history of political tension and debates over citizenship and rights. (International IDEA, 2021) For example, Lebanon and Israel facing contested democratic institutions. (Mourad, 2019) Jordan and Palestine have varying political participation due to regional conflicts. (Frost & Schaaf, 2024) Meanwhile Syria reflects the impact of authoritarian rule on governance. (Sajad, 2023) Therefore, Topic 1 highlights statements on the Middle East as a politically complex region by focusing on democratic principles and civil rights. Overall, Topic 1 emphasizes debates to navigate struggles surrounding democracy in complex political contexts, both legally and ideologically.

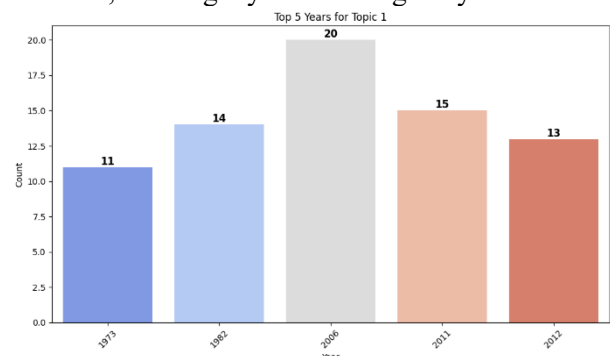


Figure 16. Top 5 Years for Topic 1 of Democracy

From Figure 16, Topic 1 has a broad temporal distribution range from the 1970s to 2010s. 1973 was the start of the Yom Kippur War, which influenced current relations between Israel and the rest of the Middle East countries. (Rubin, Ginat, & Ma'oz, 1994) Meanwhile, 1982 was the start of the Lebanon War. That war created a lasting impact on the political dynamics and institutions of Lebanon. 2011 was the period when Arab Spring movements for democratic reform faced resistance from the authoritarian governments. (Brownlee, Masoud, & Reynolds, The Arab Spring: Pathways of Repression and Reform, 2015; Beck, Jung, & Seeberg, Syria, Palestine, and the Transformation of Middle Eastern Politics) Therefore, 1973, 1982, 2006, 2011, and 2012 are significant in Lebanon, Israel, Jordan, Palestine, and Syria due to key historical events and political developments.

Topic 2 of Democracy: Democratic Transitions and Authoritarian Rules

Table 8. Keywords for Topic 2 of Democracy

No	Keyword	No	Keyword
1	Law	6	Many
2	Society	7	Rule
3	Process	8	Political
4	Democracy	9	Right
5	World	10	People

From Table 8, the keywords may imply the statements emphasize more on structural, legal, and procedural aspects that uphold the way democratic government works. Keywords “law,” “rule,” and “process” in the topic reflect that. Compared to the previously discussed Topic 1, with a focus on political events, Topic 2 is more leaning toward how democracy works in society based on the keyword “society”. While Topic 1 and Topic 2 share similar keywords in “political,” “right,” and “people,”, they differ on how societies implement democratic governance through legal and political mechanisms. Therefore, Topic 2 is all about the law, public, and political processes of a government.

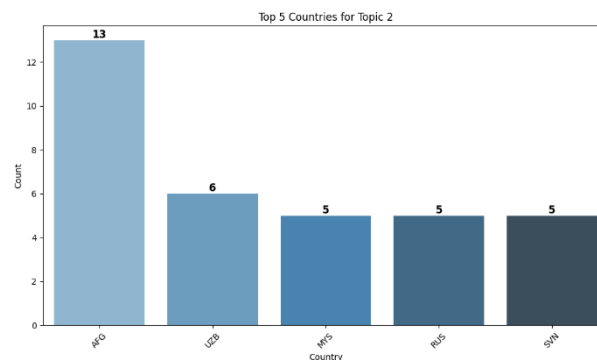


Figure 17. Top 5 Countries for Topic 2 of Democracy

In Topic 2, the top 5 countries are Afghanistan (AFG), Uzbekistan (UZB), Malaysia (MYS), Russia (RUS), and Slovenia (SVN) (See Figure 17). These countries are from different parts of the world and have diverse democratic experiences, governmental control, and public participation. Afghanistan, Uzbekistan, and Russia are authoritarian regimes with government authority that limit public participation. (Kubicek, 1998; Owen & Bindman, 2017) On the other hand, Malaysia represents a hybrid democratic model because of the constitutional monarch and governance that significantly shape the political processes. (Ahmed, Kausar, & Behan, 2016) Next, Slovenia, on the other hand, has successfully built a stable democracy. That shows how important laws and institutions are in managing a post-socialist government. (Ramet, Hassenstab, & Listhaug, 2017)

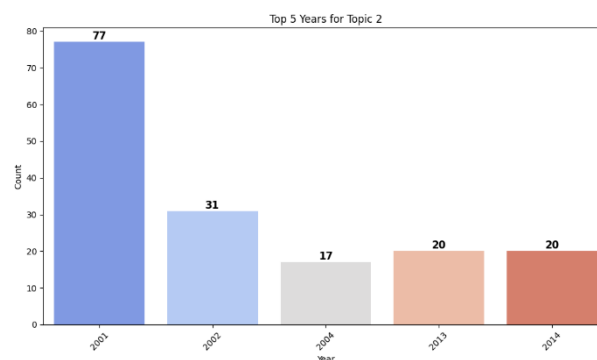


Figure 18. Top 5 Years for Topic 2 of Democracy

Figure 18 shows that 2001 is the peak year in the temporal distribution of Topic 2. One explanation for that is Afghanistan as the key country. Afghanistan was undergoing a transition after the previous Taliban rule, with the expected transition to finish in 2004 with a new constitution. (Suhrke, 2008) On the other hand, Russia is also in

a transition because Vladimir Putin consolidated his power in the same year. (Vroblevska & Rätfelders, 2024) Both represent heightened discussions about law, governance, and democracy as a structured process in the datasets. In 2013 and 2014, Slovenia was in the process of democratic consolidation. (Krašovec & Johannsen, 2016) That was very different from Russia, where civil society and governance faced increasing restrictions. (Vroblevska & Rätfelders, 2024)

Topic 3 of Democracy: Democratic Process and Trends Across Regions

Table 9. Keywords for Topic 3 of Democracy

No	Keyword	No	Keyword
1	Democracy	6	Democratic
2	Institution	7	Society
3	Population	8	Citizen
4	Country	9	Social
5	World	10	Right

From Table 9, the keywords “democracy,” “institution,” “population,” “citizen,” “democratic,” and “right” for Topic 3 may imply the statements in the debates emphasizing how embedded democratic ideas are in society and collectively experienced by citizens. In addition, the keywords like “society” and “social” may suggest the inclusion of a broader participation for that. In other words, Topic 3 leans toward how democracy works with the role of citizens in society. The collective experience in the population is the key difference between Topic 3 and the previously discussed Topic 2, which was more on the rule of law and democratic process in the government.

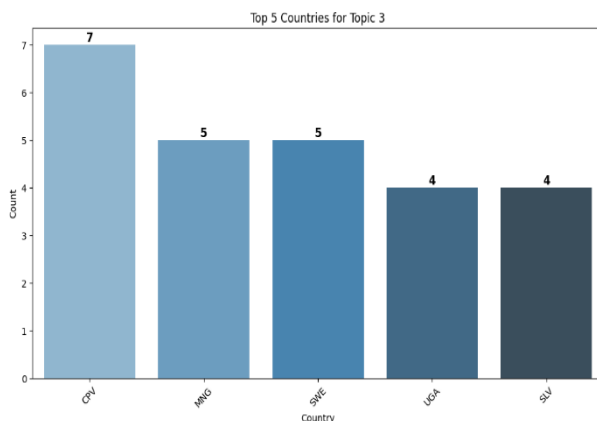


Figure 19. Top 5 Countries for Topic 3 of Democracy

The top 5 countries for Topic 3 are geographically diverse, with Cabo Verde (CPV), Mongolia (MNG), Sweden (SWE), Uganda (UGA), and El Salvador (SLV) (See Figure 19). Cabo Verde is one of the countries in Africa with democratic success because of how the country performs in implementing decentralization. (Sanches, 2020) On the other hand, Mongolia experienced political crises in 2008 but successfully resolved them within the context of democratic institutions. (Greene, 2020) Meanwhile, Sweden represents institutionalized democratic citizenship with fair administration and a pragmatic conception of citizenship. (Fernández, 2019) In contrast, Uganda and El Salvador exemplify how populations navigate democracy amid institutional challenges and reforms in post-conflict societies, with key domestic issues often remaining politically unstable. (de Zeeuw & Kumar, 2006)

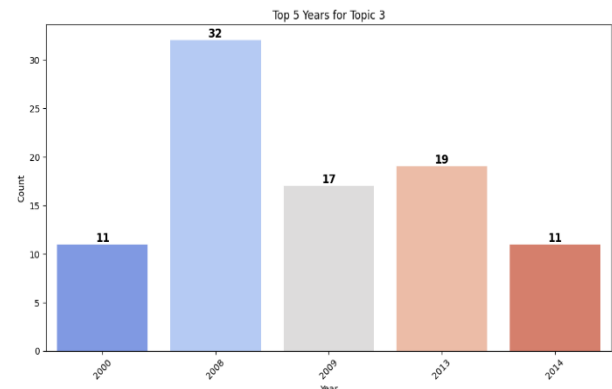


Figure 20. Top 5 Years for Topic 3 of Democracy

From Figure 20, the temporal distributions of Topic 3 are 2000, 2008, 2009, 2013, and 2014. 2008 is the highest in the distributions as the world was in a global financial crisis, and governments reasserted democratic accountability and social welfare in response to public frustrations. (McBride, Mahon, & Boychuk, 2015) 2013 and 2014 are the key years for political development in Mongolia, Uganda, and El Salvador. Mongolia had a peaceful and fair presidential election, which became a success story for democracy. (Tsedevdamba, 2016) In contrast, Uganda was initially aimed for inclusive development but later shifted towards personalized bureaucracy. (Golooba-Mutebi & Hickey, 2013) Then, the Farabundo Martí National Liberation Front

(FMLN) won its second presidential contest in El Salvador. (Réserve, 2016)

Topic 4 of Democracy: Democratic Principles and Western Countries

Table 10. Keywords for Topic 4 of Democracy

No	Keyword	No	Keyword
1	World	6	Democracy
2	Right	7	Different
3	Law	8	Institution
4	Society	9	Individual
5	Rule	10	Many

Table 10 shows the keywords for Topic 4, which may suggest statements in the datasets around global standards, institutional variations, and the rule of law. The keywords such as “world,” “law,” “rule,” and “institution,” are the indicators for that. Topic 4 also leans more toward how democratic principles apply in societies across the world based on the keywords “right,” “individual,” and “society.” That makes Topic 4 and the previously discussed Topic 3 have the same scope, but Topic 4 is more conceptual rather than citizen engagement. Compared to Topic 3, keywords in Topic 4 underline the democratic ideals in many different contexts.

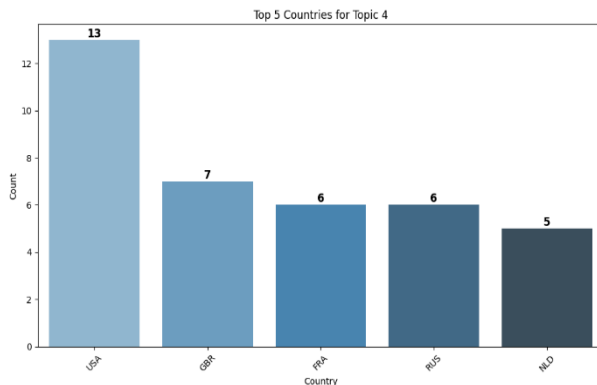


Figure 21. Top 5 Countries for Topic 4 of Democracy

The United States (USA), the United Kingdom (GBR), and France (FRA) as the top 3 in the topic may show the promotion of legal norms for democracy, domestically and internationally (See Figure 21). That is also in line with how these countries have shaped democratic principles like the rule of law and the protection of individual rights. (Feng, 2024) The appearance of Russia (RUS) in the top 5 may suggest how Russia challenges the top 3 with its alternative

governmental models. (Prozorova, 2024) Meanwhile, the Netherlands (NLD) leans to the top 3 by emphasizing the importance of individual rights. (Ballin, 2019) Therefore, these countries highlight the global debates on democracy.

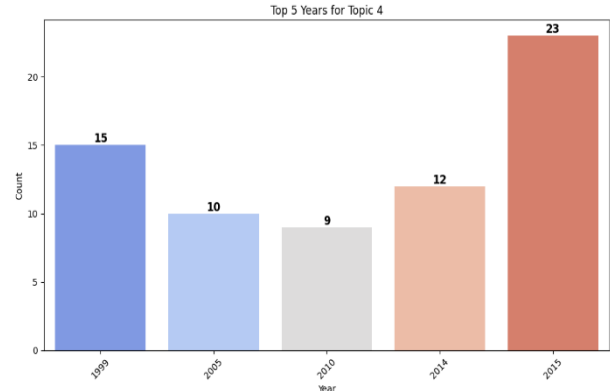


Figure 22. Top 5 Years for Topic 4 of Democracy

The temporal distribution of Topic 4 is around the start of the 21st century until the 2010s (See Figure 22). In 1999, the world faced new challenges in managing global affairs after the Cold War. That led to discussions about changing institutions and legal systems to address these issues. (Dzhyhora, Kuchmenko, Kovalchuk, Melnyk, & Hrab, 2024) By 2005, people started to question civil liberties and the growth of the European Union (EU), especially after the 9/11 in the United States. (Kaunert & Léonard, 2018) Tensions between state authority and democratic protests emerged by 2010 amid economic crises in Western countries. (Brancati, 2016) In addition, western concerns over democratic decline and institutional trust intensified in 2014 and 2015 because of Russia. (Arpino & Obydenkova, 2020)

Key Inferences from the Findings on Democracy Topics in United Nations General Debates

The findings show the main political transition and institutional developments on democracy issue, particularly in the region of Africa during the 1990s. In general, African countries at that time were focusing on democratic consolidation and inclusive governance. Reports and studies from that period such as Melber and Saunders (2001) and Nijzink and Piombo (2005) emphasize the emergence of formal democratic institutions and processes, which became central to defining political competition and representation

due to post-apartheid South Africa. These developments occurred in the broader context of a dramatic continental shift away from authoritarian regimes, with only four out of fifty-two African countries classified as stable democracies at the end of the 1980s (McFerson, 1992).

In addition to that, the temporal patterns align with the broader global discourse on governance reform and regional efforts to promote political pluralism amid ongoing challenges such as ethnic conflict, contested citizenship, and weak local governance structures (Joseph, 1999). These themes became prominent in policy documents and scholarly literature of the time to form a set of common narratives on democratic development. Therefore, the recurring concepts across the findings underscore the central challenges, institutional responses, and evolving international perspectives on democracy and governance in Africa during a transformative decade.

Topics Associating Economic Development with Democracy in United Nations General Debates

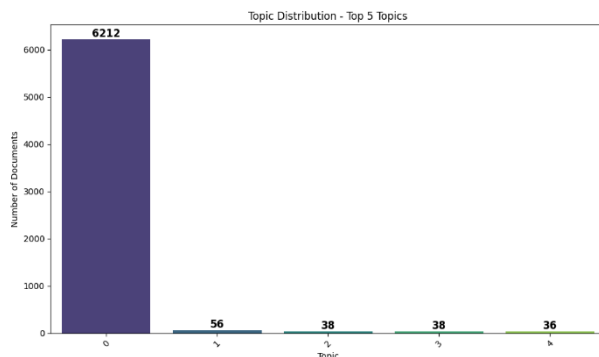


Figure 23. Topic Distribution for Top 5 Topics Associating Economic Development with Democracy

Figure 23 shows the topic distribution for associating economic development with democracy, and the results reveal a dominant concentration of Topic 0 in the datasets with 6,212 statements. The striking result may suggest Topic 0 is the central theme and widely stated theme about the relations between economic development and democracy in the debates. In contrast, Topics 1 to 4 have 36 to 56 statements in the datasets. The imbalance between Topic 0 and the rest may suggest the topic represents a mainstream and general understanding of how economic development and democracy interact. Meanwhile, the rest of the topics may suggest more localized contexts.

Topic 0 of Associating Economic Development with Democracy

Table 11. Keywords for Topic 0 of Associating Economic Development with Democracy

No	Keyword	No	Keyword
1	Country	6	Economic
2	Nation	7	Right
3	World	8	New
4	People	9	Organization
5	Development	10	Assembly

From the keywords in Table 11, Topic 0 shows an overlap between keywords for economic development and democracy. The keywords “development,” “economic,” “country,” “nation,” “world,” “new,” and “people” shared with the previously discussed topics of economic development. That means Topic 0 also points out the economic growth, development projection, and global connectivity as the focus of development, both from the government and the people. Meanwhile, the keywords “right,” “assembly,” and “organization” serve as the bridge to democracy by suggesting the participation and structure in the government. Overall, the theme of economic development appears more dominant in Topic 0 because seven out of ten keywords are directly related to that.

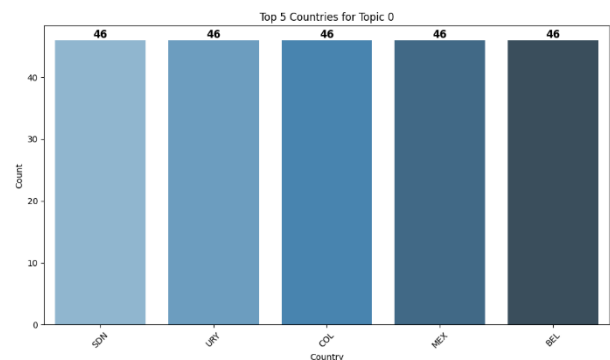


Figure 24. Top 5 Countries for Topic 0 of Associating Economic Development with Democracy

From Figure 24, the top 5 countries for Topic 0 are Sudan (SDN), Uruguay, (URY), Colombia (COL), Mexico (MEX), and Belgium (BEL). The countries are interesting because none of them ranked in the top five for any of the specific topics (Topics 0 to 4) related to economic development or democracy. This is important because it indicates that Topic 0 does not rely on well-known cases previously discussed, like Namibia, South Africa, Kenya, or Ethiopia for

economic development, or Lebanon, Israel, France, and the United States for democracy. Instead, Topic 0 takes a broader approach, discussing the association between economic development and democracy in general terms across different countries.

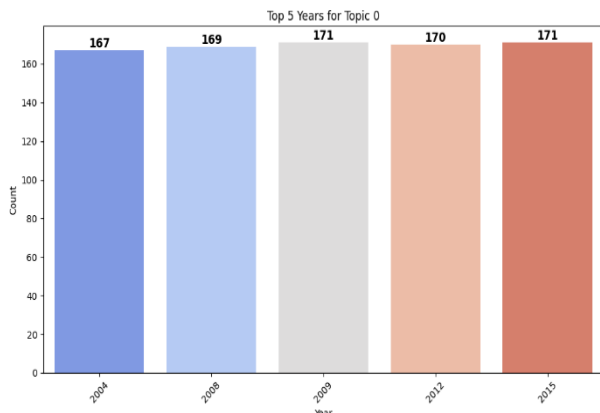


Figure 25. Top 5 Years for Topic 0 of Associating Economic Development with Democracy

The top 5 years for Topic 0 are 2004, 2008, 2009, 2012, and 2015 (See Figure 25). Previously discussed economic development and democracy shared between 2004, 2009, and 2015. For example, 2004 is present in Topics 1 and 4 of economic development and Topic 2 of democracy, 2009 appears in Topic 3 of economic development and Topic 3 of democracy, and 2015 is in Topic 4 of economic development and Topic 4 of democracy. These overlaps suggest an alignment between economic development and Democracy with the implementation of MDGs and its transition to SDGs. Meanwhile, 2008 was only in economic Development, and 2012 was only in democracy.

Topic 1 of Associating Economic Development with Democracy

Table 12. Keywords for Topic 1 of Associating Economic Development with Democracy

No	Keyword	No	Keyword
1	Republic	6	Human
2	Nation	7	Democratic
3	Country	8	World
4	Development	9	Process
5	Right	10	Law

The keywords “republic,” “nation,” “country,” “development,” “right,” “human,” “democratic,” “world,” “process,” and “law” in Table 12 show how Topic 1 has thematic overlap between economic development and democracy. For example, the keywords “country,” “nation,” “development,” “world,” and “process” suggest national progress and global interaction to achieve institutional capacity for economic development. Meanwhile, the keywords “republic,” “right,” “human,” “democratic,” and “law” may emphasize individual freedom and its legal basis to support participation in democracy. Based on how to balance the keywords for economic development and democracy, Topic 1 may be interpreted as a topic centered on how democratic principles are embedded within economic development to achieve growth and support inclusion.

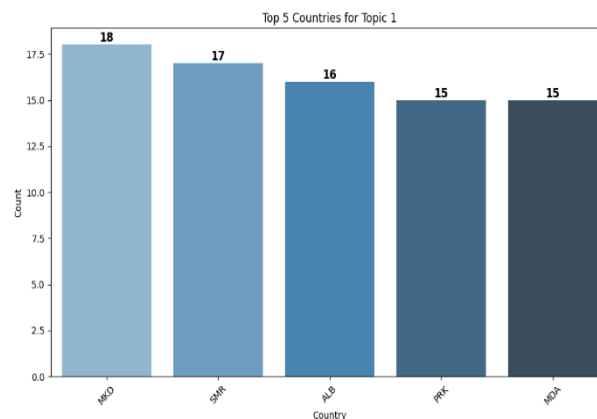


Figure 26. Top 5 Countries for Topic 1 of Associating Economic Development with Democracy

The top 5 countries for Topic 1 are North Macedonia (MKD), San Marino (SMR), Albania (ALB), North Korea (PRK), and Moldova (MDA) (See Figure 26). Topic 1 mainly represents smaller countries that have undergone political and economic shifts, such as North Macedonia, Albania, and Moldova. That means Topic 1 captures statements in the debates around countries in the process of state-building and democratization at that time. Topic 1 is also notable because none of the top 5 countries appear in the top 5 of any previously discussed standalone topic for economic development and democracy. That highlights how Topic 1 represents a separate theme compared to previously discussed topics.

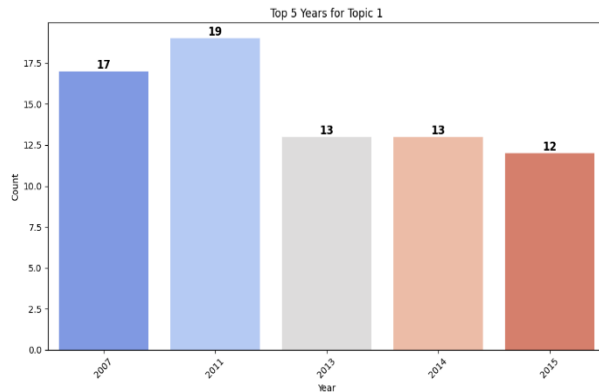


Figure 27. Top 5 Years for Topic 1 of Associating Economic Development with Democracy

From Figure 27, the temporal distribution for Topic 1 is 2007, 2011, 2013, 2014, and 2015. Compared to topics 0 to 4 of economic development, Topic 1 shares only 2014 and 2015. Meanwhile, Topic 1 aligns more closely with democracy because the overlaps are 2011, 2013, and 2014. These overlaps suggest the same surge of democratic issues observed in the early 2010s of the Arab Spring. However, based on the previously discussed top 5 countries of Topic 1, no Middle Eastern countries are present to align with the theme of Arab Spring. Therefore, these top 5 years are more outliers in the datasets.

Topic 2 of Associating Economic Development with Democracy

Table 13. Keywords for Topic 2 of Associating Economic Development with Democracy

No	Keyword	No	Keyword
1	Government	6	Process
2	Country	7	Political
3	Right	8	Nation
4	Human	9	People
5	Social	10	Development

Topic 2 centered around keywords "government," "country," "right," "human," "social," "process," "political," "nation," "people," and "development" (See Figure 13). Topic 2 also represents both economic development and democracy. For example, keywords like "development" and "country" may suggest economic growth, while "rights," "human," "political," and "people" relate to democracy. Compared to previous keywords, Topic 2 shares four keywords with democracy and three with economic development. Despite that, the tiny presence of Topic 2 suggests that while it

offers notable connections between democracy and development, it should be interpreted as a minor topic rather than a grand theme about associating economic development with democracy.

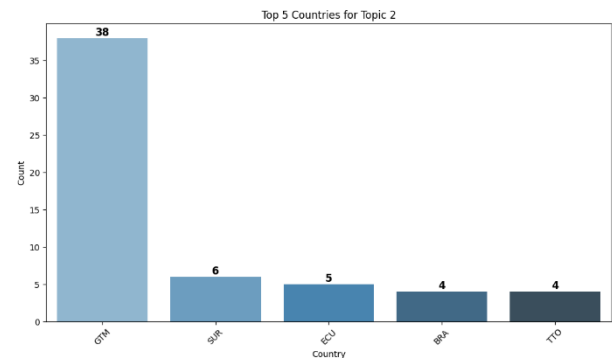


Figure 28. Top 5 Countries for Topic 2 of Associating Economic Development with Democracy

From Figure 28, the top five countries in Topic 2 are Guatemala (GTM), Suriname (SUR), Ecuador (ECU), Brazil (BRA), and Trinidad and Tobago (TTO). All of them are a notable cluster in Latin America and the Caribbean. Compared to countries that lead in other topics like economic development and democracy, they stand out because they are very different regions. This difference is notable because it shows that the issues in Topic 2 come from a specific context in this region. However, Topic 2 has a low presence, which means that while these countries offer valuable insights, their overall influence is limited to associating economic development with democracy.

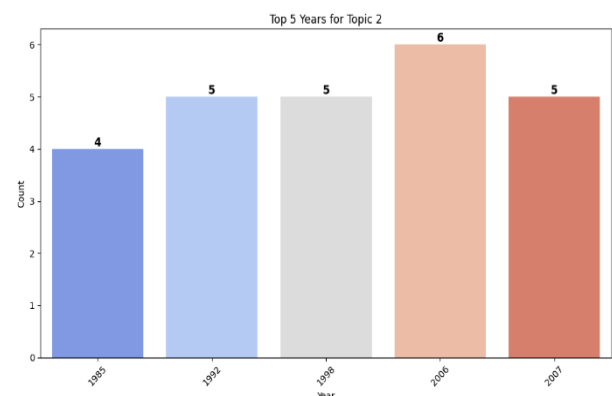


Figure 29. Top 5 Years for Topic 2 of Associating Economic Development with Democracy

The top 5 years for Topic 2 are 1985, 1992, 1998, 2006, and 2007 (See Figure 29). These years are different from economic development and

democracy. Economic development peaked in 2003, 2004, 2005, and again in 2014 and 2015. Democracy also had its highs, mainly between the 2000s and 2010s, with peaks in 2013, 2014, and 2015. However, Topic 2 focuses more on the late 1980s and 1990s. None of the top years for Topic 2 are among the top 5 years for any individual topics related to economic development or democracy. This may highlight how Topic 2 represents earlier stages of associating economic development with democracy.

Topic 3 of Associating Economic Development with Democracy

Table 14. Keywords for Topic 3 of Associating Economic Development with Democracy

No	Keyword	No	Keyword
1	Country	6	Organization
2	Government	7	Republic
3	People	8	Economic
4	National	9	Development
5	Political	10	Nation

From Figure 14, the keywords for topic 3 are “country,” “government,” “people,” “national,” “political,” “organization,” “republic,” “economic,” “development,” and “nation.” Those keywords show an overlap between economic development and democracy, especially with the keywords “economic” and “development” for economic development and the keywords “political” and “people” for democracy. Furthermore, the keywords “political” and “people” have the same theme as previous keywords for democracy such as “institution,” “citizen,” and “society.” While Topic 3 is an outlier because of minimal presence in the datasets, the topic may suggest a mutual reinforcement to associate economic development with democracy because of the balance between economic development and democracy keywords.

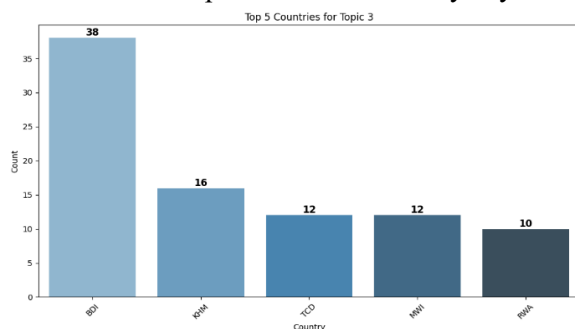


Figure 30. Top 5 Countries for Topic 3 of Associating Economic Development with Democracy

The top 5 countries for Topic 3 are Burundi (BDI), Cambodia (KHM), Chad (TCD), Malawi (MWI), and Rwanda (RWA) (See Figure 30). Those countries were not present in the previous discussions, both on economic developments and democracy topics. That may suggest how Topic 3 is focusing more on weak state-building, national rebuilding, and economic development through strong government rather than liberal democracy based on the previous keywords of “government,” “nation,” and “organization”. Those keywords highlight that rather than human rights or democratic participation just like any topic of democracy. Therefore, Topic 3 highlights countries where economic growth and democracy are framed as national governance issues under authoritarian authorities.

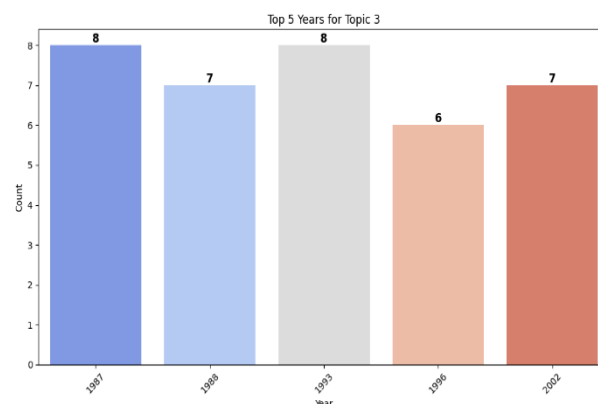


Figure 31. Top 5 Years for Topic 3 of Associating Economic Development with Democracy

From Figure 31, the years 1987, 1988, 1993, 1996, and 2002 are the peak for temporal distribution of Topic 3. The distributions are so different compared to the most temporal distribution for previously discussed topics on economic development and democracy. Most of the temporal distribution for economic development is in the 2000s and 2010s, such as 2001, 2002, 2011, 2014, and 2015, while most of the temporal distribution of democracy is primarily in the early 2000s and mid-2010s, including 2000, 2008, 2009, 2013, and 2014. Therefore, Topic 3 differs from the main periods typically discussed for economic development and democracy because it highlights an earlier historical era.

Topic 4 of Associating Economic Development with Democracy

Table 15. Keywords for Topic 4 of Associating Economic Development with Democracy

No	Keyword	No	Keyword
1	Nation	6	Life
2	New	7	Measure
3	People	8	Economic
4	Country	9	Political
5	World	10	Policy

As shown in Table 15, the keywords in Topic 4 are “nation,” “new,” “people,” “country,” “world,” “life,” “measure,” “economic,” “political,” and “policy”. By counting the keywords, Topic 4 may lean more toward economic development than democracy. Furthermore, keywords like “economic,” “policy,” “measure,” and “life” may suggest economic progress to improve the quality of life. Meanwhile, the keywords “political,” “people,” and “nation” relate more to the key democracy terms but still lack the presence of “democracy,” “institution,” “law,” or “rights” as the keywords that align more to a deeper understanding on democracy. Overall, Topic 4 is the least significant among the five topics in the datasets.

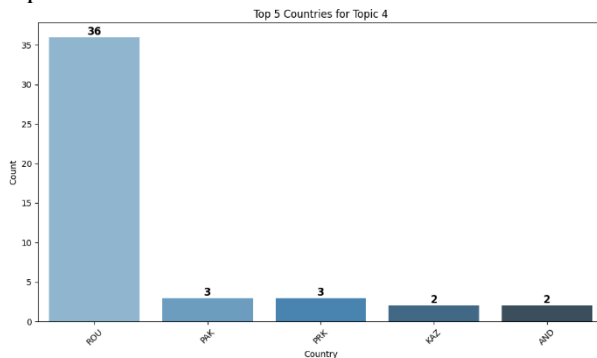


Figure 32. Top 5 Countries for Topic 4 of Associating Economic Development with Democracy

From Figure 32, the top 5 countries for Topic 4 are Romania (ROU), Pakistan (PAK), North Korea (PRK), Kazakhstan (KAZ), and Andorra (AND). Most countries in Topic 4 only appear in the topics associating economic development with democracy, not the previously discussed standalone topics in both economic development and democracy. For example, the previously discussed economic development topics have Namibia, South Africa, Kenya, Turkey, and India. In addition to that, the previously discussed democracy topics are the

United States, France, Mongolia, Lebanon, and Israel. Therefore, it highlights how Topic 4 is distinct and limited because of its small presence in the datasets.

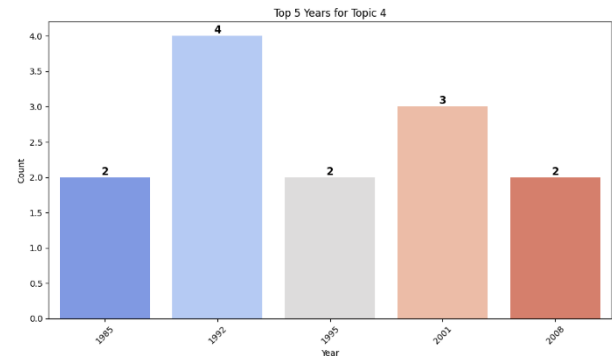


Figure 33. Top 5 Years for Topic 4 of Associating Economic Development with Democracy

The top 5 years for the temporal distribution of Topic 4 are 1985, 1992, 1995, 2001, and 2008 (See Figure 33). Topic 4 shows an uneven timeline and most of the years do not belong to the periods previously discussed topics. 2001 and 2008 may overlap with the same temporal distribution for economic development and democracy topics. However, 1985, 1992, and 1995 indicate that Topic 4 spans different temporal distributions. This uneven distribution suggests that Topic 4 might highlight unusual references to the associating economic development with democracy. Therefore, its unclear distribution and the small number of statements point to Topic 4's limited presence in the overall debates.

Key Inferences from the Findings on Associating Economic Development with Democracy in United Nations General Debates

The findings show the transition from the Millennium Development Goals (MDGs) to the Sustainable Development Goals (SDGs) in 2015. That marked a shift in the global development agenda by reflecting it with broader changes in the understanding of governance and economic progress (Mohammadi *et al.*, 2023). Findings from this period consistently highlight an association between economic development and the emergence or consolidation of democratic governance. That particularly shown by how development fosters changes in social structure and class dynamics. However, the complexity of this relationship became increasingly apparent

during the global policy shift. Especially when it comes to inequality, institutional strength, and broader global trends emerged as key factors influencing how development outcomes translated into democratic practices (Evelyn *et al.* 2020). Compared to the MDGs, the expanded scope of the SDGs brought renewed attention to these multidimensional influences because its impact is shaped by intersecting local and global dynamics (Mohammadi *et al.*, 2023). That also emphasizing how development can support democratization. The other themes in this period have recurring terms on inclusion, governance, and institutional capacity. That in return reveals a deeper narrative linking economic progress to democratic resilience. This reflects the growing recognition that democracy and development are not linear outcomes but interconnected processes shaped by a wider development framework and international policy discourse (Evelyn *et al.* 2020).

CONCLUSION

Applying BERTopic as the topic modeling framework for the United Nations General Debates 1970-2016 dataset reveals uneven political narratives on associating economic development with democracy. The association does not fully coexist across the countries, even when some keywords from economic development and democracy overlap, such as "development," "nation," "people," "world," "economic," and "political." Furthermore, Economic development and democracy topics differ by region. The Pacific Islands, Southern Africa, and Western Europe are in the economic development topic, while the Middle East, Central Asia, and Western countries are in the democracy. In addition, the topic that associates economic development with democracy includes countries not existed in the previous topics, such as Sudan, Uruguay, Colombia, and Mexico.

The association also does not fully coexist across the years in the dataset. The only temporal distribution that matches the topics of economic development, democracy, and associating economic development with democracy are 2008, 2009, 2013, 2014, and 2015. From the result and discussion, this research argues those temporal distributions align with the final implementation of the UN MDGs and its transition to UN SDGs. Therefore, this research concludes the answer for

“To what extent do the UN member states associate economic progress with democratic governance based on the patterns from the topic modeling?” as follow. The political narratives associating economic development with democracy happened in the later years of the dataset, where the MDGs and SDGs are the programs that encapsulate that narrative at the global level across different countries.

This research has two main limitations when applying BERTopic as the topic modeling framework to reveal the narratives on associating economic development with democracy. First, this research relies on the co-occurrence of keywords to guide BERTopic on economic development and democracy. That means improvement for the keywords needed because it opens up more nuance for modeling the topics. The second limitation is the dataset. Not all years have an equal number of statements. That means fewer statements may distort the visibility of specific topics, leading to possible biases in year-based interpretations. Because of that, this research suggests representative sampling to ensure the availability and volume of the data across years

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The author utilizes Generative Artificial Intelligence (AI) tools such as ChatGPT and Grammarly to support code generation and to detect errors on errors in grammar, spelling, punctuation, as the author is not a programmer and is not a native English speaker. Further details on the use of these tools may directed to the author via email.

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