Voting power in subregional multilateral development banks in Latin America and the Caribbean-The case of the CAF

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Abstract: Multilateral development banks (MDBs) are international institutions that provide financial assistance for the development of their member states. Decision-making of MDBs is undertaken by the representatives of shareholders by voting. This article uses the absolute Banzhaf power index to measure the voting power of the shareholders of subregional MDBs, which have a voting system with a layered structure of different stock classifications. Differences in the voting power of shareholders holding different classifications of stocks are analyzed. The article also aims to explore the influence of the special voting system in the protection of the voting power in developing countries in the subregional MDBs of Latin America and the Caribbean. This protection benefits the democracy and independence of countries in the region.
Keywords: MDBs; MDBs´ voting systems; decision-making power; democratic principles; Latin American development.

Resumen: Los bancos multilaterales de desarrollo (MDB, por sus siglas en inglés) son instituciones internacionales que ofrecen asistencia financiera para el desarrollo de los Estados miembros. La toma de decisiones de estos es llevada a cabo por los representantes de los accionistas por medio de la votación. Este artículo utiliza el Índice de Poder Banzhaf para medir el poder de voto de los accionistas de los MDB regionales que cuentan con un sistema de votación estructurado en capas de diferentes clasificaciones de acciones, y analiza las diferencias en el poder de voto de los diferentes accionistas. También explora la influencia que el sistema de votación de

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estos bancos tiene en la protección del poder de voto de los países latinoamericanos. Dicha protección es beneficiosa para la democracia y la independencia de los países de la región.
Palabras clave: BMD; sistema de votación en los BMD; poder de decisión; principios democráticos; desarrollo latinoamericano.

Summary: I. *Introduction*. II. *Definition of multilateral development banks (MDBs)*. III. *Subregional MDBs in Latin America—A financial institution for development and a tool for the integration of Latin America*. IV. *Comparison of Decision-making Mechanisms for Different Classifications of MDBs*. V. *Examples of the voting systems of different MDBs*. VI. *Differences in the voting systems of MDBs*. VII. *The Principle of Democracy and the Fragility of Democracy in Subregional MDBs*. VIII. *The mathematical explanation of voting power—The absolute Banzhaf index*. IX. *The voting power of the shareholders in subregional MDBs in Latin America under a special voting system—Taking the CAF as an example*. X. *The protection of the democratic principle in subregional MDBs in Latin America-Comparison between IDB and CAF*. XI. *Another example- The Inter American Development Bank (IDB)*. XII. *Conclusion*. XIII. *References.*

I. Introduction

A multilateral development bank (MDB) is a type of international financial institution that encourages development in poor nations. MDB loans to fund projects related to infrastructure, energy, education, environmental sustainability, and other areas that often have little or no interest for traditional banks. The governance mechanism and the decision-making mechanism of MDBs, which could affect the projects undertaken in low-income countries and regions, are influenced by the voting power of bank members. The distribution of the voting rights of member states is relevant to the shares of member countries and presents various scenarios in different kinds of MDBs. Among them, some MDBs in Latin America, such as the Development Bank of Latin America (CAF) and the Central American Bank for Economic Integration (CEBEI), adopt a shareholding structure that is similar to a dual-class equity structure, dividing their capital into different classes and subscribing to different entities, which have different voting rights in the affairs of the banks. Some of the MDBs in Latin America adopt this special equity structure, which is different from that of other global or regional MDBs.

This article aims to analyze the distribution of decision-making power of Latin American MDBs based on their member states´ voting rights, as well as its democratization. It addresses the equity structure and voting rights regulations of various MDBs, and then calculates and compares the power index of this system regarding the voting power of the member states in subregional MDBs based on probability theory.

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II. Definition of multilateral development banks (MDBs)

Multilateral development banks (MDBs) are international institutions chartered by two or more countries, including regional developing countries and donor countries, to provide financial assistance in the form of loans and grants to developing countries for economic and social development.[2] The status of MDBs in international society is unique. MDBs have a dual nature: one is the international financial system, and the other is the international development system. They have their own specific mandate, which is different from that of commercial banks; that is, they can fund complex and important projects in developing countries, including large infrastructure projects and social projects, in which commercial banks may hesitate to invest.[3]

1. Institutional structure of MDBs

The basic structure of MDBs is based on the design of the Bretton Woods institutions, which include three tiers: first, board of governors; second, board of directors; and third, senior management. Formally, shareholders have representatives on the board of governors, and all powers of the MDBs are allocated to those representatives. The board of governors oversees the a MDB and takes responsibility for the admission and suspension of member countries, changes in capital, agreements for cooperation with other international organizations, supervision of the board of directors, appropriation of strategies, distribution of profits, etc. The responsibility of the board of directors is to supervise and guide management. It approves loans, investments and the borrowing of fund. It handles other matters related to the enforcement of decisions by the board of governance. The management and the staff take charge of daily operations.

III. Subregional MDBs in Latin America—A financial institution for development and a tool for the integration of Latin America

Latin America and the Caribbean developed a network of subregional MDBs in the 1960s. This includes the Central American Bank for Economic Integration (CEBEI), referred to as Banco Centroamericano de Integración Económica (BCIE), and the Development Bank of Latin America, formerly referred to as the Corporación Andina de Fomento (CAF). These MDBs were built with the purpose of facilitating financial integration and cooperation in their respective subregions. They adopted the same organizational dynamics as global

[2] Rebecca M. Nelson et al., Multilateral Development Banks and International Finance 2 (Leah M. Groffe ed., 2010).

[3] José Antonio Ocampo et al., Regional Financial Cooperation 68 (José Antonio Ocampo ed., 2006).

and regional MDBs and are made up mostly by borrower member states and a small number of donor states.

The CAF and CEBEI are subregional MDBs constituted by developing countries in Latin America and the Caribbean, and they fill the gaps in international financial institutions in the region.

IV. Comparison of decision-making mechanisms for different classifications of MDBs

MDBs are generally classified into global, regional and subregional according to their scope and ambition. Global MDBs lend to countries in several continents and include the World Bank (WB) and the International Bank for Reconstruction and Development (IBRD), among others. Regional MDBs lend to just one continent, for example: the Asian Infrastructure Investment Bank (AIIB) focuses on the infrastructure of Asia, and the Inter-American Development Bank (IADB) is a partnership between the United States and 19 Latin American and Caribbean countries.

Subregional MDBs focus on a specific region that is smaller than a continent; for example, the Development Bank of Latin America (CAF) is composed of 20 countries in Latin America and the Caribbean, as well as Spain, Portugal, and 13 Latin American private banks, focusing on Latin America and the Caribbean.

V. Examples of the voting systems of different MDBs

1. The global MDB: The World Bank (WB)

The World Bank is a global MDB composed of 189 member countries. These countries are represented by the board of governance, the ultimate policy maker of the World Bank. The World Bank provides low-interest loans, zero- to low-interest credits, and grants to developing countries to promote development in various sectors.[4]

The International Bank for Reconstruction and Development (IBRD), the International Development Agency (IDA), and the International Finance Corporation (IFC) are the arms of the World Bank that provide loans. In these institutions, the voting power of each member is determined by the combination of basic votes and share votes. The basic votes of each member are the number of votes that results from the equal distribution among all members, provided that there are no fractional basic votes. The share votes of each member are

[4] The World Bank, *Global Gender Gap Persists,* (Feb.17, 2024), https://www.worldbank.org/en/home.

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the number of votes that result from the allocation of one vote for each share of stock held.

2. A regional MDB: The Asian Infrastructure Investment Bank (AIIB)

The Asian Infrastructure Investment Bank (AIIB) is an MDB focused on developing Asia but with members from all over the world, which invests in infrastructure and other productive sectors with the aim to foster sustainable economic development, create wealth and improve infrastructure connectivity. The share structure of the AIIB is a combination of basic votes, share votes and founding member votes. The basic votes of each member are equally distributed among all the members, with twelve percent of the aggregate sum of the basic votes. The share votes are equal to the members' shares of the capital stock of the bank, and for each founding member, the AIIB allocates six hundred founding member votes.[5] According to the Articles of Agreement of the AIIB, the decision-making institution is the board of governors. Each member appoints one governor and one alternate governor. The governor votes as the representative of the member state, and the alternate governor votes only in the absence of the governor.[6]

Some critical affairs in the AIIB are decided by a special majority vote that requires an affirmative vote of a majority of the total number of governors, representing no less than the majority of the total voting power of the members. Other times a super majority vote requiring an affirmative vote of two-thirds of the total number of governors is needed, representing no less than three-fourths of the total voting power of the members. Except for these situations, general affairs are decided by a majority of the votes cast.[7]

3. A regional MDB in Latin America and the Caribbean: The Inter-American Development Bank (IADB)

The Inter-American Development Bank (IADB) is the regional MDB of Latin America. According to the establishing agreement of the IADB, votes are constituted by basic votes and votes connected to shares. The quorum for decisions on regular affairs requires two-thirds of the total votes, and some special decisions require three-fourths of the total votes. However, whether the increased authorized capital will have voting rights is determined by the board of governance. The proportion of votes held by the member countries is regulated by

[5] Asian Infrastructure Investment Bank, Asian Infrastructure Investment Bank Articles of Agreement, art. 28, Dec. 25 (Asian Infrastructure Investment Bank, A.I.I.B) (2015).

[6] *Id.* art. 22.

[7] Sagasti & Prada, *supra* note 2.

the Establishing Agreement of the IADB and should not be reduced.[8] The total proportion of votes held by the USA and Canada is 34.5%, and as PangXun and HeYikun mentioned, the high proportion of votes makes it easier for these developed countries to form a winning coalition and then obtain leadership in the IADB, while other member countries are less likely to resist the leadership of the USA because of their inferiority in votes.[9]

4. Regional and subregional MDBs with special capital structure in Latin America: The Development Bank of Latin America (CAF) and the Central American Bank for Economic Integration (CEBEI)

The CAF and CEBEI have a special weighted voting system based on their own structure of shares; that is, there are multiple types of shares. The shares of these MDBs are usually divided into different classes corresponding to different kinds of subscription entities, and each entity has its own weight in voting power.

The voting system of the CAF is a typical example. According to its Constitutive Agreement, the capital of the CAF is distributed in three series: Series "A", Series "B" and Series "C". Series "A" is for subscription by the government of each member country or by public, semipublic or private institutions, as the former may designate. Series "B" is for subscription by governments or public, semipublic or private entities of member countries. Series "C" is for subscription by legal entities or natural persons from outside the member countries.[10] Series "B" and Series "C" have the same nominal values of US $5000.[11] Although every share of these three Series represents one vote, the CAF implements the decision-making mechanism of weighted voting rights in the form of a double majority. For example, according to Article 17 of the establishing agreement, decisions at regular shareholders meetings shall be adopted by a majority representing at least 60% of Series "A" shares, plus half plus one of the other shares represented at the meeting.[12] As another example, in the CEBEI, the stocks are divided into Series "A" for founding members and Series "B" for nonfounding members. However, the purpose of classification is to control the fixed shares of shareholders and protect the voting power of the founding members. In CEBEI, all kinds of stocks have the same weight of one vote, while the holders of Series "A", which are founding member countries,

[8] Inter-American Development Bank, Agreement Establishing: Inter-American Development Bank, art.8, sec.4, (Inter-American Development Bank, I.D.B) (1987).

[9] Xun Pang & Yikun He, *Power versus Institution: How does the United States Manipulate and Control Multiple Development Bank?* 9 World Economics & Politics, 4, 20-21 (2015).

[10] Corporación Andina de Fomento, CAF Establishing Agreement, art. 5 (Corporación Andina de Fomento, C.A.F.) (2015).

[11] *Id.*

[12] *Supra* note 10, art. 17.

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shall always have a percentage equivalent to 51% of the increase. The shareholders of Series "B" are non-founding regional countries and non-regional countries. Series "C" is an addition of shareholders of "A" and "B", to align the equity of value of the shares with their nominal value. On the other hand, the maximum shares of Series "B" that non-founding members and cooperating parties outside the member states can hold should be decided by the board of governance.[13]

In the process of the election of the board of directors, different kinds of shareholders have different weights of power. In the CAF, every shareholder of Series "A" shall appoint one director and the respective alternate. Each of the member states that holds stock of Series "B" shall appoint one director and the respective alternate, and the private banking and private financial entities can elect one director. However, the shareholders of Series "C" can elect only two directors and their alternates. In the CEBEI, five directors and their alternates are elected by the founding members, and no fewer than four directors and their alternates are elected by the nonfounding members and cooperation outside the member states.

VI. Differences in the voting systems of MDBs

In traditional global and regional MDBs, developed countries have more decision-making power, and the developing countries that are influenced by the policies and decisions of MDBs have less negotiation and decision-making power. The MDBs built later, especially the regional MDBs formed by developing countries, concentrate on the protection of the decision-making power of developing countries.

The voting system of subregional MDBs in developing regions, such as Latin America, has a unique power structure to protect the voting power of founding members. The model of MDBs in Latin America, such as the CAF, is very unique in comparison to that of other MDBs. This kind of voting system involves setting different kinds of shares representing different votes. The shares of stock of the MDBs are divided into different classes, one class of shares with superior voting rights and a second class of shares with inferior voting rights. This voting mechanism is divided into different criteria, and for each criterion, the percentage of votes is different. Making the decision requires the result of voting to satisfy different criteria simultaneously, and the shares of founding members represent a greater proportion of the decision-making process and the election process. For example, the CAF does not apply a simple majority,

[13] Banco Centroamericano de Integración Económica, Banco Centroamericano de Integración Económica Convenio Constitutivo, art. 4 Feb. 5, 2021 (Banco Centroamericano de Integración Económica, B.C.I.E, AG-6 2010).

and a larger percentage of the votes of Series "A" is required in the decision-making process.

VII. The principle of democracy and the fragility of democracy in subregional MDBs

One of the principles of democracy is that one of the all-affected-interests. This principle states that all those affected by a policy decision should be given opportunities to participate in decision-making.[14] The decisions of subregional MDBs, especially decisions concerning the float of funds and programs for development, influence the interests of countries inside the region directly and indirectly. Thus, the reasonable and balanced distribution of voting power among these countries is significant to the democracy of subregional MDBs.

However, the gap in the degree of development in different countries affects the investment and shares of countries and could influence the distribution of negotiation and decision-making power. One of the influences is from the donor countries outside the region of the MDBs. The donor countries (non-borrowing members) primarily benefit from investment in MDBs at the political level. According to the neo-Gramscian perspective, the formal participation of donor countries may be weighted in favor of the dominant powers or the voting power of shareholders, which could help donor countries promote their economic and political hegemony.[15] In this process, MDBs serve as a tool to promote the interest and influence of donor countries in the area by propagating "appropriate" socioeconomic policies and requiring borrowers to comply with standards and practices on a wide range of issues, which violates the original function of MDBs as international financial institutions and development organizations.[16] For example, the European Bank for Reconstruction and Development (EBRD), the regional MDB in Europe, provides resources and funds under the conditions of reform and the principle of democracy, and if the borrower states are not in conformity with democratic principles or are retracting on reforms, the funding of the EBRD may be curtailed or cut.

In this scenario, the EBRD plays an ideological role through conditional funding.[17] The role of MDBs as tools for promoting political influence brings about the problem of hegemony. In addition to promoting ideology, developed donor countries can affect the borrower countries of MDBs in international affairs. Guo Yifan reported that the congruity between countries in Latin

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[14] Kim Angell & Robert Huseby, *The All Affected Principle, and the Weighting of Votes,* 19 Politics Philosophy & Economics, 366, 368 (2020).

[15] Robert W. Cox, *Gramsci, Hegemony and International Relations: An Essay in Method,* 12 Cambridge Studies in International Relations, 162, 172 (1983).

[16] Ihsan U. Delikanli et al., Multilateral Development Banks: Governance and Finance 22 (Palgrave Macmillan ed., 2018).

[17] S*upra* note 13, at 17.

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America and the USA in the United Nations General Assembly is positively correlated with the total amount of stocks in MDBs.[18]

The other influence is from the countries that are in the dominant economic position in the region. The economic level varies among the developing countries within a region. In regional and subregional MDBs, countries with higher economic levels potentially could hold more shares than other countries. The projects and policies of MDBs concern the public interest of borrower countries, especially underdeveloped countries, which need more international economic aid. The countries at a lower level of development are influenced by MDBs, so it is important for these countries to maintain their voice in the process of decision-making to appropriately meet their development demand. Maintaining democracy in the decision-making process for developing countries is a significant problem for MDBs.

VIII. The mathematical explanation of voting power—The absolute Banzhaf Index

One of the power indices is the absolute Banzhaf index. It was first proposed by John Banzhaf in 1965. The theory of John Banzhaf is that in weighted voting games, the voting power is not necessarily proportional to the number of votes the voter can cast but rather to the effectiveness of the voter in a coalition. When the votes of a voter have a decisive effect in a coalition constituted by voters, the sum of the votes cannot meet the quota of the voting game.[19] For example, in a simple voting game with a quota of 6, voters A, B, C and D can cast 4, 3, 2, and 1 votes, respectively. In this game, the number of combinations is =16, and in these combinations, AB, AC, ABC, ABD, ACD, and BCD are total swing combinations, that is, combinations that cannot reach the quota without swing voters (the underlined items are swing voters). Thus, the absolute Banzhaf index divides power as follows: A = 5/12, B = 3/12, C = 3/12, and D = 1/12.[20] This simple example shows that the absolute Banzhaf index of the voters is the proportion of the number of times that the voters become the swing voters in the winning coalitions to the number of times all voters become swing voters.

[18] Yifan Guo, *Influence of Donor Interests on Infrastructure Investments by Multilateral Development Banks in Latin America,* 3 Comparative Economic & Social Systems, 183, 191-192 (2023).

[19] John Banzhaf, *Weighted Voting does not Work: Mathematical Analysis,* 19 Rutgers Law Review, *Nov. 25, 1965, at 317.*

[20] Philip D. Straffin, Game Theory and Strategy 185-187 (The Mathematical Association of America ed., 1993).

IX. The Voting Power of the Shareholders in Subregional MDBs in Latin America Under a Special Voting System—Taking the CAF as an Example

Rebecca Ray and Rohini Kamal calculate the voting power of different classifications of shareholders taking the shareholders of Series "A", Series "B" and Series "C" as a whole to calculate the voting power of each classification. To explore the voting power of regional and nonregional countries, this article calculates the Banzhaf index of every shareholder of the CAF in a complex layered voting system.[21]It uses the enumeration method to calculate the number of all the swing winning coalitions and the number of all the situations in which the voters can be swing voters.

Taking the adoption of the decisions at regular shareholder meetings as an example, in the voting system of the CAF, the criteria for passing a decision are 60% of the votes of Series "A" and half plus one votes of Series "B" or Series "C". According to these conditions, there are three classifications of winning coalitions containing swing voters from all the members: the first classification is the combination of 60% of the votes from the shareholders of Series "A", half plus one votes of the shareholders of Series "B" and any number of votes of the shareholders of Series "C". The second classification is the combination of more than 60% of the votes of the shareholders of Series "A", half plus one votes from shareholders of Series "B" and any number of votes from the shareholders of Series "C". The third classification is the combination of at least 60% of the votes of the shareholders of Series "A", at most half of the votes of the shareholders of Series "B" and half plus one votes of the shareholders of Series "C".

Because all the member states that hold Series "A" stocks are also shareholders of Series "B" stocks, and in Series "B", only commercial banks do not have Series "A" stock, this article assumes that the voters of Serie "A" are set like this: A= $\{a_1, a_2, a_3 ...\}$ (n≥0 and a_n round to integer)

Series "B" is set B= $\{b_1, b_2, b_3...\}$ (n≥0 and n round to integer). The quota of Series "A" is q, and the number of the least winning b_{n+1} voters in the coalition is w (n*q+1>w≥n*q, w round to integer).

The coalition of Series "C" is the set $\{c_1, c_2, c_3...c_m\}$, and the number of voters in the coalitions is k(k≥0).

$$\sum_{k=1}^{n} b \qquad \sum_{k=1}^{w} b$$

Supposing the subset of B, B_W= $\{b_1, b_2, b_3...b_W\}$, if > *50%, the subset B_W can meet the criterion, and each voter can be a swing voter. Then, B_W $\sum\binom{k}{m} C_m^k$ matches all the voting coalitions of Series "C", including 0 votes. According to the combination formula, the number of coalitions of all the shareholders of Series "C" is $=2^m$.

[21] Rebecca Ray & Rohini Kama, *Can South–South Cooperation Compete? The Development Bank of Latin America and the Islamic Development Bank*, 50 Development & Change, 191, 197-200 (2019).

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Suppose that the number of subsets B_W is W and that the number of swing voters in the first classification is S_1 =W* 2^m*w.

For the second classification, suppose that for the subset of B, $B_s = \{b_1, b_2, b_3...b_s\}$, (w<s≤n+1, s round to integer); if > $\Sigma_{k=1}^{s} b$ $\Sigma_{k=1}^{n} b$ *50% and $\Sigma_{k=1}^{s} b$ b - b ≤ $\Sigma_{k=1}^{n} b$ *50%, the element b concerns the swing voters. Suppose that b is sv_b.

For the third classification, in the subset $C_j = \{c_1, c_2, c_3...c_j\}$(0<j≤m, j round to integer), the voters of C could swing the voting result $\Sigma_{k=1}^{j} c > \Sigma_{k=1}^{n} c * 50\%$ if, $\Sigma_{k=1}^{j} c - c \leq \Sigma_{k=1}^{n} c * 50\%$ and $\Sigma_{k=1}^{w} b$ $\Sigma_{k=1}^{n} b \leq$ *50%. Suppose the number of c $\Sigma_{k=1}^{j} c - c \leq \Sigma_{k=1}^{n} c * 50\%$ that satisfies the condition is sv_c . Additionally, when the number $\Sigma_{k=1}^{s} b$ $\Sigma_{k=1}^{n} b$ of voters surpasses the quota, if ≤ *50%, the decision will be adopted. The number of $\Sigma_{k=1}^{w} b$ $\Sigma_{k=1}^{n} b$ subsets C_n^w B_W that meet the condition of ≤ *50% is -W. Suppose the number of subsets B_S is S, the number of voters of C that could swing the voting result is J, and the number of swing voters in the second classification is S_2 =$\mathcal{J}$* (C_n^w -W+S).

Therefore, the number of all swing voters is $S_1 + S_2 = W* 2^m*w+\mathcal{J}*$ (- C_n^w $W+S$)= $W*2^m*w+\mathcal{J}*$ [$n!w!(n-w)!-W+S$]. Suppose that the number of members that could swing the result of the voting coalitions is v, and the absolute Banzhaf index of the shareholders of Series "B" is β = S_2) = $sv_b/[W * 2^m * w + J * (C_n^w - W + S)$ sv_b /(S_1 +]The absolute Banzhaf index of the shareholders of Series "C" is β = $sv_c/(S_1+S_2)=sv_c/$ {W* 2^m *w+J* [n!w! (n-w)!-W+S]}.

Taking the situation of the subscribed capital of the CAF in 2021 as an example, the capital distribution of countries is shown in Table 1.

Table 1. Shares of countries in 2021[22]

Countries	Series "A"	Series "B"	Series "C"
Bolivia	1	62360	
Colombia	1	199613	
Ecuador	1	65115	
Peru	1	211432	
Venezuela	1	93021	
Brazil	1	94284	
Panama	1	37793	
Uruguay	1	39026	
Argentina	1	119079	
Paraguay	1	37313	

[22] Table 1 is made by the author. The data was taken from annual report of the CAF for the years 2021 and 2022.

Trinidad and Tobago	1	28037	
Barbados			3522
Chile			5541
Costa Rica			11038
Dominican Republic			10556
Jamaica			182
Mexico			15367
Portugal			1920
Spain			51939
Sum of Shares		984570	100065
Quota of Regular Meeting	7	492285	50032.5

According to this figure, to reach the criterion of at least 60% of votes for Series "A", the number of voters should be more than 11*60%=6.6; thus, w=7. Therefore, the number of coalitions that meet this criterion should be $C_{11}^{7}\left(\frac{7}{11}\right)$ =11!7! *(11-7)!=330.

The number of winning coalitions of Series "B" is 298,[23] and the number of failed coalitions of Series "B" is 330-298=32.

In coalitions of voters in Series "C", when the sum of votes of the coalition has reached half plus one votes of the shareholders of Series "C", the voters of Series "C" can only affect the result when the voters of Series "A" reach the criterion of 60% and the coalitions of Series "B" fail simultaneously; this situation belongs to the second classification of the winning coalition. When the sum of all shares of stock in these winning coalitions minus the shares of stock in one country is equal to or less than half of all shares of stock of Series "C", then this country is the swing voter, and this coalition is the swing coalition. In this example, the number of swing voters is 127, so the number of swing voters belonging to the second classification is 127*(330-298+38)=4064.

The calculation of the sum of the swing voters is shown in Table 2:

[23] In this article, the author uses the Python computer program to calculate the winning coalitions, and designed a command composed of *for loop* and conditional *if* statements to iterate all the combinations and judge whether the sum of the shares in the combination has reached the quota.

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Table 2. Example of The Calculation of The Swing Voters[24]

Swing type	Swing ways	Swing votes of Series "A" & Series "B"	Swing votes of Series "C"
A: 60% votes B: Half plus one votes C: Any votes	$298 \times 2^8 = 76288$	$298 \times \times 7 = 534016$	
A: More than 60% of votes B: Half plus one votes C: Any votes	$360 \times 2^8 = 92160$	$747 \times = 191232$	
A: At least 60% of votes B: Less than half plus one votes C: Half plus one votes	$127 \times (330 - 298 + 38) = 8890$		$127 \times (330 - 298 + 38) = 8890$
Sum of swing voters			734138

This article used the Python program and the command made by the author to analyze the specific voting structure of CAF to calculate the number of swing voters. It will take the capital and the distribution of the voting power of the voters in 2021 as an example to explain how the computer program calculates the number of winning coalitions and swing coalitions.

In the first classification, the decision-making process needs 70% of votes in Series "A", which means in 2021, the value of q is 7. The computer program the quota in Series "B" and Series "C", which should reach half plus one according to the rule. The program uses the *for loop* statement and the conditional statement *if* to calculate the value of W, the number of the coalition of 60% of Series "A" and half plus one votes of Series "B". In this classification, when the program randomly takes the 7 countries holding the shares of Series "A" and "B", and calculates their total votes, when the number of total votes reaches the quota, the boolean of the conditional statement will be "true", then the program will calculate and output the number of the "true" coalitions.

In the second classification, the number of coalitions which will fail to pass the decision without the swing voters is ^{SV}b also calculated by the *for loop* and *if* statements in the similar code. After calculating the total coalitions in different classifications and the number of winning coalitions and swing coalitions, the power index can be calculated mathematically. The absolute Banzhaf index (β) of all shareholders of 2021 is shown in Table 3.

[24] Table 2 is made by the author. This table is an example to show the calculation process of power index.

Table 3. Absolute Banzhaf Index (β) of All Shareholders of 2021[25]

2021	60%	> 60%	The number of swing voters	Absolute Banzhaf index
Series "A" & Series "B"				
Argentina	188	81	68864	0.093802528
Bolivia	186	44	58880	0.080202905
Brazil	188	65	64768	0.088223195
Colombia	209	176	98560	0.134252688
Ecuador	186	44	58880	0.080202905
Panama	183	22	52480	0.071485198
Paraguay	183	22	52480	0.071485198
Uruguay	183	22	52480	0.071485198
Peru	191	191	97792	0.133206563
Trinidad	183	0	46848	0.063813615
Venezuela	188	65	64768	0.088223195
Series "C"				
Barbados	0	0	0	0
Chile	0	0	0	0
Costa Rica	0	0	0	0
Dominican Republic	0	0	0	0
Jamaica	0	0	0	0
Mexico	0	0	0	0
Portugal	0	0	0	0
Spain	127	7	8890	0.01210944

Using this method, the absolute Banzhaf index of shareholders from 2001 to 2021 was calculated and is shown in Table 4.

[25] Table 3 was made by the author.

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Table 4. Banzhaf index of CAF from 2001 to 2021[26]

Country	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Argentina	0	0	0.004164739	0.004408658	0.006172462	0.009599511	0.010285679	0.018254648	0.017258232	0.02189405
Bolivia	0.060769109	0.0625	0.059231837	0.062700915	0.062580211	0.062610822	0.06250763	0.062622309	0.062557273	0.076929681
Brazil	0.014717519	0.02734375	0.027070801	0.012246273	0.017417344	0.017242434	0.016634111	0.012322652	0.014005132	0.076929681
Colombia	0.131666403	0.270833333	0.256671294	0.271703967	0.271180916	0.271313564	0.270866398	0.27136334	0.271081516	0.197819181
Ecuador	0	0.0625	0.059231837	0.062700915	0.062580211	0.062610822	0.06250763	0.062622309	0.062557273	0.076929681
Panama	0.000474759	0.00390625	0.006709857	0.002939105	0.003116788	0.002384592	0.001922842	0.00272138	0.003940375	0.076929681
Paraguay	0.000474759	0.00390625	0.006478482	0.00269418	0.002750107	0.001956588	0.001617629	0	0.001557823	0
Peru	0.212691882	0.270833333	0.256671294	0.271703967	0.271180916	0.271313564	0.270866398	0.27136334	0.271081516	0.197819181
Trinidad and Tobago	0.000474759	0	0.000462749	0.000489851	0.000305567	0.000122287	0.000152607	0.0000917319	0.000213819	0
Uruguay	0	0	0.002776492	0.002081866	0.003483469	0.003852033	0.003570993	0.004433708	0.00644511	0.076929681
Venezuela	0.212691882	0.208333333	0.256671294	0.271703967	0.271180916	0.271313564	0.270866398	0.27136334	0.271081516	0.197819181
Commercial Bank	0	0	0	0	0	0	0	0	0	0
Barbados	0	0	0	0	0	0	0	0	0	0
Chile	0.000474759	0	0.001619621	0.000734776	0.000672248	0.000428004	0.004608717	0.003332926	0.002657462	0
Costa Rica	0	0.00390625	0.009949098	0.005755748	0.005072419	0.003729746	0.002716396	0.001742906	0.001557823	0
Dominican Republic	0	0	0	0	0	0.001834301	0.002655353	0.002660225	0.002779644	0
Jamaica	0.000474759		0.000462749	0.000122463	0.000305567	0.000122287	0.0000917319	0.001100783	0.0000305455	0
Mexico	0.000474759	0.00390625	0.019666821	0.008939779	0.008128094	0.005502904	0.00375412	0.00272138	0.002229825	0
Portugal	0	0	0	0	0	0	0	0	0	0
Spain	0	0	0.032161037	0.019104185	0.013872762	0.014062978	0.014375534	0.011283023	0.008949844	0

[26] Table 4 is made by the author. The data is from annual reports of the CAF from 2020 to 2021, and calculated through Python program made by author.

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Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Argentina	0.087550884	0.087322074	0.09005713	0.097029394	0.099282982	0.094283544	0.097770964	0.099516602	0.100178465	0.100124542	0.094423237
Bolivia	0.07295907	0.070801682	0.073246466	0.073507116	0.07358621	0.072365229	0.073328223	0.074724747	0.076607061	0.078254335	0.080733623
Brazil	0.087550884	0.087322074	0.087655607	0.091148824	0.092274771	0.094283544	0.09358078	0.091834619	0.089086039	0.089872882	0.088806985
Colombia	0.162941922	0.155763699	0.157299787	0.151130631	0.162040483	0.12768288	0.125007161	0.127101906	0.127562889	0.12917091	0.135141064
Ecuador	0.07295907	0.070801682	0.073246466	0.073507116	0.07358621	0.072365229	0.073677405	0.074724747	0.076607061	0.081329832	0.080733623
Panama	0.062015209	0.057821373	0.060038087	0.058217636	0.060737824	0.066102854	0.068439675	0.06913785	0.069327657	0.071078173	0.071958229
Paraguay	0.143486171	0.048381149	0.050431993	0.058217636	0.060737824	0.066102854	0.068439675	0.068439488	0.069327657	0.070394729	0.071958229
Peru	0.066879147	0.160483811	0.164504357	0.157011201	0.153012595	0.133597346	0.133387529	0.130593717	0.128949442	0.130537798	0.071958229
Trinidad and Tobago	0	0.003908843	0.001491571	0.002159272	0.002155846	0.066102854	0.065297037	0.06564604	0.065861274	0.069711285	0.134088017
Uruguay	0.062015209	0.062541485	0.064841134	0.067626547	0.065409964	0.067494493	0.069487221	0.069836212	0.070020934	0.071761617	0.064235883
Venezuela	0.162941922	0.155763699	0.157299787	0.152306745	0.153012595	0.130814068	0.124308797	0.121165828	0.119590209	0.100807986	0.088806985
Commercial Bank	0	0	0	0	0	0.00034791	0	0.000349181	0.000346638	0.000683444	0
Barbados	0	0	0	0	0.000513297	0	0	0	0	0	0
Chile	0	0.003908843	0.001491571	0.001295563	0.00153989	0	0	0	0	0	0
Costa Rica	0	0	0.00049719	0.000431854	0.000513297	0	0	0	0	0	0
Dominican Republic	0	0.003908843	0.001491571	0.002159272	0.001745209	0	0	0	0	0	0
Jamaica	0	0	0	0	0.000102659	0	0	0	0	0	0
Mexico	0.018700512	0.003908843	0.001491571	0.002159272	0.002155846	0	0	0	0	0	0
Portugal	0	0	0.00049719	0.000431854	0.000307978	0	0	0	0	0	0
Spain	0	0.0273619	0.014418522	0.011660066	0.010984549	0.008457197	0.007275535	0.006929062	0.006534673	0.006272467	0.005572375

As shown in Chart 1, the indices of Peru, Venezuela and Colombia increased to more than 25% until 2009, and then decreased from 2010 to 2021. Bolivia, Ecuador, Brazil, Uruguay, Trinidad and Tobago, and Argentina show an upward trend. The index of Paraguay first increased abruptly and then decreased in the same way, after which it gradually increased from 2012 to 2021. Jamaica, Costa Rica, Mexico, Spain and Portugal remain at a stable low level of less than 5%. Fluctuation of the index usually occurred in 2011 and 2012.

Chart 1. Banzhaf Index of CAF from 2001 to 2021
(Regular Shareholders' Meetings)[27]

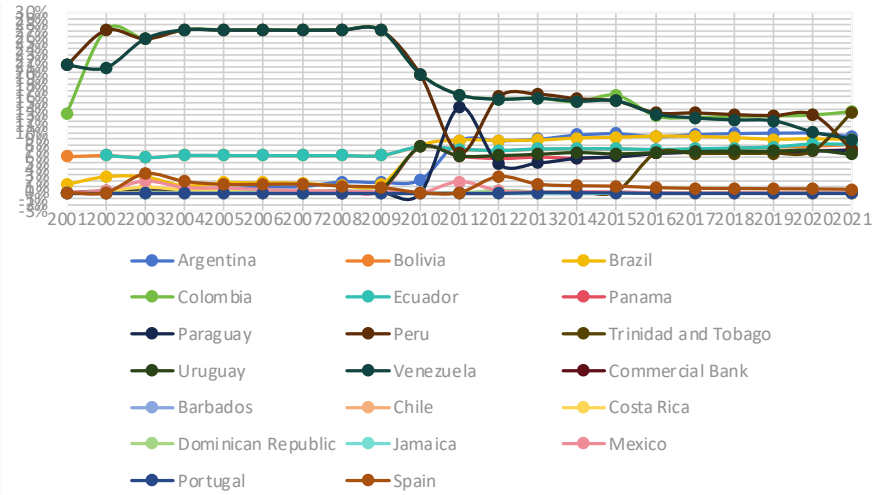


Chart 2 shows the absolute Banzhaf index of special shareholders´ meetings, in which decision adoption requires 80% of Series "A" votes and half plus one of Series "B" or "C" votes. In this chart, none of the shareholders of Series "C" have any voting power. The absolute Banzhaf index of shareholders shows a decreasing trend. The absolute Banzhaf index of Ecuador and Venezuela decreased in 2009, in which Uruguay held Series "A" and Series "B" stock; then, the absolute Banzhaf index of members declined when the countries holding stock of Series "A" and Series "B" increased. In 2021, the voting power of member states holding Series "A" and "B" was not obviously different.

[27] Chart 1 is made by the author. The result of power index is from Table 1.

Chart 2. Banzhaf Index of CAF from 2001 to 2021
(Special Shareholders' Meeting)[28]

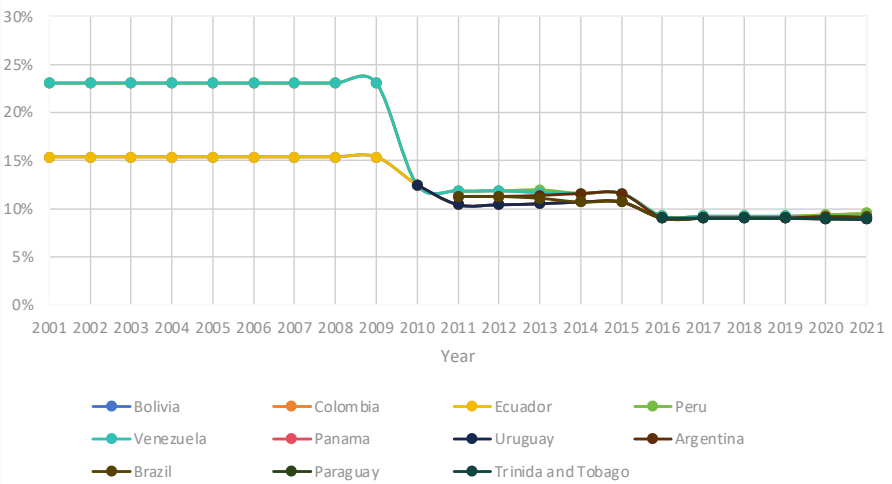
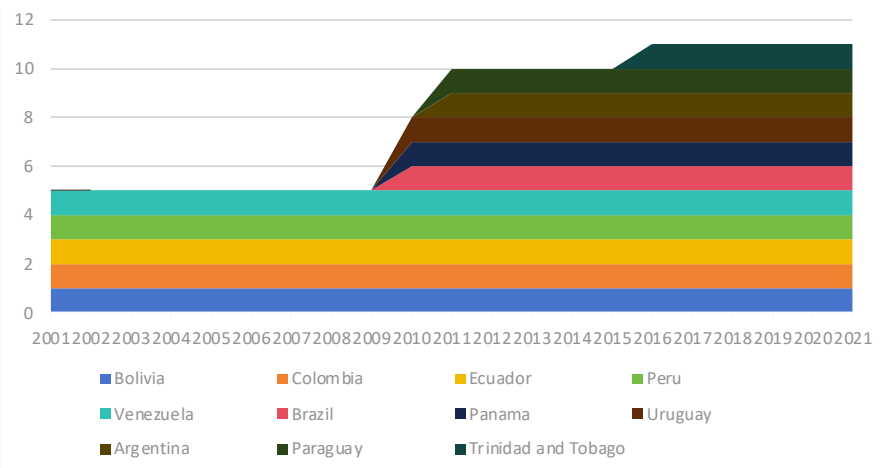


Chart 3 shows the trend of the number of shareholders of Series "A" stocks. According to Chart 3, from 2001 to 2009, the shareholders of Series "A" stocks were Bolivia, Colombia, Ecuador, Peru and Venezuela. From 2010 to 2015, Argentina, Brazil, Panama, Paraguay, and Uruguay held Series "A" stocks, and after 2016, Trinidad and Tobago joined the group of shareholders of Series "A".

Chart 3. Shareholders of Stock Series A[29]



[28] Chart 2 is made by the author. The power index is calculated by the author using the data of shares from annual reports of the CAF from 2020 to 2021.

[29] Chart 3 is made by the author. The data is from the CAF annual reports from 2001 to 2021.

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Although nearly all the member states have increased their shares of stock, the trends in the voting power of different members are mixed. As the number of shareholders of Series "A" increased, the voting power of the member states that initially held Series "A" stocks declined when the new countries joined the group, while the voting power of new members that gained Series "A" stocks increased when they first obtained them, to then decrease when more member states obtained Series "A" stocks in the series.

X. The protection of the democratic principle in subregional MDBs in Latin America-Comparison between IDB and CAF

Rebecca Ray and Rohini Kamal mentioned that in practice, the arrangement of the CAF voting system gives nearly equal decision-making power to Series A shareholders, regardless of their widely varying levels of Series B stock, and gives almost no power to Series "C" shareholders.[30] An economic gap exists not only between developed donor countries and developing member countries but also between developing countries at higher or lower levels of development in the region. To analyze whether the distribution of the voting power of subregional MDBs in Latin America can protect the democracy and equality of the MDBs, the influence of both nonregional developed countries and regional countries with dominant economic status needs to be explored.

Latin America and the Caribbean form the region with the largest external debt relative to GDP, and many countries in the region are affected by MDB programs and funds.[31] The regional and subregional MDBs in Latin America and the Caribbean are important supplements to the large MDBs in providing floating capital to the countries in this region, so the democratic governance of these banks, especially the all-affected-interest principle is a very important guarantee for the countries in this region.

In Latin America, the level of economic development varies among countries, and the structural gaps in poverty, inequality and productivity widened after the COVID-19 pandemic. Brazil, one of the BRICS countries, is an important emerging economy in the world. Additionally, Brazil, Mexico and Argentina are members of the G20. According to H. Wurf, the G20 has played an important role in promoting and directing investments focused on infrastructure in terms of quality and quantity.[32] Generally, the member states of the G20 have strong voting power in all MDBs, and while few G20 countries are members of the regional and subregional MDBs, they still have greater power

[30] Ray & Kama, *supra* note 20.

[31] ECLAC, *The Recovery Paradox in Latin America and the Caribbean Growth Amid Persisting Structural Problems: Inequality, Poverty and Low Investment and Productivity*, (Feb.17, 2024) https://repositorio.cepal.org/server/api/core/bitstreams/fe4f8baa-26bb-416f-9adb-dbb1d4e00d67/content.

[32] Wurf H., *Promoting Infrastructure Investment: The G20 and the Multilateral Development Banks*,12 International Organisations Research Journal, 230, 235-236 (2017).

at the country level.[33] Although the economic development level of countries has no absolute connection to the shares they hold, countries with a higher level of economic development potentially invest more capital and obtain more shares. In contrast to these countries, some member countries in Central and South America have a lower level of economic development, and others, such as Venezuela, even face sanctions and a weak economic situation. The less-developed countries need more assistance from subregional MDBs and are more easily affected by MDB policies and programs, but their voting power may be undermined by the countries that have the ability to hold more shares, which violates the all-affected-interest principle and is not in conformity with the democratic spirit.

The statistics of the voting power index in the CAF indicate that the democratic principle is protected under the voting system of subregional MDBs in Latin America and the Caribbean, such as the CAF and CEBEI. That is, the negotiation and voting power of developing countries within the specific region is protected, and a balance of voting power is reached because the shareholder countries have different economic levels. This voting system limits the influence of donor countries and commercial banks by allowing them to maintain less voting power in the hierarchy of shares. The shareholders of Series "C" in the CAF and the shareholders of Series "B" in the CEBEI have less voting power as a result of the design of the voting system. In contrast, the shareholders of Series "A", including some less-developed countries, have stronger voting power relative to the capital they invest. This distribution of voting power protects the voting power of borrower countries. As the subregional MDBs are composed of developing countries, this kind of complex voting system protects the democracy of the core members made up of shareholders of Series "A"[34] and shields democracy in the MDBs from the control of donor countries.

Additionally, the unique voting system of subregional MDBs, such as the CAF, can maintain a balance between G20 countries and other developing countries in Latin America. Since an economic gap exists between G20 countries and other countries, one concern about democracy in the MDBs is that developing countries with worse economic situations are less likely to gain enough influence and negotiation power.[35] However, as Chart 4 shows, under the voting system of the CAF, developed countries outside Latin America and the Caribbean and the G20 countries in Latin America do not have decisive superiority in terms of voting power compared with other countries in Latin America and the Caribbean, which have much lower GDPs. Moreover, because the voting power is diluted by the newly entered shareholders of Series "A", the gap in voting power tends to shrink.

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33 S*upra* note 13, at 99.

34 Ray & Kama, *supra* note 20.

35 Nelson et al., *supra* note 1 at 20.

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This is because the power structure of the CAF is not similar to that of IADB, as shareholders who have more shares do not have a large advantage in forming winning coalitions required by regulations.[36] The voting power tends to be distributed increasingly equally among the core member states, and the voting system balances the voting power between G20 countries and other countries in Latin America, which reflects the all-affected-interest principle. Thus, the hierarchy of the shares and unique voting system in the subregional MDBs in Latin America, which protects the voting power of developing countries with lower GDPs, is significant for protecting the interests of these countries and maintaining the principle of democracy.

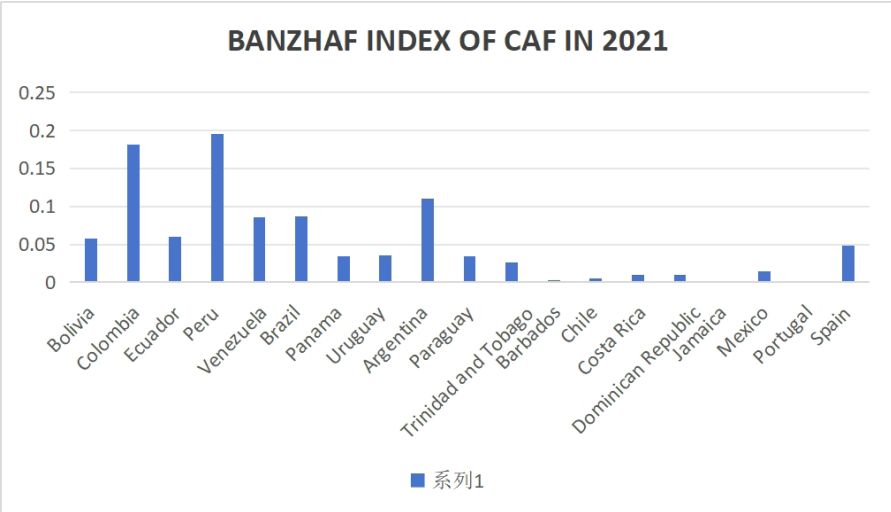
XI. Another example- The Inter American Development Bank (IDB)

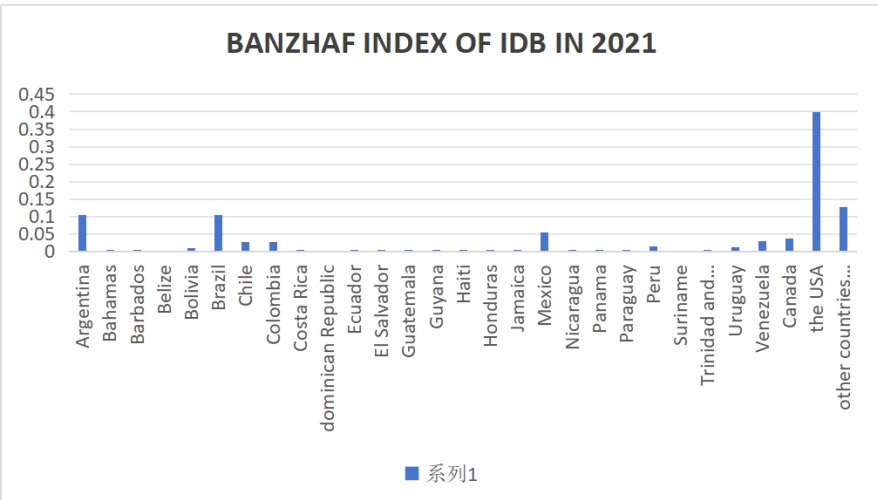
The IDB and the CAF are the two biggest MDBs in Latin America. IDB is the main source of financing of infrastructure in Latin America, and has 26 borrowing member states. Most of the loans has been provided to the borrowing member states. For example, in 2023, the sovereign guaranteed projects focused on countries like Argentina, Brazil, etc. The structure of voting power in IDB is to grant every votes equal weight of power, while the USA and Canada hold fixed share which accounts 34.5% of total votes. So the power index of member states could be calculated in the traditional way, that is, count the proportion of the swing voters in all winning coalitions.

This article use the calculator of power index provided by Generating Functions Program ipgenf (https://homepages.warwick.ac.uk/~ecaae/ipgenf.html). Because the shares of capital stock of IDB has been stable from 2001 to 2021 in the gross[37], this article will only calculate the Banzhaf Index of countries in IDB in 2021.

[36] For example, in 2021, Peru held most of the shares of Series "B", and the shareholding ratio of Peru is 21.47%, and the power index of Peru is 7.20%, while in IADB, the largest shareholder hold the votes in the percentage of 34.5% that is fixed by the establishing agreement. Additionally, the Establishing Agreement of the CAF did not maintain the number of shares in a standard.

[37] According to the annual report of IDB in 1999, the share of stock of total regional developing members was 50.057%, the USA was 30.031%, and Canada was 4.004%. In 2023, the share of stock of total regional developing members was 50.015%, the USA was 30.006%, and Canada was 4.001%.





Variance is the measure of the variability. The larger the value of variance is, the higher the degree of dispersion of data is. The power index in CAF is 0.003294222, while the variance of the power index in IDB is 0.006040731, which means the gap of the power index of IDB is larger than in CAF, and the degree of equality of IDB is lower than CAF. From the chart, it can be seen that the voting power of the USA is larger than that of other countries, which means it has a larger influence on the decision-making progress of IDB.

From the annual report from CAF and IDB, it could be known that the focus of both MDBs is different, which will have different influences on member countries. For example, in the annual report of IDB, the cross-cutting issues that IDB has positively acted on by approving operations are climate change and environmental sustainability, gender and diversity; institutional capacity,

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and the rule of law. IDB has invested $500 million in the sovereign guaranteed projects of the program to strengthen equality and equity policies for women and diverse populations in Colombia, which accounts for a much larger proportion of the investment to programs like Energy Efficiency ($34.5 million) or the Bogotá Subway Line ($50 million). In CAF, the significance of Bogotá Subway Line and the Gender, Inclusion, and Diversity Sector Program is relatively equal ($250 million and $255 million). This difference presents a different perspective of the program.

Another example is Ecuador. The loans from IDB concentrated on the energy transition ($500 million) and programs in water and sanitation ($125 million). They also support the innovation ecosystem and the reduction of the digital divide in education. In the energy sector, CAF concentrated on expanding the network of electricity distribution for aquaculture, and in the education sector, on infrastructure, connectivity, high school reforms and professionalization of teachers; also, it invested $125 million totally in water and sanity program.

Divergence exists between CAF and IDB in the prospect of development and the decision of the investment programs in Latin America. The different decisions derive from the different decision-making systems. In IDB, the voting power rests with the USA and Canada. Thus the decisions of IDB is affected by the attitude of these two advantaged voters, which does not conform with the all -affected-interest principle, and may cause the risk that the decision is inappropriate to the demand of Latin America.

XII. Conclusion

The subregional MDBs in Latin America distribute voting power in a unique way. The shares are divided into different classifications, and stocks are assigned different weights through the regulation of the voting process. This article uses the absolute Banzhaf index to measure the voting power of the members states, and compares the voting power of countries investing in the CAF. Through the calculation and comparison of the absolute Banzhaf index of different countries investing capital in the CAF, this article shows that the original founding member states and some states in Latin America are granted shares of Series "A" and have more voting power, while the donor countries outside the core member countries are granted the shares of Series "C" and have much less voting power.

According to this voting system, developed countries outside the member states have less control of the MDB and are less likely to influence the less-developed countries in Latin America through financial investment. Additionally, the distribution of voting power among shareholders of Series "A" is relatively equal, and in comparison with less-developed countries, the larger economies in Latin America and the Caribbean have no absolute superiority. The gap in

voting power shrank as countries joined the group of Series "A " shareholders. The low-income countries of Latin America, which have less influence and less negotiation power in international society, can maintain their voting power in these subregional MDBs and are more likely to benefit from decisions made by member states that are appropriate for the developing member states, especially countries with lower levels of development.

This voting power structure is adapted to the economic situation of Latin America and the Caribbean and supplements the funding gap for less-developed countries, allowing them to obtain more decision-making power. In other MDBs investing countries in Latin America without this kind of system such as IDB, the decision-making power rest in developed countries which have divergent prospect in the development of Latin America. This may cause the risk of mismatch of loans. Thus, a voting system such as the one the CAF has, helps developing countries in Latin America and the Caribbean to maintain independence from the developed donor countries. The voting power of countries with different levels of development within the region remains relatively equal, which benefits the democratic principle of the subregional MDBs.

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