

Original Article

GDP and Per Capita Income Inequality of Provinces of Nepal

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Abstract: The economic growth of a nation is complexly connected to the growth and development of its provinces. This holds for the Federal Republic of Nepal as well, where the performance of its provinces significantly contributes to the economic progress of the nation. This study aims to explore the contribution of provincial Gross Domestic Product (GDP) to the National GDP to understand the extent of their interdependence. Additionally, the research delves into income inequality within the provinces. Employing a quantitative approach, this research utilizes secondary data obtained from the National Office of Statistics in Nepal. The examination of income inequality, as determined by the Gini index, demonstrates that income distribution falls within an acceptable range. The study highlights the importance of the contribution seven provinces have made to the overall national economy of Nepal. The study also depicts the state of income inequality, a key element of Nepal's economic development. The results add to the corpus of information already available on regional economics and provide a basis for future policy deliberations and endeavors targeted at attaining equitable and sustainable economic development in Nepal.

Keywords: GDP, Gini index, Income Inequality, Regional Economic growth.

I. INTRODUCTION

Following the adoption of its new constitution in 2015, Nepal saw a profound political shift as it adopted federalism. It has become a federal country with seven provincial governments and one federal government. The federal government is entrusted with the responsibility of overseeing the overall national economy. It formulates policies, allocates resources, and coordinates economic activities at the national level.

On the other hand, seven provincial governments are responsible for catering to the unique needs and goals of their respective provinces. These governments have been granted certain authority, power, and independence to handle provincial development, such as achieving economic growth and reducing inequality in their respective provinces (Wagle, 2018).

Provincial governments have been actively working towards developing their provinces. They have been focusing on different sectors like infrastructure development, education, healthcare, tourism, and other key areas to stimulate economic growth and improve the quality of life for their citizens.

II. LITERATURE REVIEW

Numerous studies have explored the intrinsic relationship between provincial and federal economic growth. Economic distribution across different provinces has also attracted many scholars. Some studies following the neo-classical growth model, like Solow (Solow, 1956), have found evidence of per capita income “convergence” in Russia, indicating that poorer provinces tend to catch up with richer provinces over time (Oshchepkov et al., 2023), leading to a reduction in inter-provincial disparities. Other studies (Martin, 2001) have observed “divergence,” suggesting that regional disparities widen over time due to various factors such as unequal development policies, infrastructure disparities, and resource allocation.

In the calendar year 2022, the United States recorded a Nominal GDP at Current Prices of \$25.463 Trillion. Among the U.S. states, California, Texas, and New York stood as the top three contributors to the GDP with figures of \$3.6 Trillion, \$2.356 Trillion, and \$2.053 Trillion, respectively. Conversely, Vermont, Wyoming, and Alaska were the states with the lowest GDPs, reporting \$40.6 Billion, \$47.4 Billion, and \$63.6 Billion, respectively (Wisevoter, 2023). These figures illustrate a significant concentration of the U.S. economy in a few states, indicating that coastal and metropolitan areas play a substantial role in driving the country's overall GDP.

Based on the year 2018-19 data, out of the 33 Indian States and Union Territories, Maharashtra state holds the highest contribution to India's GDP at current prices, standing at 13.88%, followed by Tamil Nadu (8.59%), and Uttar Province, the most populous state, at 8.35%. Gujarat (7.92%) and Karnataka (7.87%) complete the top 5 states in terms of GDP contribution (GDP of Indian States, 2021). India's largest state, Rajasthan, ranks 7th, while West Bengal precedes it at number 6. Bihar, the poorest state, is positioned at number 14, and the capital, Delhi, stands at number 12 in terms of GDP contribution (GDP of



Indian States, 2021).

Nonetheless, the disparity in contributions to the national economy is substantial. The top 5 states collectively share 46.6% of India's total GDP, while the combined GDP contribution of five South Indian states amounts to nearly 30%. In contrast, the eight states in North-East India contribute a mere 2.8% to the national economy (GDP of Indian States, 2021). Indian states that share borders with Nepal are Uttarakhand (1.3%), Uttar Pradesh (8.35%), Sikkim (0.15%), West Bengal (5.77%), and Bihar (2.81%) (GDP of Indian States, 2021). The impact study of provincial policies, infrastructure investments, and private sector incentives on provincial economic growth and the role of provincial development policies and fiscal decentralization in the national economy has been a central idea in the literature (Anam & Plaček, 2023).

It has only been 6 fiscal years provincial governments of Nepal have completed. They were formed after the transformation of Nepal into a federal system in 2015 and the establishment of provincial governments in 2017. Over this time, there is a noticeable dearth of literature examining the contribution of provincial economic growth to the overall national economy of Nepal. An analysis of how the per capita income of the provinces can be utilized to obtain national income inequalities is also absent in existing studies.

The contribution relationship between provincial economic growth and national economic growth is complex and can be studied and explained using various models and frameworks. Below are some frequently used models and frameworks, as per Malizia et al. (2020), that explain this relationship.

A) Neoclassical Growth Theory

Neoclassical growth theory is a widely accepted economic framework that examines long-run economic growth. According to this theory (Solow, 1956), economic growth at the national level is primarily driven by factors such as capital accumulation, technological progress, and labor force growth (Nissanke & Ocampo, 2020). These factors can also be applied at the provincial level to understand how the economic growth of individual provinces contributes to the overall national economic growth. For example, the economic growth of individual provinces contributes to national growth when they attract investments, adopt advanced technologies, and increase their productivity, leading to increased output and overall economic expansion. The link between provincial economic growth and national economic growth is rooted in the concept of aggregate production function and capital accumulation. The model focuses on long-run economic growth and identifies factors that drive economic expansion over time. In Nepal's economy, it has been found that an increase in the per capita capital of Nepal helps to achieve sustained economic growth in the long run (Paudel, 2020).

B) Capital Accumulation

In the neoclassical growth model, capital accumulation plays a central role in promoting economic growth. Capital refers to the stock of physical assets, such as machinery, equipment, and infrastructure, used in the production process (Shaw, 1992). Provinces that attract investments and allocate resources efficiently to productive capital projects tend to experience higher rates of economic growth. This increased capital stock in individual provinces contributes to overall national economic growth.

C) Technological Progress

Technological progress is a key driver of economic growth in the neoclassical model. As provinces adopt advanced technologies and innovations, their productivity improves, leading to increased output and efficiency in the production process. Technological advancements in one province can also spill over to other provinces, benefiting the national economy.

D) Labor Force Growth

Population growth and changes in the labor force also influence economic growth in the neoclassical growth model. As provinces experience population growth, the labor force expands, leading to increased production capacity and economic output. Moreover, provinces that invest in human capital through education and skill development tend to have a more productive and efficient labor force, which contributes to both provincial and national economic growth.

Provinces that experience higher rates of capital accumulation, technological progress, and labor force growth tend to exhibit higher economic growth rates. The economic growth of individual provinces contributes to national economic growth as their increased output and productivity collectively expand the overall economy. Spillover effects can occur between provinces when advancements in technology and productivity in one province benefit neighboring provinces and the nation.

Policymakers can influence provincial economic growth through policies that promote investment, innovation, and human capital development, thus contributing to overall national economic growth.

Regional Growth Models

Various regional growth models focus on understanding the dynamics of economic growth at the subnational level, such as provinces or states. These models often consider factors like regional innovation, human capital, infrastructure, natural resources, and local policies. By analyzing these factors, researchers can gain insights into how provincial economic growth contributes to national economic growth and how regional disparities might impact overall economic performance. It can also indicate whether growth is characterized by competition, where the advancement of one region comes at the cost of another, or by generative dynamics. In the context of regional and urban economic analysis, the spatial dimension is crucial. (Malizia et al., 2020).

Export-Led Growth Hypothesis

The Export-Led Growth Hypothesis suggests that economic growth is driven by a country's ability to increase exports. This hypothesis can be applied at both national and provincial levels. Provinces that specialize in exporting certain goods or services can play a significant role in driving national economic growth by generating foreign exchange earnings and contributing to overall economic performance (Malizia et al., 2020).

It's important to note that while these frameworks and models help understand the relationship between provincial and national economic growth, the actual link can be influenced by various other factors, such as fiscal and monetary policies, trade relations, geopolitical dynamics, and global economic conditions. Therefore, a comprehensive analysis would require considering multiple factors to get a holistic view of the interplay between provincial and national economic growth.

Keynesian perspective

In the Keynesian perspective, the federal economy of a country and the economies of its provinces can be analyzed concerning the role of government intervention in stabilizing the overall economy and addressing economic fluctuations. Keynesian economics emphasizes the importance of aggregate demand management, fiscal policies, and the role of government in achieving full employment and economic stability (Malizia et al., 2020).

Federal Economy

In the context of the federal economy or the national economy, Keynesian economics advocates for active government involvement to manage aggregate demand and ensure economic stability. During periods of economic downturn or recession, Keynesian theory suggests that the central government should increase its spending on public works, infrastructure projects, and social programs. This increase in government spending boosts aggregate demand, creates jobs, and stimulates economic activity, helping to pull the economy out of recession.

Similarly, during times of high inflation and economic overheating, the Keynesian perspective recommends using contractionary fiscal policies. The central government can reduce its spending or increase taxes to reduce aggregate demand, cool down the economy, and combat inflationary pressures. Keynesian economics acknowledges the importance of monetary policy conducted by the central bank. The central bank can use tools like interest rate adjustments to influence investment, borrowing, and overall economic activity, aligning with the objectives of maintaining full employment and stable prices.

Provincial Economies

In the Keynesian perspective, the economies of individual provinces within a country can also benefit from government intervention during times of economic challenges. Provinces that are experiencing economic downturns or high unemployment rates may face difficulties due to reduced consumer spending and private investment (Malizia et al., 2020).

Provincial governments can play a role in addressing these challenges through their fiscal policies. Like the central government, provincial governments can implement expansionary fiscal measures to stimulate demand and encourage investment in their regions. For example, they can invest in local infrastructure, education, healthcare, and other development projects to boost economic activity and create jobs.

On the other hand, provinces facing overheating economies and inflationary pressures can adopt contractionary fiscal policies, such as reducing provincial spending or increasing taxes, to manage demand and maintain economic stability. Moreover, provincial governments can work in coordination with the central government to ensure a harmonized approach to fiscal and monetary policies that align with the overall national economic objectives.

According to regional growth theory (Malizia et al., 2020), a Post Keynesian perspective posits that the output growth driven by producers in a particular location leads to increased productivity through returns to scale. This heightened productivity enhances the price competitiveness of the region's export sector in comparison to producers from other provinces. Consequently, the region experiences growth in exports as consumers from other areas purchase more of its

goods and services. This export-led growth, in turn, generates further expansion in regional output through a multiplier effect.

The growth of a region's production triggers an inflow of migrating workers and investments from other regions. It is important to note that the growth of productive factors is considered the consequence rather than the cause of output growth. Post-Keynesians argue that in a world characterized by increasing returns, the tendency of some regions to lag behind others is more of a rule than an exception. However, Nepal's context study by Pokhrel and Khadka (2019) found that "there exists a positive long-run relationship between gross fixed capital formation, government expenditure, and economic growth".

This investigation involves examining key economic indicators such as the Gross Domestic Product (GDP) and per capita income of each province. The GDP represents the total value of goods and services produced within a province, while per capita income is an essential indicator of the economic well-being of the population.

The study also analyzes income inequality refers to the disparity in income distribution among different provinces. This aspect is crucial as it sheds light on the level of economic inclusivity within the country. High levels of income inequality can hinder overall economic growth and lead to social tensions. These findings can potentially inform policy decisions and help in designing more targeted and equitable development plans for the country's sustainable progress. The research aims to examine the contribution of the economies of different provinces in Nepal to the overall national economic growth and also to analyze income inequality at the sub-national level by measuring the Gini Index of the state's per capita income.

III. METHODS AND MATERIALS

This research adopts a quantitative approach, utilizing a time series secondary data set obtained from the National Statistics Office (NSO) from the year 2017/18 to 2022/23. The data for the year 2022/23 is a projected value. The study observed the composition of provincial GDP in national GDP. Additionally, the per capita income for each province and a comparison with the national per capita income were performed. Moreover, by incorporating the variables of provincial GDP and population, the research assessed income inequality through the Gini Index.

A) Gross Domestic Product (GDP)

Gross domestic product measures the total final output of goods and services produced by the country's economy, within the country's territory, by residents and nonresidents, regardless of its allocation between domestic and foreign claims (Todaro & Smith, 2020). Provincial GDP is measured within the territory of the provinces. National GDP is measured within the country and is the aggregate of all provincial GDP of the country. The contribution of provincial GDP to the national GDP is calculated using the following formula (Froyen, 2012).

$$\% \text{ of GDP contribution by a province} = \frac{\text{National GDP}}{\text{GDP of the Province}}$$

B) Per Capita Income

Per capita income is a measure of the average income earned by individuals in a specific geographic area, such as a country, region, or city. Per capita income provides an insight into the economic well-being of the population in a particular area. It indicates the average income level and can be used to compare the economic prosperity of different regions or countries (Thirlwall & Pacheco-López, 2017). Higher per capita income generally indicates a higher standard of living and better economic conditions for the residents. Conversely, lower per capita income may suggest economic challenges and lower living standards for the population. The formula for calculating per capita income is:

Per Capita Income of a Nation = Total GDP of Nation / Total Population of Nation

Per Capita Income of Province = Total GDP of Province / Total Population of province

The difference between the **Per Capita Income of a Nation** and the **Per Capita Income of a Province** is calculated. It indicates how unequal the income is among the provinces.

C) Lorentz curve

The Lorentz curve is a graphical representation of income distribution within a population. It is used to depict the cumulative percentage of total income earned by a given percentage of the population, arranged in ascending order of income (Perkins et al., 2013). The curve helps to visualize the degree of income inequality within a society. To construct a Lorentz curve, the following steps are taken:

Data Collection: The percentage of Provincial Population over National Population (*% population*) and Percentage of Provincial GDP over National GDP (*% income*) are tabulated. Data is sorted from lowest to highest based on the ratio of these variables (*% income over % population*).

Cumulative Percentage of Income: The cumulative income of the population is calculated at each provincial level. This is done by adding up the *% income* of provinces from the lowest to the highest until the total income of all provinces is reached.

Cumulative Percentage of Population: The cumulative percentage of the population is calculated at each provincial level. This represents the percentage of the total population covered by a given income level. This is done by adding up the '*% population*' of provinces from the lowest to the highest until the total population percent of all provinces is reached.

Plotting the Curve: The Lorentz curve is then plotted on a graph, with the cumulative percentage of the population (horizontal axis) against the cumulative percentage of income (vertical axis). A line of perfect equality is also plotted, where each percentage of the population earns an equal percentage of total income.

If the Lorentz curve lies below the line of perfect equality, it indicates income inequality, as a smaller percentage of the population holds a larger share of total income. Conversely, if the Lorentz curve lies above the line of perfect equality, it implies income redistribution, where a larger percentage of the population holds a larger share of total income.

D) The Gini Coefficient

A numerical measure derived from the Lorentz curve is often used to quantify income inequality. This is calculated as the ratio of the area between perfect inequality and the Lorentz curve over the area under perfect inequality (Cowell, 2011).

$$\text{Gini Index} = \frac{\text{Area between Lorentz curve and Equality}}{\text{Area under Equality}}$$

Here,

the area under the Lorentz curve is calculated using the following formula.

$$\sum_i^n \frac{1}{2} * (\%Population_i - \%Population_{i-1}) * (\%Income_i + \%Income_{i-1}) * \frac{1}{100}$$

And,

$$\text{Area under equality} = 50.$$

Therefore,

$$\text{Area between Lorentz curve and Equality} = 50 - \text{Area under the Lorentz curve}.$$

A Gini coefficient of 0 indicates perfect equality (every individual has the same income). In contrast, a coefficient of 1 represents perfect inequality (one individual or group has all the income, while others have none). The closer the Gini coefficient is to 1, the higher the income inequality within the society.

IV. RESULTS AND DISCUSSION

A) National and Provincial GDP.

The GDP of seven provinces, along with the GDP of the Nation, is shown in Table 1 (NSO National Account, 2023). Provincial GDP as a percentage of National GDP is shown in Figure 1.

Table 1: GDP of Provinces and National

Province	2075/76	2076/77	2077/78	2078/79	2079/80p
Koshi	341851	336608	352330	370303	379121
Madhes	290813	279806	291409	303521	309294
Bagmati	765013	736158	770043	816299	830713
Gandaki	186661	184375	191924	203627	211239
Lumbini	300487	294940	308421	322703	329888
Karnali	80503	81232	84961	89159	91103
Sudur Paschim	143935	145031	151410	157959	161024
National GDP	2109263	2058149	2150498	2263570	2312383

Note: GDP in basic, constant price as of 2011, in Nepali Million Rupees. GDP of the year 2079/80 is predicted.

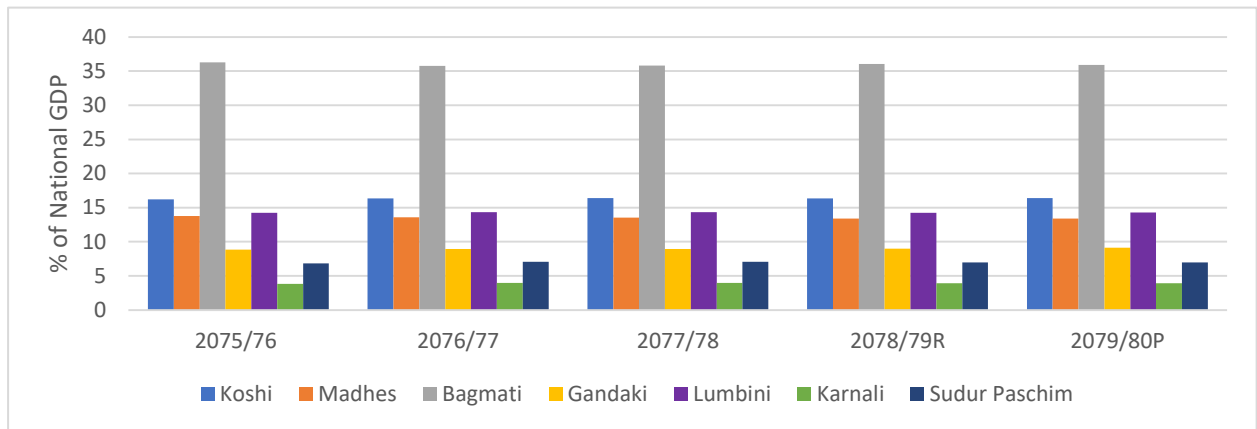


Fig. 1 Percentage of Provincial GDP in National GDP

As can be seen in Fig. 1, Over the years since 2017, all seven provinces of the country have consistently contributed approximately the same percentage to the National GDP. Bagmati province has consistently been the highest contributor to the National GDP, accounting for more than 35% of the total. Following Bagmati, Koshi province comes in as the second-largest contributor, but its share is less than half of Bagmati's, standing at 16%.

Lumbini and Madhes province hold the third and fourth positions, respectively, with contributions close to 14% and 13% each. Gandaki Province's share is comparatively lower, contributing around 8%, which is less than a quarter of Bagmati's contribution. Sudur Paschim and Karnali provinces stand at the bottom of the list, contributing 6% and 3%, respectively, to the National GDP. Despite the passage of time, the relative contributions of each province to the National GDP have remained relatively stable.

The rate of change in GDP refers to the percentage increase or decrease in GDP from one period to another. Figure 2 shows the relationship between the rate of change in the GDP of individual provinces and the rate of change in the national GDP.

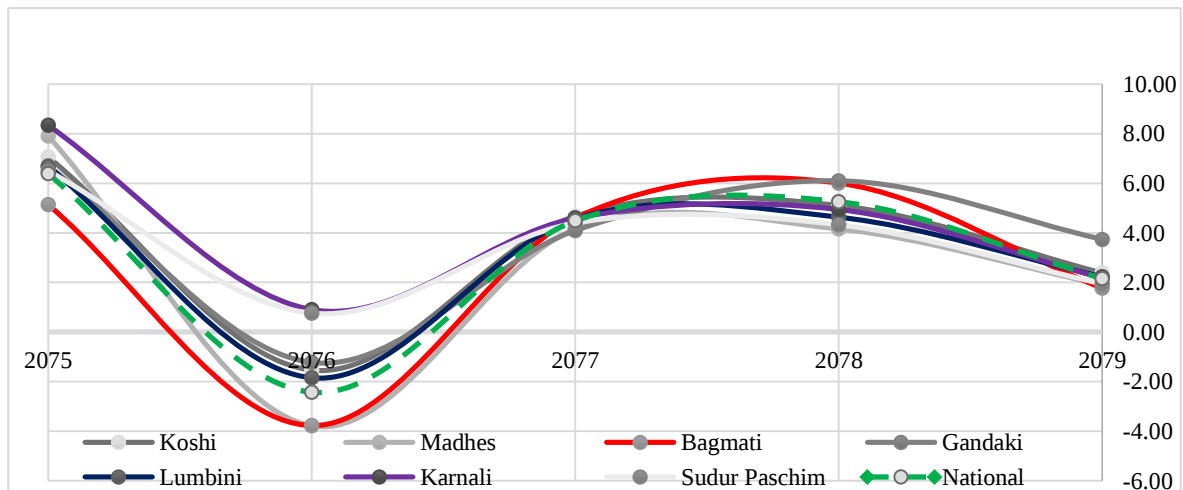


Fig. 2 National and Provinces' GDP growth rate.

Note: GDP in basic, constant price as of 2011.

Examining Figure 2, It can be noticed that the fluctuations in the GDP of provinces closely align with the changes in the national GDP. This suggests that either the factors of production contributing to the National GDP have remained relatively constant across the provinces or any changes in these factors have occurred at similar percentages in each province.

When provinces experience positive economic growth rates, it tends to positively influence the growth of the national

economy. Similarly, if some provinces face economic challenges and experience lower growth rates, it may have an adverse impact on the overall economic performance of the country.

B) Per Capita Income

Figure 3 illustrates both the per capita income of the overall country and the per capita income of individual provinces. The line graph represents the national per capita income based on the right axis. In contrast, the bars, based on the left axis, depict the differences between the per capita income of each province and the national per capita income.

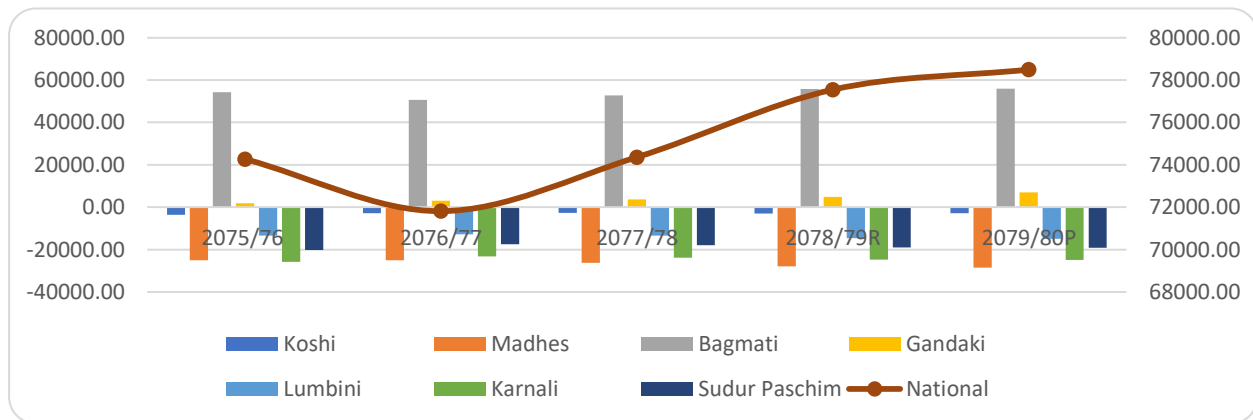


Fig. 1 Difference of Percapita Income of Provinces with National

Note: GDP in basic, constant price as of 2011, GDP of the year 2079/80 is predicted

In Figure 3, It becomes evident that both Bagmati province and Gandaki province have per capita income levels that surpass the national average. Bagmati Pradesh, with 20% of the total population, exhibits a per capita income higher by 50 – 55 thousand compared to the national per capita income. On the other hand, Gandaki Pradesh has seen its per capita income grow by 2000 to 7000 more than the national per capita income from 2075/76 to 2079/80.

In contrast, the per capita incomes of the other provinces are below the national average. Koshi Pradesh has been narrowing the gap with the national average, reducing from 36 to 28 thousand since 2075/76. However, Madhesh province has been increasing the gap with the national average, rising from 25 to 28 thousand since 2075/76. The fact that Bagmati Province stands as the highest, while the other five provinces lag below the national average, implies a potential disparity in economic growth and income distribution within the country.

To further assess and quantify income inequality, the Gini index is calculated, offering a comprehensive measure of the economic disparities between different provinces.

C) Lorentz curve and Gini Index

Table 2 shows the data computed to plot the Lorentz curve for the year 2018. Lorentz curve is shown in Figure 4.

Table 2: Data for Lorentz Curve

Province	Population	per capita income	% population	% income	Ratio of % income over % population	Cumulative % of population	Cumulative % of income
Karnali	1.66	48495.96	5.85	3.82	0.65	6	4
Madhes	5.91	49206.87	20.81	13.79	0.66	27	18
Sudur P.	2.66	54110.80	9.37	6.82	0.73	36	24
Lumbini	4.94	60827.35	17.39	14.25	0.82	53	39
Koshi	4.84	70630.37	17.04	16.21	0.95	70	55
Gandaki	2.45	76188.15	8.63	8.85	1.03	79	64
Bagmati	5.95	128573.68	20.95	36.27	1.73	100	100

Note: For the year 2018.

In Table 2, the data reveals that despite Karnali accounting for only 5.85% of the population, it contributes 3.82% to the National GDP. On the other hand, Bagmati, with 20.95% of the population, significantly contributes to 36.27% of the National GDP. This stark contrast highlights income inequalities among the provinces.

Ideally, a balanced income distribution would result in the ratio of income percentage to population percentage being close to 1. However, the observed disparities show that some provinces deviate significantly from this ideal scenario. Notably, Koshi and Gandaki emerge as provinces with a more equitable income-to-population ratio compared to others. Fig. 4 shows the Lorentz curve plot of the data obtained in Table 2.

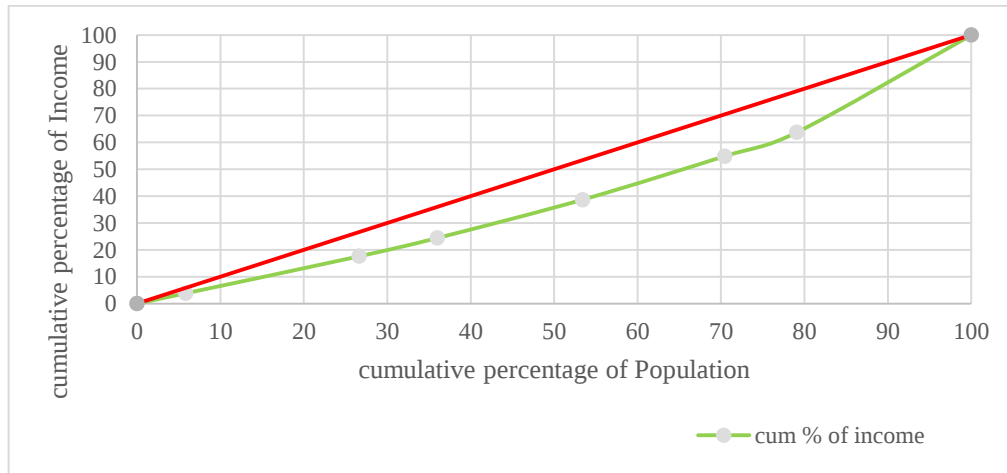


Fig. 4 Lorentz curve of Income Inequality For the year 2018.

The Gini Index of the above Lorentz curve was found to be 0.19. A similar step is repeated for the year 2019 to 2022 and the results are shown in Figure 5.

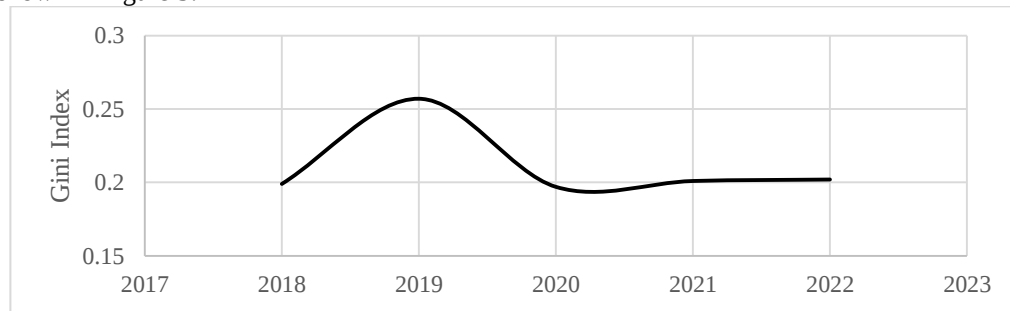


Fig. 5 Gini Index

Note: For the years 2018 - 2022.

The Gini index remains consistently below 0.2, except for the year 2019. This relatively low Gini index indicates a more equitable distribution of income among the population. However, it is essential to note that the adopted method in this research to calculate the Gini index is based on province-level income and population data, which masks the income distribution within the province itself.

V. POLICY IMPLICATION AND INTERPRETATION

This research underscores the necessity for a well-balanced and equitable approach to economic development. It is imperative to ensure that all provinces experience sustainable and uniform growth, as such an approach directly contributes to fostering a stable and resilient national economy. To achieve sustained and inclusive economic growth at a national scale, it becomes crucial to comprehensively grasp and address the intricacies of regional-level economic dynamics. Policymakers acknowledge this imperative and strive to implement strategies that promote regional development, address disparities among regions, and encourage investments in less-developed areas, thereby fostering overall economic progress.

Provincial governments in Nepal can significantly influence economic growth within their respective regions through various mechanisms. As sub-national entities, provincial governments have the authority to implement micro-level policies, allocate resources, and promote local development. Governments must build suitable policies to strengthen the economic growth of provinces in order to develop the nation.

It's important to note that the effectiveness of provincial government initiatives on economic growth depends on factors such as governance, financial capacity, and policy coherence. Coordination with the central government, neighboring provinces, and other stakeholders is also essential to ensure comprehensive and cohesive economic development across Nepal.

In this regard, the federal government ought to concentrate on macroeconomic objectives, while provinces can effectively address micro-level goals, catering to the specific needs of their respective populations. By adopting such an approach, the nation can work cohesively towards achieving an all-encompassing and balanced economic growth trajectory.

VI. CONCLUSION

This research explains the importance of understanding the contributions of provincial GDPs to Nepal's overall national GDP. It also illuminates the variations in per capita income across different provinces, comparing them to the national average. The results highlight Bagmati province as the leading contributor to the national GDP, concurrently exhibiting the highest per capita income among all provinces. The examination of income inequality by delving into the Gini index of regional data reveals a nuanced perspective that suggests the phenomenon is situated within an acceptable range. These insights offer valuable considerations for policymakers and stakeholders aiming to formulate targeted strategies for economic development and income distribution within the diverse provinces of Nepal.

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