UNDERSTANDING INDUSTRY CONSOLIDATION IN INDIA: AN EMPIRICAL ANALYSIS OF MEASUREMENT CHALLENGES

Abstract

As we know, accurate measurement of indices is crucial for policy makers. This article examines eight indices—Normalized Herfindahl, Herfindahl-Hirschman (HHI), Horvath, Entropy, Genericious, GRS, Gingi, and Coefficient of Variation—across 10 industries. While HHI is widely used, it is less accurate. By comparison, Horvath and Coefficient of Variation indices better assess market concentration by considering firm size and market share distribution.

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Introduction:

Market concentration indices are critical tools for evaluating the competitive structure of industries, as they indicate the extent of firm dominance. Industries dominated by a few large firms require different regulatory strategies compared to those with numerous smaller firms. Various indices, including the Normalized Herfindahl, Herfindahl–Hirschman (HHI), Horvath, Entropy, Ginevicius, GRS, Gingi, and the Coefficient of Variation, are widely used to assess competitiveness. This study examines eight such indices using the criteria proposed by Ginevičius and Čirba (2009). Given that conventional indices may produce misleading results and misinform policy decisions, this research emphasizes identifying more reliable measures, thereby addressing the lack of focus on index suitability across industries.

Literature Review:

An examination of India's competition policy highlights the shift from the MRTP Act to the Competition Act. Despite liberalization, market concentration persists (Basant & Morris, 2000), while Ginevičius and Čirba (2009) critique the Herfindahl index and suggest alternatives like Horvath, entropy, and Rosenbluth indices. Horvath (1970) developed the Comprehensive Concentration Index (CCI) to capture both dominant and smaller firms, improving policy and antitrust analysis.

Kambhampati (1996) applies the SCP model to Indian industries, linking high concentration with reduced competition via pricing power, though some argue it fosters growth. Studying 1990s reforms, he finds mixed effects—liberalizing some

markets while reinforcing large firms' dominance. Traditional measures like HHI are critiqued for overlooking evolving dynamics.

Mishra (2005) examines mergers and acquisitions (M&A) in post-liberalization India, highlighting globalization, FDI, and reforms as drivers. Though efficiency may rise, monopoly risks persist. Mishra and Behera (2007) find manufacturing concentration unstable, shaped by R&D, advertising, and trade, calling for stronger regulation. Pushpangadan and Shanta (2008) reveal weakened competition and persistent rents, stressing stricter regulation. Ramaswamy (2006) likewise emphasizes market structure, firm behavior, and policies in shaping competition and efficiency outcomes.

Theoretical Background:

Market Concentration in Indian sectors: Conventional and Alternative measures.

Herfindahl-Hirschman Index (HHI): Companies and analysts use the HHI to evaluate how competitive an industry is. The index considers the relative size of all firms in the market.

Formula,

$$HHI = \sum_{i=1}^{n} si^2$$

Here, s_i standsfor the market share of the i^{th}firm in the industry. If there is only one firm in the industry, the HHI is 1. Low HHI (near 0) depicts a competitive market having fewer market shares. HHI of 0 implies a perfectly competitive market, and HHI of 1 implies a monopoly market.

Calculating the HHI enables firms to assess the intensity of competition and adapt their strategies accordingly.

Horvath Index: Unlike HHI, the Horvath Index is less sensitive to individual firm size and instead highlights how firms are distributed within a market. It provides a broader view of industry dynamics, offering insights into competitiveness, innovation potential, and overall market health.

The **Horvath index** is defined as

$$HOR = S_1 + \sum_{i=2}^{n} si^2(2 - si)$$

Here, S_1 shows the market share of the largest firm in the industry. It accounts for the market share of the largest firm in a discrete manner and that of other firms in a weighted firm.

Entropy Index: The Entropy Index measures uncertainty, disorder, and diversity. Higher values indicate greater unpredictability, while lower values show more uniformity, quantifying randomness, diversity, and dispersion in a dataset.

Where, Entropy Index is defined as,

$$ENT = \sum_{i=1}^{n} si \log\left(\frac{1}{Si}\right)$$

When there is no uncertainty in the market, i.e., income of monopoly, the Entropy Index's value will be zero. In case of N numbers of equal size in an industry, i.e., market, is an uncertain value with the log (m).

Ginevicius Index: The following formula is related to the Ginevicius Index.

$$GIN = \sum_{i=1}^{n} \left(\frac{si}{1 + n(1 - si)}\right)$$

The number of firms in the industry and their market share are matters of analysis in the GIN. It assesses how far the firms in an industry are distributed in a balanced way. As far as this index if the number of suppliers is large, the competition will be greater. It means higher uncertainty in the market. In case of a monopoly, Ginevicius Index will be 1. The degree of seller's concentration will decline when GIN→0. Therefore, the value of GIN will lie between 0 and 1.

GRS Index: The GRS Index measures competition using firm size distribution and market share, overcoming HHI and entropy weighting issues, providing a more accurate concentration measure ranging between 0 and 1.

Mathematically, the index can be written as –

$$GRS = \sum_{i=1}^{n} \frac{n^2 s1 + 0.3si^2}{n^2 + 0.3ns1si} si$$

The market share of the largest firm in the industry is denoted by s1.

Gini Coefficient: The Gini Coefficient measures competitiveness among firms, ranging from 0 for perfect competition to 1 when a single firm dominates the industry, reflecting market share

distribution.

Formula:

$$\text{Gini Coefficient} = \frac{\text{Sum of index function of matrix}}{2 \times \text{No.of firms under industry}}$$

The Gini Coefficients provides a single numerical value to represent the underlying structures of the distribution.

Case-1: If one firm holds most of the shares, while others have the much smaller shares in the industry.

Case-2: When inequality spreads across firms instead of one dominant firm, the Gini coefficient can still show the same value. This means markets may look similar but differ—one led by giants, another by mid-sized firms.

Coefficient of variation Index: The Coefficient of variation is a simple yet effective test for having information about firm concentration in an industry. It helps make out market structures and competition levels.

The CV can be calculated as follows:

$$CV = \frac{\sigma}{\mu} x100$$

σ denotes the standard deviation of firm sizes and μ the mean. The CV is a supplementary measure, not reliable with few firms, as it captures only relative dispersion, ignoring the actual distribution of market shares.

Data:

This study analyzes revenue performance of ten Indian industries (2020–2024) using firm-level data from Moneycontrol.com. Sectors include Two & Three Wheelers (9), Air Conditioners (6), Trucks/ LCV (5), Gas Transmission (7), Passenger Cars (5), Lubricants (8), Cigarettes/Tobacco (6), Oil Exploration (12), Paints (8), and Footwear (10), capturing Sectoral variations, financial metrics, and market trends.

Table-1: Industries by measures of Concentration Index value with rank

Industries by measures of Concentration Index value with rank									
Sl. No.	**Industry**	**HH Index**	**Normalised HHI Index**	**Horvath Index**	**Entropy Index**	**Ginevicius Index**	**GRS Index**	**Coefficient of variation Index**	**Gini Index**
1	Automobile Two & Three Wheelers	0.2743	0.1950	0.7932	0.5912	0.1335	0.3238	0.7778	0.5082
	Indexed rank	3	2	8	6	1	4	7	5
2	Air Conditioners Industry	0.2784	0.1258	0.8505	0.6044	0.1899	0.3803	1.1146	0.1899
	Indexed rank	4	1	7	6	2	5	8	2
3	Automobiles-Trucks/Lcv Industry	0.8081	1.5520	1.7943	0.1730	0.6044	0.8657	0.5129	0.1869
	Indexed rank	5	7	8	1	4	6	3	2
4	Gas Transmission/ Marketing Industry	0.2562	0.1279	0.5868	0.6379	0.1626	0.3336	1.0389	0.2208
	Indexed rank	4	1	6	7	2	5	8	3
5	Passenger Cars Industry	0.3528	0.3187	0.9686	0.4636	0.2375	0.3908	1.0232	0.1173
	Indexed rank	4	3	7	6	2	5	8	1
6	Lubricants Industry	0.1715	0.0643	0.6497	0.5912	0.1028	0.3238	2.9481	0.2212
	Indexed rank	3	1	7	6	2	5	8	4

7	Cigarettes/Tobacco Industry	0.8635	3.0393	0.6497	0.5912	0.1028	0.3238	0.4464	0.2122
	Indexed rank	7	8	6	5	1	3	4	2
8	Oil Exploring industry	0.8934	4.2670	1.8898	0.1039	0.5682	0.9251	0.3070	1.3035
	Indexed rank	4	8	7	1	3	5	2	6
9	Paints Industry	0.4015	0.3823	1.1791	0.5214	0.1890	0.5837	0.6288	0.4351
	Indexed rank	3	2	8	5	1	6	7	4
10	Footwear Industry	0.1974	0.1079	0.6381	0.78514	0.11202	0.29160	0.96114	0.51732
	Indexed rank	3	1	6	7	2	4	8	5

Source: Authors' estimation

Table-2: Variance in Values of Measures across the Industries

Industry	HH	NHH	HI	EI	GI	GRS	CV	Gini
Automobile Two & Three Wheelers	3	2	8	6	1	4	7	5
Air Conditioners Industry	4	1	7	6	2	5	8	2
Automobiles-Trucks/Lcv Industry	5	7	8	1	4	6	3	2
Gas Transmission/Marketing Industry	4	1	6	7	2	5	8	3
Passenger Cars Industry	4	3	7	6	2	5	8	1
Lubricants Industry	3	1	7	6	2	5	8	4
Cigarettes/Tobacco Industry	7	8	6	5	1	3	4	2
Oil Exploring industry	4	8	7	1	3	5	2	6
Paints Industry	3	2	8	5	1	6	7	4
Footwear Industry	3	1	6	7	2	4	8	5
Variance of Rank	1.56	9.16	0.67	4.89	0.89	0.84	5.57	2.71

Source: Authors' estimation

Findings:

Accuracy of Measures:

Table 1 presents concentration measures for 10 industries. The Ginevicius index ranks Two- and Three-Wheelers least concentrated, with eight industries overall identified as less concentrated. Air Conditioners, Gas Transmission, Passenger Cars, Lubricants, and Footwear rank second, while the entropy index ranks Oil Exploration and Trucks/LCV first. Horvath and Ginevicius indices show lower fluctuations across industries.

Table 2 presents contradictory results: the Horvath index shows concentration, while the Ginevicius index does not. Using Ginevičius & Čirba's (2009) criterion, when R = 0 it reflects market conditions, and smaller differences mean higher accuracy, favoring the Horvath index.

Table-3: Rank of Measure by accuracy (R-value) across the industry

Rank of Measure by accuracy(R-value) across the industry									
Sl. No.	Industry	HH Index	Normalised HHI Index	Horvath Index	Entropy Index	Ginevicius Index	GRS Index	Coefficient of variation Index	Gini Index
1	Automobile Two & Three Wheelers	3	2	8	6	1	4	7	5
2	Air Conditioners Industry	4	1	7	6	2	5	8	2
3	Automobiles-Trucks/Lcv Industry	5	7	8	1	4	6	3	2
4	Gas Transmission/Marketing Industry	4	1	6	7	2	5	8	3
5	Passenger Cars Industry	4	3	7	6	2	5	8	1
6	Lubricants Industry	3	1	7	6	2	5	8	4
7	Cigarettes/Tobacco Industry	7	8	6	5	1	3	4	2
8	Oil Exploring Industry	4	8	7	1	3	5	2	6
9	Paints Industry	3	2	8	5	1	6	7	4
10	Footwear Industry	3	1	6	7	2	4	8	5

Source: Authors' estimation

Accuracy of measures:

By using the actual and calculated market share accuracy of the measures can be determined. According to the formula,

$$R = \sum_{i=0}^{n} | Si - S* |$$

R = accuracy of a concentration measure.

S= calculated market share

S*=relative value of market shares as per the formula of the concentration measure.

If the value of R is zero, then it implies that the concentration measure is most accurate in representing an ideal market situation. If there is a difference between S and S*, then the value of R will be greater than zero. In our research article, we found a more accurate measure of market concentration.

Table 3 shows the Horvath Index is most accurate. HHI ranks well only for Cigarettes/Tobacco (2nd) and Trucks/LCV (4th), but poorly for others. Except these, the coefficient of variation gives better ranks for most industries.

Conclusions:

In empirical research, the Herfindahl-Hirschman Index (HHI) is widely used to measure market concentration. However, our study finds HHI less accurate, which may mislead analysis. The Horvath Index and Coefficient of Variation are better alternatives. The Horvath Index assigns larger weights to all firms, providing a more precise concentration measure. By considering firm size and market share distribution, it offers deeper insights into industry consolidation, though further research is required for definitive conclusions. MA

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