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MEASUREMENT OF COMPARATIVE ADVANTAGES OF SERVICE SECTOR

MESURE DES AVANTAGES COMPARATIFS DU SECTEUR DES SERVICES

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Abstract:
The services sector has emerged as the dominant sector in India's GDP, with significant contribution to exports, FDI and employment generation. It is imperative to assess revealed comparative advantage (RCA) for service trade requiring modification of Product- specific and time-specific RCAs because of unique features of services like intangibility, non-storability and different modes of supply of services unlike cross-border trade for goods. The paper suggests aggregation of RCA's of each service category, enabling assessment of progress/decline of the index across time. Focusing on volume and velocity of trade in services, Visvizi–Wosiek RCA (VWRCA) index for the service sector satisfying desired properties is suggested. For n-number of service categories, the ratio $\frac{VWRCA_{cj}}{VWRCA_{0j}}$ reflects the stochastic nature of $VWRCA$ of the j-th service category in the current year over the base year where progress is indicated if $\frac{VWRCA_{cj}}{VWRCA_{0j}} > 1$ and composite $VWRCA$ of i-th country in the current year can be obtained by geometric aggregation of such ratios, i.e. $VWRCA_{C0}^{i} = \prod_{j=1}^{n} \frac{VWRCA_{cj}}{VWRCA_{0j}}$ Future investigation may be undertaken to compare $VWRCA$ index with a chosen base period and traditional RCA along with plotting graphs of service sector of India across time and also graph for each service category.

Keywords: RCA; VWRCA; Composite RCA; Gross Value Added (GVA), Servitization; Geometric mean.

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1. Introduction:

International trade of services plays an important role in the growth and development of the economies. Global export of services valued at $7.1 trillion in 2022, represented 7.1% of world GDP and 23 % of total world trade covering both goods and services. Growth of services exports in 2022 over 2021 was 14.8% at world level and 24.8% for developing economies. India ranked second after China in terms of value of services exported in 2022 (billions $) (UNCTAD, 2023). Thus, trade of services is the leading force of economic growth, especially for the developing countries (Hiziroglu et al. 2012). Services also help to generate employment and contribute to growth of GDP in developed, as well as developing countries and are considered crucial for the economic growth (Seyoum, 2007). As per World Trade Outlook and Statistics, October, 2023 (*www. wto.org*) year-on-year growth in commercial services exports during 2023, India registered 23% growth (the first quarter) against 7% and 8% growth by United States and UK respectively (the first half).

1.1 Service sector in India:

The services sector in India with estimated Gross Value Added (GVA) at current prices at 131.96 lakh crore INR in 2022-23, accounts for 53.33% of India's total GVA of 247.43 lakh crore Indian rupees. (Ministry of Statistics and Programme Implementation, December, 2023). Services sector in India covers a variety of activities like trade, hotel and restaurants, transport, storage, communication, financing, insurance, real estate, business services, community, social and personal services, etc. India has a strong comparative advantage (CA) in computer and information services. The service sector in India is the highest employment generator and achieved 5-7% y-o-y growth in 2022. Burange et al. (2010) observed robust competitive advantages for India during 1980 – 2007 in commercial services instead of traditional services like transportation and travel. Wu and Lin (2008) found that India enjoyed comparative advantage in the freight services between 2000 and 2003 which was lost in the subsequent years. The sector accounts for 53.89% of total India's Gross Value Added (GVA).at current prices. At 2011-12 prices, contribution of Services sector was 54.27% against 16.38%, for primary sector and 29.34% for secondary sector (Ministry of Statistics & Programme Implementation, GoI, 2021). GVA share of the services sector in India is predicted to increase to 63.8% in 2030–31. Using regression-

based measure of revealed comparative advantage (RCA), Banerjee & Rajmal. (2022) found comparative advantage of India in sectors like 'telecommunications, computer, and information services' and 'other business services' which are the sunrise sectors within services with high growth rates and increasing share in world services trade.

1.2 Demand of the service sector in India:

Demand of the service sector in India is robust primarily due to:

→ Availability of skilled manpower at a low-cost, especially in IT and ICT areas.

→ Increasing size of youth population (people in 15 – 64 years constituted 68% of India's population in 2023) looking to migrate from traditional sector to service sector

→ Make-in-India initiative and associated promotion of entrepreneurial ecosystems with emphasis in service sector by Govt. of India

→ Highest flow of FDI in the sector. During the period April 2000–December 2023, service sector of India received the highest FDI equity inflow of US$ 108.04 billion (16.21%), followed by the computer software and hardware industry at 14.75% (US$ 98.32 billion), trading at 6.33% (US$ 42.19 billion), telecommunications at 5.90% (US$ 39.31 billion), and automobile industry at 5.35% (US$ 35.65 billion).

→ Private equity investment (PEI) for the sector is increasing. For example, PEI in the sector increased to USD 11.82 billion in the first half of 2021 against USD 5.43 billion during the corresponding period of 2020. In 2023-24, FDI equity inflow in the services sector in India was around US$ 8.7 billion.

→ As per World Trade Organisation (S/C/W/ 300, June 2009), market size of software service industry of India (a significant area of trade interest) is likely to reach USD 1 trillion by 2030.

→ India's service sector exports dominated by ICT sub-sector continued to grow since 2018-19. (Ministry of Commerce and Industry, GOI*)*. Exports of services by India are likely to reach US$ 400 billion by the end of 2023-24 and US$ 1 trillion by 2030, according to Services Export Promotion Council (SPEC).

→ India's service trade (exports and imports combined) was US$ 432.13 billion during April –January, 2023-24 and US$ 417.61 billion during the corresponding period

of 2022-23 implying positive net trade flow for this sector(Ministry of Commerce and Industry, GoI)

→ As per the OECD's services trade restrictiveness index (STRI) (http://oe.cd/stri), India scored 0.37 in 2022 and India's major markets (EU, US, UK) and FTA partners (Japan, Korea) are far more liberal.

However, RCA for service trade needs modification of RCAs for goods trade (Langhammer, 2004) because of unique features of services like intangibility, non-storability and different modes of supply of services unlike cross-border trade for goods. Trade policy in services is governed by domestic policy measures and not by border measure. Balance of payments (BoP) documentation covers cross-border trade only. Thus, supply of services via factor movements, (say, exchanges between residents and non-residents in the same country) are not reflected in BoP statistics. Four categories of exchanges in trade in services are: i) cross-border supply, the traditional view on trade where both consumer and producer remain in their respective territories; (ii) consumption abroad, implying movement of the consumer(like tourism activities, ship repairing services, etc.); (iii) commercial presence, when a company acquires/ establishes an affiliate in another country and/or is a provider of services to the locals; (iv) presence of natural persons, implying presence of a person in a foreign country to whom the service is provide (United Nations, 2010). In addition, interpretation of CA measures for royalties and license fees needs to be done with care.

Need is felt to measure capabilities of service sector of a country considering the pattern of its net trade flows for the long-term growth prospects, in terms of RCA (Balassa, 1965) and other measures like Specialization of the country from RCA index (Stellian and Danna-Buitrago, 2019), Contribution to the Trade Balance (CTB) of the country, etc. (De Saint Vaulry, 2008). CTB Index can also help to find regional specialization. However, the measures need to consider among others, emergence of servitization of economy aiming at integration of services to products and added value i.e. shift from product-centric manufacturing to customer-centric service firm (Alkraiji 2020; Saeedi and Visvizi 2021). Product- specific and time-specific (RCA) gives a static insight of trade performance of a country and may not reflect dynamic, conceptual, and satisfy methodological issues. A number of alternate indices were suggested by researchers to by-pass the limitations of

Balassa's RCA index (BI). Alternative RCA measures with different assumptions help to improve BI in one aspect or another, but none has overcome all its shortcomings (Yu et al. 2009).

The paper provides a method of aggregation or pulling of RCA's of each commodity/service category and enabling stochastic evaluation of an index for assessment of progress or decline of the index in successive time periods, i.e. $RCA_{ij(t+1)}$ over $RCA_{ij(t)}$ which may help to investigate the progress path of other service- trade related indices.

Rest of the paper is organized as follows: The following section discusses the relevant literatures covering various indices used in studies. Section 3 gives the proposed method which is followed by properties and benefits of the method proposed. The last section concludes the findings of the paper.

2. Literature survey:

2.1. Balasa RCA Index:

Balasa's RCA Index for the *j*-th commodity exported by the *i*-th country is given by

$$RCA_{ij} = \frac{X_{ij}/\sum_i X_{ij}}{\sum_j X_{ij}/\sum_i \sum_j X_{ij}}$$

$$= \frac{X_{ij}}{\sum_j X_{ij}} \cdot \frac{\sum_i \sum_j X_{ij}}{\sum_i X_{ij}} \quad (1)$$

where X_{ij} denotes export of product *j* by the *i*-th country at a time-period; $\sum_j X_{ij}$ indicates total export of the *i*-th country; $\sum_i X_{ij}$ is world export for the *j*-th commodity; and $\sum_i \sum_j X_{ij}$ denotes world export of all commodities.

For a country, RCA_{ij} is positively related to the proportion of export of *j*-th commodity to the country's total export and inversely associated with the proportion of world export for the *j*-th item. Thus, the relative measure RCA_{ij} can be computed from trade-related data of the country and the world. RCA_{ij} also indicates the relative importance of the destinations of the product exported by a country at a particular commodity at a specific time.

It may be noted that $0 \leq \frac{X_{ij}}{\sum_j X_{ij}} \leq 1$ and $\frac{\sum_i \sum_j X_{ij}}{\sum_i X_{ij}} > 1$.Thus, $RCA_{ij} \geq 0$ where equality is attained if $X_{ij} = 0$ i.e. the country does not export the *j*-th commodity. $RCA_{ij} > 1$ indicates that country *i* has a comparative advantage and can be taken as a degree of 'export specialization' of the *i*-th country in the *j*-th sector. Higher the value, higher is the

advantage. However, BI based on export data only has many limitations including size bias. A country may high values of BI despite presenting relatively small share of exports (Elsa and Gianluca, 2014). The time-period-specific, commodity-specific and partner country-specific RCA fails to indicate the composite or aggregated RCA of a country to know the country's comparative advantage of all the export items taken together as a function of trade flows relative to the point of reference i.e. a base period.

2.2. Other indices:

Studies on comparative advantage in the service sector of the developing countries differ in terms of indices used, period covered, service categories and countries under consideration. Seyoum (2007) used traditional BI, slightly modified version of the BI and a combination of both on four categories of services for 60 developing economies for the periods 1998 to 2003. Using IMF Balance of Payments data between 2000 and 2005 and two categories of services viz. transportation and freight, Wu and Lin (2008) used BI. Hiziroglu *et al.* (2012) used three indices namely standard BI, BI with imports instead of exports and subtraction of the second index from the BI, for the period 2000 to 2010 for Turkey and 16 European Union countries. For the study of CA of bilateral services-trade of USA with China and India from 1992 to 2010, Nath *et al.* (2015) used two measures including the symmetrical RCA for the period of 1992 to 2010 covering 16 different categories of services.

RCA_{ij} depicts static insight into a country's economic performance without allowing extent of specialization in the services sector (Wosiek and Visvizi, 2021).

The pattern of trade specialization is different for low and high unit values, requiring separate analysis for different segments of distribution of unit value. For analysis of the underlying capabilities of a country, measure of CA could be related to the net contribution of a country to global trade.

Net trade specialization index (T_{ij}) is the normalized trade balance, defined as the ratio between the sectoral trade balance and total sectoral trade. It reflects the share of one country's exports going to a partner divided by the share of world exports going to the partner. Iapadre, (2001) surveyed indicators for international specialization and observed that the individual normalized trade balances are only performance indicators, deviations from their average correctly measure the intensity of specialization.

The export specialization (ES) index is a slightly modified RCA index involves export values of *j*-th commodity exported by *i*-th country and import values of *j*-th commodity in *k*-th market and total imports in *k*-th market, where a value of the index exceeding one represents specialization in this market.

CTB index is a process-based index designed to consider structural sectoral proximities to reveal the comparative advantage (Stellian and Danna-Buitrago, 2019) and is given by

$$CTB = y_{ik} - (g_{ik} * Y_i)$$

where $y_{ik} = 1000(\frac{Export_{ik} - Import_{ik}}{Export_i + Import_i})$ is the trade balance for the *i*-th country and *k*-th commodity relative to its total trade; $g_{ik} = \frac{Export_{ik} + Import_{ik}}{Export_i + Import_i}$ is the share of *k*-th commodity in the trade of the *i*-th country and $Y_i = 1000(\frac{Export_i - Import_i}{Export_i + Import_i})$ is the overall trade balance of the *i*-th country. Clearly, $CTB < 0$ implies negative balance of trade which in turn indicates a comparative trade disadvantage.

CTB index given by CEPII (www.cepii.fr/CEPII/en/welcome.asp) used weighted sum approach. For the time period *t* and set of *K* items, let X_{ijt} and M_{ijt} denotes respectively value of exports made by the *i*-th country to set of other countries $\boldsymbol{J}$ and value of imports made by the *i*-th country from other countries $\boldsymbol{J}$. Let Y_{it} be the GDP of *i*-th country in *t*. The weight of *K* in total trade of *i* in *t* is taken as $w_{kt} = \frac{\sum_{j \in J}(X_{ikt} + M_{ikt})}{\sum_{j \in J}\sum_{l \in K}(X_{jlt} + M_{jlt})}$ and the CTB index of country *i* with respect to good/service *k* in the time period **t**, with r ∈ T, $CTB_{ikt,r}$ is given by

$$CTB_{ikt,r} = \frac{1}{Y_{it}}[\frac{w_{kr}}{w_{kt}}(X_{ikt} - M_{ikt}) - w_{kt}\sum_{l \in K}\frac{w_{lr}}{w_{lt}}(X_{ilt} - M_{ilt}) \quad (2)$$

where $w_{kt} \neq w_{kr}$ (to minimize bias due to short-run fluctuations in trade flows in the time period r) and $\frac{w_{kr}}{w_{kt}}(X_{ikt} - M_{ikt})$ represents the actual (adjusted) trade balance which can be compared with the theoretical level

Observations:

- CTB index by (2) assumes $w_{kt} \neq w_{kr}$ (to minimize bias due to short-run fluctuations in trade flows in the time period r).
- Here, $\frac{w_{kr}}{w_{kt}}(X_{ikt} - M_{ikt})$ represents the actual (adjusted) trade balance which can be compared with the theoretical level

- In case $w_{kt} = 0$, $\frac{w_{kr}}{w_{kt}}$ is undefined.
- Extent of CA depend heavily on w_{kt}. Higher value of w_{kt} indicates that some countries have higher ability to trade with others. Thus, the *i*-th country needs to higher trade- balance with respect to *k* to have a CA for that item.
- The trade-balance registered by *i*-th country with respect to *k* in the *t*-th time period and the corresponding total adjusted trade-balance registered by *i* in *t* is normalized by GDP unlike normalization by total trade for the NY index (Yu et al. 2009), product–specific trade for the BI (Balassa, 1986), etc.
- $CTB_{ikt,r} > 0$ implies that the *i*-th country has a CA for the *k*-th item in period *t*. However, $CTB_{ikt,r} > 0$ may not be interpreted as strength of the *k*-th item of the *i*-th country only in *t*, since other countries might also have a CA for *k* in t in terms of higher value of $CTB_{Other\ country.kt,r}$
- Here, one needs to define the sets **J**, **K** and **T** keeping in mind availability of data. For example, data by UNCTADStat do not include services in trade flows (set **K**). The set **T** is fixed by the data provider; one can reduce cardinality of the set **T** but cannot go beyond what have been provided. Data on GDP are taken from other sources like World Bank, etc.
- To check time-stationary, one may use Harris-Tzavalis unit-root test on the panel data comprising the RCA indexes for each *i* - *k* combination for each type of RCA index (Harris and Tzavalis, 1999) assuming that all units share the same first-order autoregressive parameter (ρ) This involves large volume of panel data and testing of hypothesis H_0: . $\rho = 1$
- Empirically, Stellian and Danna-Buitrago,(2019) found that the CTB index failed to show the greatest symmetry on average from the vantage point of skewness.
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2.3 Visvizi–Wosiek RCA index for the service sector:

Focusing on volume and velocity of trade in services only, Wosiek and Visvizi, (2021) proposed Visvizi–Wosiek RCA (VWRCA) index for the service sector and used the index to study evolution of the services sector in Poland during 2010–2019. The index is defined as

$$VWRCA = \frac{EXP_i^P}{IMP_i^P} * \frac{\sum_{i=1}^{n} EXP_i^P}{\sum_{i=1}^{n} IMP_i^P} \quad (3)$$

where EXP_i^P denotes value of export of the *i*-th category of services of the economy *P*. Similarly, IMP_i^P is the value of import of the *i*-th category of services of the economy and *n* denotes the number of service categories relevant to *P*.

The $VWRCA$ index has the following properties:

- Considers category of services only for a country
- Possible to examine volume and velocity of trade in services independently from the trade in goods
- Considers exports as well as imports of services
- Evaluates performance of an economy regarding the services sector.
- Fits well even under servitization of the global economy
- The index is calculated for a specific time period and thus is static in nature.
- For analysis over time, VWRCA index was adjusted to account for fluctuations in trade balance, corrected RCA for the *i*-th category of services (CRCA_i) was computed by $\mathrm{CRCA}_i = \frac{EXP_i^P}{\sum_{i=1}^{n} EXP_i^P} - \frac{IMP_i^P}{\sum_{i=1}^{n} IMP_i^P}$ and comparative advantages in trade in services
over time was determined considering values of both VWRCA and CRCA
- Confronting negative and zero values of CRCA even if VWRCA > 1 is difficult

3. Proposed method:

The $VWRCA$ index appears to be the best available index to measure CA of service sector of a country. However, the issue of aggregating $VWRCA$ indices of all service categories to get $VWRCA$ index for a country for a year is not addressed. Proposed method of such aggregation is described below.

For *n*-number of service categories, $VWRCA$ vector of service sector of a country for the current year can be viewed as a *n*-dimensional vector$\boldsymbol{RCA_c} = (VWRCA_{c1}, VWRCA_{c2,\ldots\ldots} VWRCA_{cn})^{\boldsymbol{T}}$**.** Similarly, $VWRCA$ vector for the base period $\boldsymbol{RCA_0} = (VWRCA_{01}, VWRCA_{02,\ldots\ldots} VWRCA_{0n})^{\boldsymbol{T}}$

The ratio $\frac{VWRCA_{cj}}{VWRCA_{0j}}$ reflects the stochastic nature of $VWRCA$ of the *j*-th service category in the current year over the base year. Progress is indicated if $\frac{VWRCA_{cj}}{VWRCA_{0j}} > 1$ and decline if $\frac{VWRCA_{cj}}{VWRCA_{0j}} < 1$. In line with composite RCA, proposed by Chakrabartty and Sinha, (2022), the composite $VWRCA$ of *i*-th country in the current year can be obtained by geometric aggregation of such ratios, i.e. $VWRCA^{i}_{C0} = \sqrt[n]{\prod_{j=1}^{n} \frac{VWRCA_{cj}}{VWRCA_{0j}}}$ or equivalently avoiding the *n*-th root, $VWRCA^{i}_{C0} = \prod_{j=1}^{n} \frac{VWRCA_{cj}}{VWRCA_{0j}}$ (4)

3.1 Properties:

$VWRCA^{i}_{C0}$ of the *i*-th country has the following properties:

- Simple geometric aggregation without considering correlation or association between performances of two service categories.
- Represents a continuous, monotonically increasing function which is symmetric over its arguments, i.e. independent of the order of the service categories.
- Independent of change in scale, i.e. measurements in dollars or euros or INR
- A small gain in a service category and corresponding growth in $VWRCA^{i}$ is constant i.e. $VWRCA^{i}$ has constant elasticity.
- $VWRCA^{i}_{C0} > 1$ implies improvement from the base year considering all service categories.
- Satisfies time-reversal test, since $VWRCA^{i}_{C0} * VWRCA^{i}_{0C} = 1$
- Facilitates the formation of chain indices, i.e. $VWRCA^{i}_{20} = (VWRCA^{i}_{21}) * (VWRCA^{i}_{10})$
- zero-valued trade flows are excluded
- Possible to draw the $VWRCA^{i}_{t}$ −graph over a long period to reflect the zigzag path of improvement or decline over time.
- Find relative importance of the service categories in terms of the values of $\frac{VWRCA_{cj}}{VWRCA_{0j}}$

- Classify the service categories. The service categories with $\frac{VWRCA_{cj}}{VWRCA_{0j}} > 1$ are "*Stars*" or "*Cash Cows*" and the sectors for which $\frac{VWRCA_{cj}}{VWRCA_{0j}}$ <1 but ≥ 0.5 have the potentiality to improve and become a "*Star*" if appropriate corrective actions are implemented and the sectors with $\frac{VWRCA_{cj}}{VWRCA_{0j}} < 0.5$ are critical and require immediate managerial attentions.
- Similarities of trends of VWRCA-curves of two countries may be found by correlation. Better could be to use non-parametric trend tests like the Modified Mann-Kendall trend test, which is robust in the presence of autocorrelation (Hamed and Rao, 1998).
- May help to evaluate effects of changes in policies on trade barriers, tariffs, etc. on a country's trade in services.
- Facilitate undertaking correlation analysis and finding the empirical relationship of VWRCA of a country with other trade indicators of the country.

4. Limitations:

- $VWRCA_{C0}^{i}$ of the *i*-th country considering base periods is a function of time and generates time-series data where computations of the index are done at adjacent time-periods with potential for correlation between observations and structural breaks.
- The time series may not always be stationary
- Introduction of a new service category will increase the dimension of the vector $VWRCA_c$**.** If the corresponding value of the component in $VWRCA_0$ vector is taken as zero, the method fails. Remedial action is to take the corresponding value as one.
- If for the *k*-th service category, $VWRCA_{ck} = VWRCA_{0k}$, the service category does not contribute to the country-level VWRCA for the *c*-th time-period i.e. $VWRCA_{C0}^{i}$.

5. Discussion and Conclusions:

RCA alone fails to answer the query a country's comparative advantage and degree of specialization in the services sector. The proposed index satisfying a number of desired properties appears to work well for evolution of service sector of an economy better than the other measures of service sector. In addition, the proposed index helps to quantify volume and velocity of trade in services independently from the volume of trade in goods. Future empirical investigation may be undertaken for comparison of $VWRCA$ index with a chosen base period and traditional RCA along with plotting graphs of service sector of India across time and also graph for each service category.

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