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GDP estimation in India- Perspectives and Facts

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"Resolving to seek no knowledge other than that of which could be found in myself or else in the great book of the world, I spent the rest of my youth traveling, visiting courts and armies, mixing with people of diverse temperaments and ranks, gathering various experiences, testing myself in the situations which fortune offered me, and at all times reflecting upon whatever came my way so as to derive some profit from it."

René Descartes

1. India's improved GDP methodology with base year 2011-12

1.1 GDP calculation has always been an imperfect art. Irrespective of the methodology, there are always some areas that require extrapolation, estimation and sometimes even guestimates based on past trends. However, the essence of the exercise is to always pursue perfection in calculations in a manner that best reflects a country's situation. India has frequently revised its GDP calculation methodology and the latest one by Central Statistics Office (CSO) that changed the base year to 2011-12 along with other methodological changes (as many countries do regularly) was no different. Key changes over past years also have involved new base years, incorporation of latest datasets, coverage of new activities and adoption of international standards.

1.2 In June 2015, the Central Statistics Office came up with a revised methodology to evaluate India's GDP.[1] It presented various arguments to shift away from the old series and rightly so. It started using a new base year (2011-12) along with

[1] A detailed note on all the changes is available at: http://www.mospi.gov.in/sites/default/files/press_releases_statements/Changes%20in%20Methodology%20NS%202011-12%20June%202015.pdf

certain other changes, given better availability and reporting of data. The process of changing the GDP estimation methodology started in 2008 with the Advisory Committee on National Account Statistics forming 5 subcommittees. Based on recommendations made by sub-committees 2 major changes were accepted, (i) Incorporation of MCA21 database in place of Annual Survey of Industries and (ii) Incorporation of the Recommendations of System of National Accounts (SNA), 2008.[2] In addition, the following changes actually point out that the calculation in new series is a far better reflection of reality than the old series,

- Differential productivity of workers: The old series assumed that all categories of workers engaged in an economic activity contribute equally. The new method addresses differential labor productivity issue by assigning weights to the different categories of workers engaged in an economic activity based on their productivity.
- Composition of various activities between the two series: The two series differ in relative weights of various sectors. These weights change primarily because of the availability of new data and better coverage. For instance, the weight of Manufacturing was increased from 14.7% to 18.1%, while that of Trade, repair, hotels and restaurants was reduced from 17.4% to 10.8% in the new series. Now, in the old series of 2004-05, no recent survey of unorganized trade enterprises was available for incorporation and hence the estimates were based on the survey conducted in 1999-2000. While in the 2011-12 series, this was updated with the survey on 'Unincorporated Enterprises' conducted by NSS in 2010-11.

2. India's methodology in line with advanced countries

2.1 Other countries have switched their GDP calculation methodologies as well based on SNA, 2008. This switch led to increases in GDP in some OECD countries, reductions in others. On balance, more countries had increases than decreases. For example, on an average for OECD countries, there was increase in real GDP of 0.7%. If there has been an increase in a country, that doesn't mean GDP numbers are false and untrustworthy. The reason is that over time improvement in data sources help to expand the coverage of activities, hence it should not be confused with over-estimation.

[2] Available at: http://www.mospi.gov.in/sites/default/files/press_releases_statements/Inform_no_base_year_revisi_NA10oct14.pdf

2.2 Most countries follow the SNA template. First, note that all OECD countries changed their systems of national accounts after SNA 2008 was adopted. Most did so by December 2014. Turkey followed in 2015 and Chile and Japan in 2016. This doesn't mean other countries didn't change their systems of national accounts. So did they, but OECD sources document changes better. Therefore, India is no outlier. Had India not changed its system, it would have been an outlier, and would no doubt have been decried by critics.

3. Comments on a recent paper on India's GDP estimation by Dr. Arvind Subramanian

3.1 Dr. Arvind Subramanian, former Chief Economic Advisor (referred to as 'Author' when not explicitly named) has recently written a paper titled 'India's GDP Mis-estimation: Likelihood, Magnitudes, Mechanisms, and Implications' and a newspaper column on the same subject. The author claims that India's new methodology of evaluating GDP has led to an over-estimation of economic growth in the period post 2011. It would only be fair to carefully read the author's paper without casting aspersions on his integrity or motives. [3]

3.2 Having closely read the paper and taking into account all information available until 19th June 2019, the primary contributors of this note reject the author's methodology, arguments and conclusions in the said paper. A critique of official GDP estimates must specifically critique coverage or methodology, the author does neither. The author mentions that the motivation of his paper is not political and is focused on technical aspects. However, given the fact that his paper lacks rigor in terms of specific data sources and description; alternative hypothesis; rationale of equation specifications, use of dummies, and robustness-check diagnostics of estimated equations; and choice of countries in the sample and a specific list; it would not stand the scrutiny of academic or policy research standards. Further, given the fact that the author occupied a high seat of Indian economic planning for nearly four years, it is worth assuming that he is familiar with different data sources in the country, including private and public; and their availability and quality; and hence these details are not discussed in detail in the following sections.

[3] Original paper available at: https://growthlab.cid.harvard.edu/files/growthlab/files/2019-06-cid-wp-354.pdf

3.3 As mentioned in the press release by EAC-PM on 12th June 2019, the following points provide a detailed, point-by-point rebuttal to Dr. Subramanian's claims in his working paper.[4]

3.4 **Working paper (Section I):** Dr. Subramanian's paper is not peer-reviewed. Probably, in due course of time, many experts will weigh in on the dependability of techniques used, veracity and fullness of data used, and of course the interpretation of various aspects of national income accounting that don't fall in the 'black or white' category. This certainly does not mean that the paper should not be taken seriously, but to believe it as gospel truth is equally problematic.

3.5 **Cherry-picking high-frequency indicators (Section II)**: The author uses 17 indicators to express his skepticism about the growth rates post 2011-12. Majority of the 17 indicators have been taken directly from Center for Monitoring Indian Economy (CMIE), a private agency that is not a primary source of information but collects it from different sources. On a more fundamental basis, the national income accounting framework estimates value addition of different economic activities, and not merely changes in indicators of these activities. It is, therefore, conceptually incorrect to relate levels of GDP to levels of indicators. Even if one neglects this basic flaw, the following arguments by the author raise serious concerns.

- The author suggests that the 17 indicators he uses are strongly corelated with GDP in the period from 2001-02 to 2016-17. Neither does he mention the strength of correlation nor it is clear if there are other indicators that are more strongly corelated with GDP in either of the two periods he evaluates. Further, a cursory look at the indicators suggests a strong link with Industry indicators (a sector that contributes an average of 22% to India's GDP), while the representation of Services (60% of GDP) and agriculture (18% of GDP) is as good as missing. It is difficult to believe that indicators in the Services sector would not corelate with Indian GDP. Now there are two possibilities that may have persuaded the author to ignore the indicators from Services and Agriculture, a) These indicators don't exist, b) The author chose to overlook them. In both cases, the analysis with 17 indicators appears incomplete, if not obsolete.

[4] Available at: http://pib.nic.in/newsite/PrintRelease.aspx?relid=190375

- Overlooking Tax data: While selecting 17 indicators, the author chooses to overlook tax data. He mentions, "we do not use tax indicators because of the major changes in direct and indirect taxes in the post-2011 period which render the tax-to-GDP relationship different and unstable, and hence make the indicators unreliable proxies for GDP growth". Unlike many indicators, tax data is not collected through surveys or by agencies through arcane techniques, these are hard numbers and should be an important indicator of growth. Further, there have been no major changes in tax laws until the end period in the author's analysis (31st March 2017). GST was introduced on 1st July 2017. The author's logic of not using tax data appears to be a convenient argument meant to avoid inconvenient conclusions based on hard facts.

3.6 **Right data, wrong conclusions (Section II & V)**: The author's argument for mis-estimation of GDP by Indian agencies post 2011-12 is simple- because his select 17 indicators aren't uniformly corelated with GDP in the two periods he studies and don't show high growth levels post 2011-12, GDP must have been mis-estimated in the period post 2011-12 (his original hypothesis goes on to say "the lower average values for nearly all the indicators and the negative correlations post-2011, is consistent with the hypothesis that GDP growth was substantially over-estimated in this period"). Economic logic suggests that there are more probable possibilities using the same data,

- That GDP is rightly estimated in both periods and the correlations of indicators change with time, as one would expect in any large, evolving economy: One of the indicators that the author uses that hints at this possibility is foreign tourist arrivals. Annual average growth of this indicator in both the periods chosen by the author (as evident from Figure 2 in his paper) is close to 8%. But the correlation with GDP is quite different- much more corelated with 2001-02 to 2011-12 than 2012-13 to 2017-18 (Figure 1 of working paper). This simply implies that if one were to look at 'Foreign Tourist Arrivals' as an indicator of GDP, it would show a much higher correlation with GDP between 2001-02 and 2011-12 than for the period between 2012-13 and 2017-18, despite the fact that it's growth levels are consistent in both periods. This simply means that despite high growth levels of an indicator, it's correlation with GDP can be different in different periods.
- The flipping of trends on selective basis is nothing but business as usual. As Vaidya Nathan points out "Correlations have flipped in the 1980s-90s with or without methodology revisions. Moreover, several indicators were negatively

correlated with GDP growth in the 1980s and 1990s as well. So, the claim that negative correlations between economic indicators and GDP growth are symptomatic of its measurement error is grossly misplaced". Also, the author's conclusions would have been the same even if he would have chosen different years. "Subramanian chooses to split the empirical analysis as pre-2011 and post-2011. A closer assessment of the choice seems like data mining to get preferred inferences. When we split the data in the paper one year before or after — as pre-2010 and post-2010, or pre-2012 and post-2012 — we get identical results of both flipping and negative correlations, as in the paper". [5]

3.7 **Alternate explanations to a mismatch between high-frequency indicators and GDP growth (Section II & V):** Despite the fact that the author's approach and his conclusions appear impulsive, let's assume that his exercise to show a mismatch between 17 high frequency indicators and GDP growth is actually right. Even in such a scenario, there are robust explanations that debunk his broader conclusion that GDP growth is over-estimated.

- One possible explanation is that the pre-2011 period involved exuberant lending by banks. Thus, some of the leading indicators of growth may have appeared strong, but the real economy didn't grow as much and accumulated spare capacity which became noticeable only in later years. Further, credit growth on steroids was an important creator of NPAs, that continue to be a challenge in India.
- A weaker correlation between a select few indicators and GDP growth would not necessarily signal an economic slowdown; but only that the contributors to growth changed significantly post global financial crisis. For one thing, it would then imply a structural break in 2008-09, and not in 2011-12. Besides, as countries deleveraged, and global trade momentum weakened, countries provided fiscal stimuli; while monetary authorities complemented these efforts by easing monetary policies and providing extra liquidity. In the process, growth drivers shifted toward domestic consumption, and public expenditure. Quite likely, the shift was different across different countries (possibly based on country specific factors such as the credit build-up prior to the global financial crisis), and sharper for India. It has been widely noted that domestic consumption and public investment have been the main contributors

[5] Available at: https://economictimes.indiatimes.com/news/economy/indicators/view-whats-wrong-with-arvind-subramanians-gdp-math/articleshow/69816811.cms

to growth in India in the last decade, while exports and private investment (and credit) have played a muted role.

3.8 **An unusual econometric exercise with unworthy results (Section III & IV)**: The author makes a spirited yet simplistic attempt to evaluate the quantum of over-estimation that he claims for India's GDP growth. To begin with, he chooses only 4 of the 17 indicators (again ignoring the Services sector that contributes nearly 60% to India's GDP and agriculture that contributes nearly 18% to India's GDP) that he believes are strongly corelated with India's GDP growth. The four reasons he mentions for choosing just four indicators are, 'co-movement with GDP, tractability, independently generated and measured, and, easy to produce' which certainly don't pass the statistical robustness test. To be fair to the author, he himself concedes that when he states, "one concern about these regressions could be that they are parsimoniously specified: there are only four indicators on the right-hand side when in principle there could be many such indicators that should be included".

3.9 Further, the author performs a cross-country regression where he compares India to the performance of 70 other countries. To put it simply- as per the author, if India doesn't fall on the regression line for other countries, India must be doing something wrong. The fact that India is an outlier cannot automatically lead to the inference that India's growth has been over-estimated, simply because the drivers of India's growth may have changed in the second period as per the author's classification.

3.10 In general, results based on cross country regressions are generally problematic. There are likely to be country specific heterogeneities that are not modelled. India is unique in many ways- it isn't resource rich and has no history of manipulating its exchange rate for its benefit. Also, "when variables are growing, a regression in levels can give spurious results."[6] Additionally, the author relies on the power of R square to explain sufficiency in the model. However, R-square values does not indicate whether a regression model is adequate. A model that does not fit the data can also have high value of R square.

[6] Available at: https://www.bloombergquint.com/opinion/measuring-indian-gdp-arvind-subramanian-cant-be-taken-seriously

"Econometrically, high R-bar squares have long lost their admiration and have been replaced by economic logic in the equations."[7]

3.11 In his regression, the author "neglects or assumes productivity growth differences to be constant across countries, which is inadequate in a growth regression, and unfair to India whose productivity growth differential was rising in this period [post 2011]".[6] "The paper uses 70 countries as control and only one country (India) as treatment, something that is bad econometrics." Consequently, both the 2.5% GDP overestimation and its confidence interval are highly suspect. Also, the data frame used by the author (15 years: 10 years pre-2011, and 5 years post-2011) appears to be too small to draw statistical inferences about India's GDP trends.[5]

3.12 **Institutional bias against the CSO (Section I & II)**: For anyone who reads Dr. Subramanian's paper, it is evident that he trusts CMIE but distrusts CSO. He explicitly states that one of the reasons for his choice of 17 indicators is that CSO doesn't produce them. Moreover, this distrust is not because of methodological reasons. It appears more towards the institution. the author ends up using exports and imports numbers produced by CSO but adds a caveat that "they can be verified using partner country data", further implying that CSO is not an institution to be trusted. This blind trust in a private agency (CMIE) and blind distrust in a government institution that has served India (CSO) appears unwarranted for a neutral academic.

3.13 **Misplaced hypothesis, methodology and analysis of India (Section II & V)**: The author's original hypothesis is the belief that 2004-05 series was perfect, and all the calculation and estimation errors only happened post 2011. If everything was perfect before 2011, why did global experts encourage India to adopt a more robust GDP calculation methodology? In addition, various independent commentators have concluded that the author's analysis doesn't pass the smell test.

- "The official ratio [Tax-to-GDP] for FY12 to FY17 is in line with historical estimates and is in fact a bit below the extrapolated trend based on FY02 to FY11. Subramanian's lower estimates for GDP would mean a 20 per cent ratio whereas the official is at 17 per cent, the trend suggests

[7] Available at: https://www.financialexpress.com/economy/is-india-overestimating-growth-arvind-subramanians-gdp-formula-is-political-not-intellectual/1609730/

18 per cent, and even the FY08 peak had not crossed 18 per cent. If growth really was so slow for around the first half of this decade, the ratio should be much lower."[8]

- "Subramanian can certainly argue that a 7% growth claim has a smell problem. But his 4.5% estimate fails the smell test too. India has many problems but displays nothing like the economic disaster that 4.5% growth would imply".[9]
- "Subramanian makes self-contradictory claims and draws mathematically incorrect conclusions. For instance, the paper claims that import growth less export growth was 1.1% pre-2011 and –0.9% post-2011 and that "such staggering declines are simply incompatible with stable underlying GDP growth". The evidence is correct, but the conclusion is not. If imports outpaced exports by 1.1% in pre-2011, the effect on GDP growth mathematically is negative, which is exactly the opposite of what the paper claims. And if exports outpaced imports by 0.9% post-2011, the effect on GDP growth is positive and, therefore, self-contradicts the paper's conclusions. These could be oversights, but they are far too many to ignore".[5]

3.14 **'*Manufacturing*' propositions (Section V): T**he author attributes a large chunk of his so called 'over-estimation' to the formal manufacturing sector (nearly 1 percentage point of the alleged over-estimation of 2.5 percentage points). He makes two strong arguments and draws imprecise conclusions from them.

a) Because the correlation between Manufacturing Exports growth and Real GVA (Gross Value Added) growth from formal manufacturing has reversed pre and post 2011, manufacturing GVA has been over-estimated. The author relies on a simple inflection of correlation with limited data points to arrive at this conclusion. In fact, his post 2011 analysis suggests that higher the growth of Manufacturing Exports, lower has been real growth in formal Manufacturing GVA. Let's for once assume that the author's over-estimation claim is indeed true. If such is the case then the correlation should have been strengthened post-2011, not gone in the

[8] Available at: https://indianexpress.com/article/opinion/columns/passing-the-tax-smell-test-arvind-subramanian-gdp-data-5777748/

[9] Available at: https://timesofindia.indiatimes.com/blogs/Swaminomics/subramanian-fails-the-smell-test-no-less-than-indias-gdp-data/

negative as his data suggests. He states, "old real GVA growth series yields reasonably plausible relationships with other related series, but the new series yields counter-intuitive results". In a rapidly changing economy like India, something counter-intuitive can't be a reason for national alarm. Relationships between indicators and GDP have changed many times in the past, and this is nothing to be excited/saddened about.

b) Because the correlation between Manufacturing Index of Industrial Production (IIP- Manufacturing) and Real GVA growth in formal manufacturing post 2011 is not similar to pre-2011, manufacturing GVA is wrongly estimated. To prove this point, the author does an interesting analysis. He assumes Real Formal Manufacturing Growth as the baseline and charts IIP fluctuations to conclude that the 'Net' variation pre-2011 is much less than 'Net' variation post-2011, hence, GVA is over-estimated. The fact is IIP has fluctuated (relative to GVA growth) in both the time periods the author has studied. It has fluctuated intensely in both directions before 2011 and fluctuated in one direction post 2011. The only inference one can draw from this analysis is that IIP is not a good indicator of formal Manufacturing GVA growth in any time period (neither pre, nor post 2011), as it captures production not value addition. But in the author's eyes, it is an over-estimation.

   The fact is IIP like any other indicator is not the most precise indicator of Industrial growth. To improve IIP, a new series was introduced when the base year was revised to 2011-12. The 2011-12 series for manufacturing sector contains a total of 809 items as against 620 items in the 2004-05 series. In the new series, 149 items were added while 124 items were removed from the old series. The other change was the weight of manufacturing sector in IIP, that was increased from 75.5% to 77.6%.[10]

4. GDP estimation in India- What's next?

4.1 India's GDP estimation is by no means a perfect exercise. Is it better than before? Yes. Is the process to further improve it in place? Yes. The complexities involved with a rapidly transforming economy and those associated with implementing methodological improvements warrant India to constantly work on producing

[10] Available at: http://pib.nic.in/newsite/PrintRelease.aspx?relid=161745

the most accurate estimates of GDP. And the good news is that India is on the job. However, one must appreciate that, "as with any international standard, the data requirements are immense and developing countries take time to evolve the various data sources before they can be aligned with the SNA requirements".

4.2 For instance, it is always a challenge to convert nominal GDP into real GDP. Many experts have pointed out that India is better suited to use double deflator as against a single deflator in use today. "IMF had raised certain concerns regarding the deflators used in the GDP estimates, especially the use of double deflation. In this context, it may be appreciated that the data requirements for using double deflation is immense and that only few countries like Australia, Brazil, Canada, France, Germany, Italy, Japan, Korea, Mexico and USA are presently using this methodology." To improve upon this,"[MoSPI] is working in close coordination with the Ministry of Commerce and Industry for developing the required indices for using double deflator methodology in relevant sectors. MoSPI has separately taken up this issue with the IMF. It may also be noted that the National Accounts Division, which compiles these macro aggregates and other National Accounts Statistics is also ISO (International Organisation for Standards) 9001:2015 certified for its quality management of procedures and processes." [11]

5. Conclusion

5.1 India's GDP estimation methodology stands at par with its global standing as a major and responsible economy. It is of the quality and precision expected from a transparent and well managed economy. The new methodology introduced in 2015 is a testament to India's intent to adopt the most modern global standards to accurately report its economic data. And India's direction and pace towards the goal of accurate National Income Accounting is worthy of praise. The complexity of computing GDP gets compounded in an emerging country of the size of a continent and highly diverse products ranging from agriculture produce to sophisticated satellites.

5.2 In a recent paper, Dr. Arvind Subramanian seems to have made a hurried attempt to draw conclusions about India's complex economy and its evolution. He himself admits that "the results in the paper are by no means the final word",

[11] Available at: http://pib.nic.in/newsite/PrintRelease.aspx?relid=189957

however, the sweeping conclusions and broad policy implications he lays out seem to suggest that India needs to be alarmed. If anything, the weakness of Dr. Subramaniam's attempt to suggest that the growth numbers are over-estimated confirms that the estimation process is robust to spurious criticism. The fact of the matter is that India's GDP methodology is consistent with internationally accepted standards and is in a continuous process of improvement.

5.3 The author, in the capacity of Chief Economic Adviser in the Ministry of Finance, has presided over the army of government economists and statisticians, and is aware of the enormous magnitude and complexity of the exercise to compute GDP of the continent-size highly diverse emerging economy of India. To consider attempting to approximate GDP of such a country on the basis of some correlations and four variables using simplistic econometric techniques and challenging the existing edifice of data collection is not only demoralizing to those dedicated personnel but also technically inappropriate.

5.4 Going forward, Indian National Income Accounting is bound to change for good and an important step in accomplishing that will involve criticism from experts and academics. And all the critiques can use a quote by Simon Kuznets often called the father of National Income Accounting, "*the valuable capacity of the human mind to simplify a complex situation in a compact characterization becomes dangerous when not controlled in terms of definitely stated criteria. With quantitative measurements especially, the definiteness of the result suggests, often misleadingly, a precision and simplicity in the outlines of the object measured. Measurements of national income are subject to this type of illusion and resulting abuse, especially since they deal with matters that are the center of conflict of opposing social groups where the effectiveness of an argument is often contingent upon oversimplification….The abuses of national income estimates arise largely from a failure to take into account the precise definition of income and the methods of its evaluation which the estimator assumes in arriving at his final figures."*

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