Poster Session #1
Time: Monday, August 5, PM

Boston, USA, August 05-12, 2012

**Methodological Upgradation to the Labour Input Approach:
An Application to the Private Health Care Service in India**

Suparna Pal

For additional information please contact:

Name: Suparna Pal
Affiliation: Centre for Development Studies, India

Email Address: suparna08d@cds.ac.in

Methodological Upgradation to the Labour Input Approach:
An application to the private health care service in India

Suparna Pal

PhD Scholar, Centre for Development Studies, Trivandrum
e-mail: suparna08d@cds.ac.in, suparna.pal07@gmail.com

Abstract

Since the period of independence Indian economy is witnessing a transition from agriculture based economy to a service led economy bypassing the industrial phase. In the era of economic liberalization this service sector ushered a rapid growth and boosted the overall economic growth to a moderate level. But there is an ongoing debate about the reliability of the service sector output which questioned on the actual sectoral composition of GDP in India. It is argued that the service sector output is over estimated due to inadequate reliable data availability imbibed with faulty methodology. To understand the economic development and the sustainability of economic growth of a country, it is inevitable to know the actual picture of output generated in the economy in terms of goods and services produced. In India, GDP is estimated as the sum of total production of three sectors – public sector, private organised sector and unorganised sector. Due to the non-availability of reliable information on a regular basis, the estimation of GDP for the unorganized segment of manufacturing and service producing activities, which covers around one- third portion of the domestic product, is mostly vulnerable. The GDP for this unorganised non-agriculture part is estimated by applying the Labour Input Method (LIM) as the gross value added by the labour input involved in the production process. LIM considers that the value addition of each worker involved in an economic activity is the same. This implies that all the workers possess the equal level of productivity irrespective of the skill and occupational heterogeneity, which is unrealistic. It may lead to an over estimation or under estimation of the GDP for the unorganised non-agriculture segment of the economy. As a result, the estimated value of GDP as a whole for the economy may deviate from the actual value of GDP, which has serious impact on policy formulation and budget allocation. Thus, it is essential to apply an improved LIM which is able to differentiate the value addition of each worker according to their quality in terms of heterogeneity in skill level and occupational pattern.

This study is an attempt to improve the existing version of LIM by incorporating the productivity differences among the workers, which is able to capture the value addition of different categories of workers. Besides this a comparative assessment has

been made between the proposed method and the existing one. To examine this, an application is made on private Health Care Service in India, where quality difference among the various categories of workers is vividly observable. Empirical illustration is given by using the information of NSSO (National Sample Survey Organisation) Service Sector Enterprise Survey (ES 63rd round, 2006-07) and Employment Unemployment Survey (EUS 61st round, 2004-05). Besides these NSSO Employment Unemployment Survey (55th round, 1999-00) and projected population figures from Population Census are also used.

_____

I. Introduction

The nature of the structural composition of GDP and its changing pattern over the years in India is quite different from other developed and developing countries. It is observed that since the period of 1950 the share of agriculture has declined, industrial sector has become stagnant and the service sector has added up the share uninterruptedly. As a result in 2007 the scenario changed to a service led economy with the share of service 62%, industry 19.5% and agriculture 18.5% in GDP. But there is an ongoing debate about the reliability of the estimate of service sector output in India. It is argued that the service output is overestimated due to inadequate reliable data availability imbibed with faulty methodology (Nagaraj 2008, 2009; Shetty 2007; Sharma *et al*. 2007). It questioned on the actual sectoral composition of GDP. Thus, for the sake of true estimate, it is essential to examine the drawbacks, if any, in the existing method followed in India for the estimation of GDP.

The existing method of National Accounts of India follows the framework of the System of National Accounts (SNA), 1993. In the National Accounts Statistics of India, the production approach GDP is considered firmer estimate than the income approach or expenditure approach GDP. It is a concept of value added and estimated as the sum of gross value added (GVA)[1] of all resident producer units (institutional sectors or industries) plus the total amount of taxes less subsidies on products which is not included in the valuation of output. According to the estimation procedure, GVA is mainly calculated in two ways – GVA at market prices[2] and GVA at factor cost. The concept of GVA at factor cost is not used explicitly in the SNA, 1993. The measure, GVA at factor cost is applied to those units of production where is no observable vector of prices and quantities for both inputs and outputs, and other taxes or subsidies on production can not be eliminated from the input and output prices (NAS sources and methods, 2007). It can be treated as a measure of income but not output. It is the amount of GVA, remained for distribution after the payment of all taxes on production and receipt of all subsidies on production. Thus it can be considered as the total value of the factor incomes generated by production.

Value added is created by two factors of production – labour and capital. Thus the income generated out of the production process by these two factors are remunerated by the compensation of employees and operating surplus in the case of organised sector and mixed income in the case of self employed or unincorporated enterprises. The estimates

---

[1] GVA is the difference between output and intermediate consumption.
[2] GVA at market prices is defined as output valued at producer's prices less intermediate consumption valued at purchaser's prices

of factor incomes are prepared separately for public sector, private organised sector[3] (consisting of private/public limited companies and cooperative societies) and private unorganised sector[4] (includes households and private unincorporated enterprises). For public sector, GVA is estimated using the budget documents and annual accounts of public sector enterprises. The GVA of private organised sector is calculated using the information of Annual Survey of Industries (ASI) and Company Finance Studies released by the RBI. The information on unorganised segment of manufacturing and service-producing activities are collected through the various surveys conducted by NSSO and follow up surveys of Economic Census co-coordinated by CSO. There is no required information on output and intermediate inputs, and the information is not available on regular basis. Thus, to estimate the GVA for this unorganised non-agriculture part an indirect method is followed, called Labour Input Method (LIM). According to the report of Working Group (2004), 'In this method, aggregate estimate of value added for an economic activity or a group of economic activities is arrived at by multiplying an estimate of labour input going into the process of production and an estimate of value added per unit of labour input for the respective economic activity or the group of economic activities.'

In LIM, it is assumed that all the workers involved in an economic activity have the same level of contribution in the production process and value added by each worker is same. This implies that all workers are equally productive irrespective of their skill and occupation differences. This implicit assumption of homogeneity in LIM can not be considered as a realistic one. It may lead to an over estimation or under estimation of the GDP of the unorganised non-agriculture segment of the economy. As a result, the estimated value of GDP as a whole for the economy may deviate from the actual value of GDP, which has serious impact on policy formulation and budget allocation. Thus, it is essential to apply an improved LIM which is able to differentiate the value addition of each worker according to their quality in terms of heterogeneity in skill level and occupational pattern.

This study is an attempt to improve the existing version of LIM by incorporating the productivity differences among the workers, which is able to capture the value addition of different categories of workers. Besides this a comparative assessment has been made between the proposed method and the existing one. To examine this, an application is made on private Health Care Service (HCS) in India, where quality difference among the various categories of workers is vividly observable. Section II deals

---

[3] The concept of organised sector followed by the NAS is somewhat different from the concept used by the follow up surveys of the Economic Census. Private corporate sector and cooperative societies constitute unorganised sector as per the concept of surveys.

[4] Unorganised segment of any sector of the economy in India comprise those operating units whose activity is not regulated under any legal provision (Ref: NAS sources and methods, 2007, pp. 309)

with the description of LIM currently practiced in India. Section III is based on the description of the methodology of the prescribed improved version of LIM. Section IV is on discussion of results by applying the prescribed LIM with the comparative assessment of the existing approach. Lastly, section V contains the concluding remarks.

II. Current Practice of LIM

The estimation of output of an economic activity or group of economic activities in terms of value added by applying the technique of LIM is based on the principle that labour is used as an input in the production process.

The LIM consists of the following steps –

(i) Obtain the estimate of labour input for a particular economic activity or a group of economic activities from Population Census (PC) and/or Labour Force Survey like the Employment & Unemployment Survey (EUS) of the NSSO

(ii) Find out the estimates of value added or output per unit of labour input for the same economic activity or group of economic activities from Enterprise Survey (ES) conducted by the NSSO, and

(iii) Then multiply the estimate of labour input by the estimate of per unit value added or output to arrive at an aggregate estimate of value added or output for the economic activity or the group of economic activities.

Therefore, according to the LIM, gross value added (GVA) of an economic activity is the product of gross value added per worker (GVAPW) multiplied by the number of workers (N) involved in that economic activity. i.e,

$$GVA = GVAPW * N$$

Thus, from the above description it can be said that the effectiveness of LIM depends on the following issues –

(i) Proficiency of the measure of labour input, and

(ii) The quality of the estimate of value added per unit of labour input.

About the first issue on measurement of labour input, it is required that the supply side (based on household data, PC, EUS) and the demand side (based on enterprise data, ES) estimates would be ideally the same. But to estimate the work force involved in economic activities, the concept of worker is different in three surveys – PC, EUS and ES. In PC, workers are defined in terms of main workers and marginal workers. In EUS, workers are

considered in terms of usual status approach, which represents the persons involved in economic activity in terms of principle status or subsidiary status criteria or both of them. In ES, a worker is defined as one who participates in the activities of enterprise on full-time or part-time basis on fairly regular way. PC and EUS basically collect information in terms of employment of persons whereas ES records information in terms of jobs and counts number of jobs. To resolve this problem and to reconcile the supply side and demand side estimates the Working Group recommended the following method for estimating the labour input at the national level.

(i)   Obtain the number of workers as the sum of principal status and subsidiary status workers from the last EUS for each segments of the population - rural male, rural female, urban male, and urban female. Then estimate the number of workers per thousand populations.

(ii)   Apply this activity specific rate of labour input to the four segments of the population obtained from the projected population figure (mid-year population) for that year.

(iii)   Estimate the growth rate of workforce for the four segments separately by using the last two EUS.

(iv)   Apply the growth rate to the base year (last EUS year) for each segment separately to get the labour input for the subsequent years.

(v)   Finally, to obtain the estimate of labour input of unorganised sector, the annual Employment Market Intelligence (EMI) data of the Directorate General of Employment and Training (DGET) for the workforce estimates of the organised part is subtracted from the total workforce.

By this method the issue of the measure of labour input is well handled. But still now the problem of the quality of the value added per unit of labour input remains unresolved. A way to overcome this difficulty is mentioned in the following section by incorporating the quality adjustment among the workers with their performance criteria.

III. Methodology of the prescribed LIM

For the sake of simplicity it is assumed that there are two categories of workers A and B in a service industry with different occupations and skills. Numbers of workers in those categories are N_a and N_b, and their respective average wage rates are W_a and W_b. In each category, workers are sub-divided into different sub-category according to their homogeneity of occupation and level of productivity. Suppose, category A consists of three sub-categories A_1, A_2 and A_3, with the number of workers N_{a1}, N_{a2}, N_{a3} and average wage rates W_{a1}, W_{a2}, W_{a3} respectively. And category B consists of two sub-

categories B_1 and B_2, with the number of workers N_{b1}, N_{b2} and average wage rates W_{b1}, W_{b2} respectively.

Say, the gross output generated in terms of value addition of that industry is V. Here, it is assumed that the workers are paid according to their contribution in the production process for generating the output. Thus, level of productivity of workers is reflected by their wage rate.

According to the existing measure of LIM, the gross value addition per worker is

$$\frac{\text{total value added}}{\text{total number of workers}}$$

In this example, the gross value added per worker (GVAPW) is

$$\frac{V}{N_{a1} + N_{a2} + N_{a3} + N_{b1} + N_{b2}}$$

This symbolizes that all the workers have the same value addition, which can not hold in reality.

Thus, to capture the real phenomena it is required to incorporate the notion of different value addition of workers according to their skill and occupational heterogeneity. This can be done by considering the productivity differentiation among the workers by adding up a weight according to their level of productivity. Hence, instead of taking into account the total number of workers, it is essential to consider the total of weighted number of workers as the denominator. This will results in value addition per weighted labour input in place of simple value addition per worker. Therefore, to get the actual figure of GVA it is necessary to multiply this value added per unit of weighted labour input (VAPUWLI) to the total number of workers and this can be termed as the weighted GVA.

Here, between the two broad categories A and B each category of worker will be given weight by the amount $\dfrac{W_i}{\sum\limits_{i} W_i}$, Where i = a, b

For each sub-category under the category A the weight, $\dfrac{W_a}{\sum\limits_{i} W_i}$ will be distributed by the

ratio $\dfrac{W_{aj}}{\sum\limits_{j} W_{aj}}$, (where j = 1, 2, 3) which is nothing but the weight for each sub-category

within A category.

Thus, the value of ultimate weight for jth sub-category of A will be

$$\frac{W_a}{\sum\limits_{i} W_i} \times \frac{W_{aj}}{\sum\limits_{j} W_{aj}}$$

Similarly, the value of ultimate weight for kth sub-category of B will be

$$\frac{W_b}{\sum\limits_{i} W_i} \times \frac{W_{bk}}{\sum\limits_{k} W_{bk}} \text{ , where k = 1, 2}$$

Therefore, the average number of weighted workers for each sub-category of A is

$$n_a \times \sum\limits_{j} N_{aj} \times \left(\frac{W_a}{\sum\limits_{i} W_i} \times \frac{W_{aj}}{\sum\limits_{j} W_{aj}} \right)$$

Where, n_a is the number of subcategories under the category A. In this example the value of n_a is 3 due to three subcategories in A (A$_1$, A$_2$ and A$_3$).

Similarly, the average number of weighted workers for each sub-category of B is

$$n_b \times \sum\limits_{k} N_{bk} \times \left(\frac{Wi}{\sum\limits_{i} W_i} \times \frac{W_{bk}}{\sum\limits_{k} W_{bk}} \right)$$

Where, n_b is the number of subcategories under the category B. In this example the value of n_b is 2 due to two subcategories in B (B$_1$ and B$_2$).

And the total number of weighted workers or the amount of weighted labour input is

$$n \times \left[n_a \times \sum\limits_{j} N_{aj} \times \left(\frac{W_a}{\sum\limits_{i} W_i} \times \frac{W_{aj}}{\sum\limits_{j} W_{aj}} \right) + n_b \times \sum\limits_{k} N_{bk} \times \left(\frac{Wi}{\sum\limits_{i} W_i} \times \frac{W_{bk}}{\sum\limits_{k} W_{bk}} \right) \right]$$

Where, n is the number of categories of workers. In this example the value of n is 2 due to two categories of workers (A and B).

Therefore, the value added per unit of weighted labour input (VAPUWLI) is

$$\frac{V}{n \times \left[n_a \times \sum_j N_{aj} \times \left(\frac{W_a}{\sum_i W_i} \times \frac{W_{aj}}{\sum_j W_{aj}} \right) + n_b \times \sum_k N_{bk} \times \left(\frac{W_i}{\sum_i W_i} \times \frac{W_{bk}}{\sum_k W_{bk}} \right) \right]}$$

It can be written in a generalized form as -
Corresponding weight for j[th] sub-category of the ith category is

$$\frac{W_i}{\sum_i W_i} \times \frac{W_{ij}}{\sum_j W_{ij}}$$

The average number of weighted workers in each sub-category of a category is

$$Nsc \times \sum (Lsc \times W)$$

Where Nsc = number of sub-category within a category
Lsc = number off workers in each sub-category
W = corresponding weight of that sub-category

This can be expressed as

$$n_i \times \sum_j N_{ij} \times \left(\frac{W_i}{\sum_i W_i} \times \frac{W_{ij}}{\sum_j W_{ij}} \right)$$

The total number of weighted workers or the amount of weighted labour input is

$$Nc \times \left[\sum \left\{ Nsc \times \sum (Lsc \times W) \right\} \right]$$

Where Nc = number of category

This can be expressed as

10

$$n \times [\sum_i \{n_i \times \sum_j N_{ij} \times \ (\frac{W_i}{\sum_i W_i} \times \frac{W_{ij}}{\sum_j W_{ij}})\}]$$

Therefore, the value added per unit of weighted labour input (VAPUWLI) is

$$\frac{GVA}{n \times \left[\sum_i \left\{ n_i \times \sum_j N_{ij} \times \left(\frac{W_i}{\sum_i W_i} \times \frac{W_{ij}}{\sum_j W_{ij}} \right) \right\} \right]}$$

In this study we estimated the GVA for private organised and unorganised sector of HCS by using the information of NSSO Service Sector Enterprise Survey (ES 63rd round, 2006-07) and Employment Unemployment Survey (EUS 61st round, 2004-05). Besides these to estimate the work force in HCS NSSO Employment Unemployment Survey (55th round, 1999-00) and projected population figures from Population Census are used. As in ES no information on occupational classification of workers is available, it is substituted by using the NCO classification from EUS (61st round).

Here to estimate the weighted number of workers involved in HCS by incorporating their level of productivity, the workers are broadly classified into four groups – Doctors, Nurses, Assistants & Technicians, and Others. Again, each group is subdivided into various sub-categories according to their homogeneity of occupation, level of skill and way of contribution to HCS. Doctors are classified into four sub-categories – physicians and surgeons (Allopathic) (sub-cat1), physicians and surgeons (other system of medicine) (sub-cat2), Dentists (sub-cat3), and Veterinarians (sub-cat4). Nurses are classified into two sub-groups – high skilled Nurses (sub-cat5), and low skilled nurses (sub-cat6). Assistants & Technicians consist of Assistants to provide the HCS (sub-cat7) and Laboratory Technicians (sub-cat8). These three sections of workers are directly involved to the patients for providing HCS. Besides these workers to run the HCS providing units some are involved in non-health related activities like administration and management, security, cleaning etc., who are considered as Others. Others includes three sub-categories – high skilled and managerial staff (sub-cat9), clerical and other office assistants (sub-cat10), and other helpers (sub-cat11). The detailed classification with NCO code is given in Appendix.

Due to less sample size for the industries under HCS in EUS here the industries are considered at 4-digit level following the NIC (1998). In this study we have taken into account the following industries under HCS -

I. Human health activities

8511: Hospital activities.[Includes the activities of general and specialized hospitals, sanatoria, asylums, rehabilitation centres, dental centres and other health institutions that have accommodation facilities, including military base and prison hospitals]

8512: Medical and dental practice activities. [Includes consultation and treatment activities of general physicians and medical specialists including dentists]

8519: Other human health activities [includes Activities of Ayurveda Practitioners, Unani practitioners, homeopaths, nurses, physiotherapists or other para-medical practitioners, independent diagnostic/pathological laboratories, independent ambulance activities]

II. Veterinary activities

8520: Veterinary activities [includes clinico-pathological and other diagnostic activities pertaining to animals and birds].

For less number of observations about the employment in HCS, the worker's classification is not made for each industry. The workers are classified considering the employment pattern in all these four industries. To estimate the weight for each category the above mentioned method is followed and the average wage rate is calculated by taking into account the wage pattern of all workers involved in HCS as a whole (in both public and private sector). The estimated weights are mentioned in the following table for each sub-category.

Table 1: Weights of Sub-categories of workers of HCS

Sub-category	No of sample observations	Weight
1. physicians and surgeons (Allopathic)	143	0.153
2. physicians and surgeons (other system of medicine)	25	0.090
3. dentists	6	0.116
4. veterinarians	22	0.114
5. high skilled Nurses	227	0.102

6. low skilled nurses	325	0.078
7. medical assistants	237	0.101
8. laboratory technicians	54	0.102
9. high skilled and managerial staff	12	0.070
10. clerical and other office assistants	202	0.043
11. other helpers	175	0.031

Due to the non-availability of the required information for the private organised part of HCS from the company finance statistics by RBI, the GVA of this segment is estimated by applying the LIM using the information of ES and EUS of NSSO in National Accounting. Here the GVA is estimated separately for private organised and unorganised part by using the same prescribed method. Again for each part the estimation is done individually for rural and urban sectors. The employment pattern for each sector and each industry with worker's classification is observed from the EUS. The ratio of workers for the sub-categories is applied to the estimated number of workers from ES to obtain the estimated number of workers in each sub-category. Then the respective weight for each sub-category is applied to that to get the weighted number of workers. After that to estimate the GVA per unit of weighted labour input, total GVA obtained from the ES is divided by the total number of weighted workers for each industry sector wise. In this study the estimation is done for the base-year 2006-07. Using the population census projection figure the number of workers is estimated for the same year by applying the growth rate of workers between the last two EUS (quinquennial round) involved in private HCS (working group report, 2004). The results are discussed in the following section.

IV. Empirical illustration

This section is an empirical illustration of the proposed improved measure of LIM. Besides that a comparison has been made between the existing version and the improved version of LIM to examine their effectiveness. Results are depicted in table 2 and table 3 for the private organized and private unorganized parts of HCS respectively.

Private Organised Sector

According to the EUS (2004-05) for the units, providing hospital activities (under NIC code 8511), in rural sector majority of the workers are medical assistants (sub-cat.7,

48%) and the next majority group is other helpers (sub-cat.11, 27%). In rural area doctors are hardly available to provide hospital activities in the organized part. In this case value added per unit of weighted labour input (VAPUWLI) is more than the simple GVAPW. Comparing the GVA estimates by the prescribed method and the existing one it can be said that the estimate of GVA according to the existing method for the base year 2006-07 is an underestimated figure and the amount of under-estimation is 35%. The distribution of workers in urban part of this industry is bit different. Low skilled nurses (sub-cat.6, 30%) are the first and allopathic physician and surgeons (sub-cat.1, 21%) are the second majority group. In urban part, the GVA estimate following the current practice of LIM is an overestimation (3%) compared to the alternative approach.

For the health care units related to medical and dental practice activities (under NIC code 8512), in rural sector majority of the workers are other helpers (sub-cat.11, 72%) and the rest others are allopathic physician and surgeons (sub-cat.1). Here VAPUWLI is more than the GVAPW and the estimated GVA following the existing labour input approach is an underestimation of 4% compared to the alternative method. But in urban sector for this industry the picture is quite different. In urban part majority of the workers are allopathic physician and surgeons (sub-cat.1, 39%) and low skilled nurses and medical assistants (Sub-cat.6 and 7) has equal share (28% each). In this case according to the existing measure GVA is overestimated by 45% with respect to the alternative approach.

Due to the dissimilarity in employment pattern for the units of other human health activities, including Ayurveda, Unani, Homoeopathic etc. (under NIC code 8519) a diverse image of estimated GVA for rural and urban sectors revealed from the analysis. According to the current practice of LIM, the under estimation of GVA is 43% in rural segment whereas in urban sector the underestimation is 32% with respect to the alternative measure. In rural sector majority of the workers are clerical and other office assistants (sub-cat10, 40%), whereas in urban areas majority are low skilled nurses (sub-cat.6, 48%). In this industry for the organised part the doctors are very few in number and the share of doctors are comparatively less than the other industries (6% in rural, 7% in urban areas).

According to the ES (2006-07) no information is recorded for the organised part of the units involved in veterinary activities (NIC code 8520). Due to the non-availability of sufficient information for the estimation of GVA according to the existing measure this part is not taken into account. But according to the EUS, employment has been generated in this industry also. Thus, for the sake of accuracy in the estimation of GVA, it is required to include this industry.

Table 2: Estimates of private organised health care service activities

(Values of GVAPW are in Rupees, values of GVA and GVA* are Rupees in crore)

NIC	R/U/T	GVAPW	GVA	GVAPUWLI	Quality adjusted GVA (GVA*)	Overe/under(-) estimation of GVA (in %) w.r.t. GVA*
8511 hospital activities	rural	46516.06	231.00	71131.77	353.00	-35
	urban	327585.25	8,180.00	318268.14	7,950.00	3
	total		8,410.00		8,300.00	1
8512 medical & dental practice	rural	24879.75	2.67	25891.79	2.78	-4
	urban	608680.81	317.00	418854.93	218.00	45
	total		319.00		221.00	45
8519 other human health activities	rural	13380.00	6.65	23579.78	11.70	-43
	urban	496793.83	1,660.00	731904.25	2,450.00	-32
	total		1,670.00		2,460.00	-32
8520 veterinary activities	rural	no information				
	urban					
	total					
private organised	rural		240.00		367.00	-35
	urban		10,200.00		10,600.00	-4
	total		10,400.00		11,000.00	-5

Private Unorganised Sector

For the units providing hospital activities (under NIC code 8511) in unorganized sector, majority of the workers are low skilled nurses (sub-cat.6) for both rural (26%) and urban (30%) areas. Besides that 'other' workers (sub-cat.11) are also large in number for rural area (23%) compared to the urban areas. In rural areas there is a large gap between the no of doctors (18%) and trained nurses (8%) whereas in urban areas this gap is very less (doctors 15% and nurse 14%). Comparing between the current practice of LIM and the alternative measure it can be said that for both rural and urban areas there is an incidence of under-estimation of GVA in the existing process with respect to the alternative method. This underestimation is a little more in urban area (10%) than the rural counterpart (9%) due to the difference in composition of workers.

The scenario of the health care units related to medical and dental practice activities (under NIC code 8512) is dissimilar to the units providing hospital activities (under NIC code 8511) both in terms of worker's composition and estimated value of GVA. In this industry majority of the employee are doctors in both rural (78%) and urban (57%) areas. In both the sectors according to the existing LIM, GVAPW is highly overestimated with respect to the alternative measure. As a result GVA is also over estimated and the amount of overestimation is quite high. It is 99% for rural areas and 63% for the urban part.

For the case of unorganized HCS providing units under other human health activities (NIC code 8519), the pattern of composition of workers is just reverse of the organized counterpart. In unorganized segment for both rural and urban areas majority of the workers are skilled and higher productive. Greater part of the workers is doctor (rural 52%, urban 47%). According to the current practice of measurement technique, GVA of health service for the private unorganized sector is an overestimated figure for both rural and urban parts with respect to the alternative measure. In rural sector the extent of over estimation is almost double (25%) than its urban counterpart (12%).

For the units involved in veterinary activities (under NIC code 8520) the employees are mainly Veterinarians (sub-cat. 4, 64% in rural, 93% in urban) and the rest others are assistants and laboratory technicians. Due to the presence of skilled and higher productive workers in this industry the existing GVAPW is a highly overestimated with respect to the alternative measure for both rural and urban workers. Following the current practice of LIM, for the rural part GVA is overestimated by 45% and for the urban part it is over estimated by 74%.

Table 3: Estimates of private unorganised health care service activities
  (Values of GVAPW are in Rupees, values of GVA and GVA* are Rupees in crore)

NIC	R/U/T	GVAPW	GVA	GVAPUWLI	Quality adjusted GVA (GVA*)	Overe/under(-) estimation of GVA (in %) w.r.t. GVA*
8511 hospital activities	rural	90176.04	883.00	99022.02	969.00	-9
	urban	100427.70	4,240.00	111847.84	4,720.00	-10
	total		5,120.00		5,690.00	-10
8512 medical & dental practice	rural	41354.61	1,100.00	20769.03	550.00	99
	urban	76083.96	2,320.00	46761.91	1,420.00	63
	total		3,410.00		1,970.00	73
8519 other human health activities	rural	23810.03	968.00	18998.03	772.00	25
	urban	53237.09	2,240.00	47573.87	2,000.00	12
	total		3,210.00		2,780.00	16
8520 veterinary activities	rural	27305.67	91.10	18838.37	62.80	45
	urban	41583.79	20.10	23858.61	11.60	74
	total		111.00		74.40	50
pvt unorganised	rural		3,040.00		2,350.00	29
	urban		8,820.00		8,160.00	8
	total		11,900.00		10,500.00	13

Again, it is observed that for the industries involved in human health activities (NIC code 8511, 8512 and 8519) the presence of doctors are more in unorganized sector

17

for both rural and urban areas. It is because of the fact that most of the doctors are private practitioners. There is an under estimation of GVA (5%) according to the existing measure of LIM with respect to the alternative approach for the case of private organised segment of HCS as a whole. The degree of underestimation is highest in case of the industry other human health activities (NIC code 8519). But in case of private unorganised part, as a result of dissimilar composition pattern among different category of workers the scenario is reverse. An over estimation is occurring with the extent of 13%. This overestimation is a result of overvaluation of the value addition of per unit of labour input in all health service industries except hospital activities (NIC code 8511). It is highest for the industry medical and dental practice activities (NIC code 8512). But, as a whole for the private sector, considering both the organised and unorganised segment, according to the current practice of LIM the private HCS sector is experiencing an over estimation of 3.5% compared to the proposed version of LIM for the base year 2006-07. In monetary value the over estimation is around rupees 758 crores. In existing LIM the estimation is more volatile for the rural segment than the urban counterpart as a whole for both private organized and unorganized part of HCS.

V. Concluding Remarks

In India, from the period 1997-98 onwards the growth rate of GDP became highly influenced by the rapid growth of services, accounting over half of the share of total GDP. Whereas the industrial sector remains stagnant with the share of around one-fifth of the total GDP. This highly skewed feature of the sectoral growth raises questions towards the development as well as sustainability issues of the Indian economy. Various studies reveals the fact that, besides the high contribution of services like high-tech services, communication and business services, the problem lies in the estimation of service sector output itself. If we examine the estimation procedure of the whole economy then it is vivid that in addition to the estimation of service sector output, the difficulty lies in the evaluation of output of the unorganised manufacturing and services. Through the improvement of LIM by incorporating the idea of different level of productivity among the workers according to the nature and quality of their contribution in the production process, the problem of estimation of the unorganised non-agriculture segment might be resolved to some extent.

Now applying the prescribed improved version of LIM for the estimation of GVA of HCS, it is observed that in the existing estimation, some part is over estimated and some part is under estimated. The private unorganised segment of HCS is facing the problem of overestimation (13%) whereas organised part is confronting under estimation

(5%). Over estimation of GVAPW as well as GVA occurred to those sectors where high skilled and higher productive workers are greater in number. Whereas under estimation is the result of the presence of greater number of low skilled and low productive workers. When the number of workers is quality adjusted with their level of productivity, (considering wage rate as a proxy indicator for the level of productivity) number of weighted workers increases in case of presence of higher productive workers in greater number and number of weighted workers decreases in case of presence of lower productive workers in greater number. Thus, over estimation or under estimation took place as a consequence of composition of different categories of workers in a sector, which is ignored in the existing measure. In the current practice of LIM the value added per unit of worker is the same irrespective of quality differences of the workers. By using the proposed improved version of LIM the performance of a health care industry can be judged in a right way. On the other hand, according to the involvement of the workers in a health care industry for providing the service it can also be evaluated whether the workers are performing in a satisfactory manner, by examining their value addition. This will help the policy makers to detect the area where government have to intervene in quality controlling of the service and where more public health care service is required to facilitate the people with adequate HCS both in terms of quantity and quality.

It is observed from the analysis that the average value addition by the rural health workers is significantly less to their urban counterpart for all health care industries in both private organised and private unorganised segments of HCS. This indicates that the volume of service provided by the rural workers is quite less to their urban counterparts. Studies reveal that most of the untrained service providers practice in rural areas and they are the first source of outpatient care for the rural poor, whereas in urban areas mostly trained allopathic doctors are tend to be found (Peters et al.,2002). The study based on rural Udaipur showed that about 41 percent of those who called themselves as doctors do not have college degree, and about 82 percent had received no induction or in-service training of any type (Banerjee, Deaton and Duflo, 2004). Again, volume of service output is a measure of two indicators – quantity of the service provided (number of people availing the health care facility) and the quality of the provided service. In case of rural private health care service, the average number of persons to get the health care facility per health worker is 965 whereas in urban areas it is 227. Thus, the quantity of the service provided by the rural workers is higher than the urban workers. It implies that the quality of the service provided by the rural workers is worse than their urban counterparts. Private health care service providers make a marginal contribution to preventive care but have a much larger role in providing curative care services, particularly outpatient care (India Health Report, 2010). Hence, to provide adequate cost effective health care facilities it is required to interfere by the government on quality checking of the private health care providers.

Appendix

Worker's classification in health care service

Category	Sub-category	NCO code	Description
DOCTOR	1.physicians and surgeons (Allopathic)	70	Physicians and Surgeons, Allopathic
		78	Public Health Physicians(health officier)
		79	Physicians and Surgeons, n.e.c.
		133	Psychologists
	2.physicians and surgeons (other system of medicine)	71	Physicians and Surgeons, Ayurvedic
		72	Physicians and Surgeons, Homoeopathic
		73	Physician and Surgeons, Unani
		77	Dieticians and Nutritionists
	3.dentists	74	Dental Surgeons
	4.veterinarians	75	Veterinarians
NURSE	5.high skilled Nurses	84	Nurses
		85	Midwives and Health Visitors
		89	Technicians,n.e.c(Nursing, Sanitary and other Medical Health)
	6.low skilled nurses	530	Ayahs, Nurse, Maids
		510	House Keepers, Matrons and Stewards
		539	Maids and Related Housekeeping Service Workers, n.e.c
ASSISTANTS & TECHNICIANS	7.medical assistants	76	Pharmacists
		80	Vaccinators, Inoculators and Medical Assistants
		81	Dental Assistants
		82	Veterinary Assistants
		83	Pharmaceutical Assistants
	8.laboratory technicians	10	Physical science technicians
		51	Bacteriologists, Pharmacologists &Related Scientists
		52	Silviculturists
		60	Life Science Technicians
		86	X-Ray Technicians
		87	Optometrists and Opticians
		99	Scientific medical & technical persons, other
OTHER	9.high skilled and managerial staff	20	Architects and Town Planners
		22	Electrical and Electronic Engineers
		39	Engineering Technicians, n.e.c
		137	Labour, Social Welfare & Political Workers
		269	Working Proprietors, Directors, Managers,& Related Executives
		301	Other Supervisors (Inspectors, etc.)
	10.clerical and other office assistants	169	Poets, Authors, Journalists and Related Workers, n.e.c
		191	Non-ordained Religious Workers

		300	ClericalSupervisors,OfficeSuperintendents,HeadClerks,SectionHeads
		302	Ministerial and Office Assistants
		309	Clerical and Other Supervisors, Other
		321	Typists
		330	Book Keepers and Accounts Clerks
		331	Cashiers
		350	Clerks, General
		351	Store Keeper and Related Workers
		352	Receptionists
		357	Ticket Collectors, Checkers and Examiners
		358	Office Attendants (Peons, Daftries, etc)
		359	Clerical & Related Workers(including Proof Readers&CopyHolders)
		390	Telephone Operators
		401	Merchants and Shopkeepers, Retail Trade
		412	Selling Agents
		420	Technical Salesmen and Service Advisors
		430	Sales Representative, Technical
		439	Salesmen, Shop Assistants & Related Workers, n.e.c.
	11.other helpers	529	Cooks, Waiters and Related Workers, n.e.c.
		541	Sweepers, Cleaners and Related Workers
		542	Watermen
		550	Laundrymen, Washermen and Dhobis
		573	Protection Force, Home Guard and Security Workers
		574	Watchmen, Chowkidars and Gate Keepers
		579	Protective Service Workers, n.e.c.
		590	Guides
		599	Service Workers, n.e.c.
		610	Cultivators (Owners)
		799	Tailors, Dressmakers, Sewers, upholsterers & Related Workers
		841	Watch, Clock & Precision Instrument Makers(Except Electrical)
		845	Mechanics, Repairmen, Other
		851	Electricians, Electrical Fitters and Related Workers
		880	Supervisors, Jewellery and Precious Metal Working
		986	Tram Car and Motor Vehicle Drivers
		989	Transport Equipment Operators and Drivers, n.e.c.
		999	Labourers, Other

References

Banerjee, Deaton and Duflo (2004): 'Health care delivery in rural Rajasthan', *Economic and Political Weekly*, Vol.39, Issue No. 9.

Nagaraj, R. (2008): 'India's Recent Economic Growth: A Closer Look', *Economic and Political Weekly*, Vol.43, Issue No. 15.

Mahal, Debroy and Bhandari (2010): India Health Report 2010, BS Books, Business standard Ltd.

National Account Statistics sources and methods (2007), CSO, Govt. of India available at http://www.mospi.gov.in

Peters *et al*. (2002): Better health systems for India's poor: findings, analysis and options, The World Bank, Washington D C.

Report of the working group on workforce estimation for compilation of National Accounts Statistics with base year 1999-2000 (2004), National Accounts Division, CSO, Govt. of India available at http://www.mospi.gov.in

Sharma, R., S.Hazra and S. Chitkara (2007): 'Measurement of GDP of Services Sector in the New Series of National Accounts Statistics', *Economic and Political Weekly*, September 15.

Shetty, S.L. (2007): 'Status Paper on Database Issues of the Service Sector', *Economic and Political Weekly*, September 15.