

13

Productivity Adjustment for Compensation of Employees in the Government Sector

2005 Asian Regional Comparison

Paper for Session 3

Yuri Dikhanov



Technical Advisory Group Meeting

October 1-2, 2009

Washington DC

Productivity Adjustment for Compensation of Employees in the Government Sector

2005 Asian Regional Comparison

Asian comparison of prices and real incomes covers 23 countries spanning the whole range of development levels: from some of the highest ranked in the world to some of the lowest [Hong Kong is ranked in PPP terms as No. 9 and Nepal as No. 179, respectively, in the WDI 2007]. In this respect, the Asian comparison faces unique challenges compared to other regional comparisons [for example, the difference between the highest and the lowest GDP per capita in PPP terms among South American countries is only 3 to 1, whereas in Asia the relative level of Singapore compared to Nepal is 40 times in real and 83 times in nominal terms].

Services in general and compensation part of government services in particular are among the most difficult areas of the ICP. Two approaches to compensation measurement are described in this note. The first approach postulates that “an hour is an hour”, and it means that productivity is uniform across all countries. The second approach is to make productivity adjustments to salary data under the assumption that productivity varies across countries reflecting differences in labor qualifications and capital intensity.

The salary data collected as a part of ICP Asia Pacific has shown that salaries across countries in the region vary by over one hundred times [120 times between Lao and Hong Kong in health sector¹]. Given these significant differences, it is unrealistic to expect that there would be no differences in productivity across these countries, especially, given the fact, that there exist observed differences in productivity in the rest of the GDP. Government workers in high-income countries would certainly be aided by access to modern communications services, high-speed networks, office equipment etc. when compared to the workers in low-income countries.

In describing the two approaches we employ the simple Cobb-Douglas functional form. In its typical homothetic [linear homogenous] specification, the output (Y) is a function of labor (L) and capital (K), with labor and capital coefficients being α and $(1-\alpha)$, respectively, or $Y = CL^\alpha K^{1-\alpha}$. We denote the government part with subscript G , the symbols referring to the whole economy are given without subscript. Thus L_G becomes the employment in government sector whereas L refers to the total employment. The government production function is expressed as:

¹ One can't help quoting in this regard an article from *The International Herald Tribune*: "... in many parts of rural India students would show up for classes but teachers often wouldn't, hospitals would exist only on paper, but salaries would be drawn nevertheless".

$$Y_G = cL_G^\alpha K_G^{1-\alpha} \quad (1)$$

Under the first approach which assumes that there are no productivity differences across countries, we have in each country

$$\frac{Y_G}{L_G} = c \quad (2)$$

Equation (2) simply means that labour productivity is the same across all the countries.

However, under the second approach where labour productivity depends upon capital intensity (capital-labour ratio), labour productivity can be expressed as:

$$\frac{Y_G}{L_G} = c \left(\frac{K_G}{L_G} \right)^{1-\alpha_G} \quad (3)$$

If Y_G and L_G were observed then it is quite simple to measure labour productivity and use it to make appropriate productivity adjustments. Further, it is also difficult to measure government-specific capital-labor ratios in different countries.

The methodology proposed here is based on the following assumptions. The first assumption is that relative labour productivity levels in the government sectors across countries are proportional to those observed for the whole economy. Labour productivity for the whole economy, including the government sector, is assumed to be based on a Cobb-Douglas production function. Under this specification, labour productivity in the whole economy is given by

$$\frac{Y}{L} = c \left(\frac{K}{L} \right)^{1-\alpha} = c \left(\frac{Y}{L} * \frac{K}{Y} \right)^{1-\alpha} \quad (4)$$

From equation (4), it is easy to see that productivity is driven by the capital-labour ratio (K/L). However, we do not have capital stock estimates in a form we can use for the current ICP Asia Pacific exercise. So the model is written in two components using Y/L and K/Y (capital-output ratios). In addition, we need to know the share of labour in value added, represented by α . How do we derive all the components on the left hand side of equation (4)?

The following methodology is followed in deriving productivity adjustments based on equation (4).

1. Since Y is the GDP for the whole economy including the government sector and the main aim is to arrive at reasonable estimate of the size of government sector, Y is derived iteratively.

2. The size of labour force, L , in each country is derived using population each country in the age group 15 to 65 which is further classified by gender (male and female). Gender specific rates of labour force participation are used in getting estimates of total labour force in each country. In the absence of reliable estimates of actual employment, this approach is deemed to be the best available in the context of developing countries. In the government case the employment is estimated as Total Compensation divided over Average Annual Wages².
3. The next step is to derive capital-output ratios. It is generally recognized that capital-output ratios are indicative of the level of technology available and used in different countries. These ratios are not readily available. Therefore, data from the Penn World Tables were used in getting investment series at constant prices over a 20 year period. Quick estimates of capital stock are derived using the perpetual inventory method and the following formula which uses a 5% depreciation rate.

$$K_{2005} = \sum_{t=1981}^{2005} \frac{I_t}{(1 + 0.05)^{2005-t}} \quad (5)$$

where I_t is total investment in constant prices in year t and 0.05 is the depreciation rate. It is important to note that these calculations omit investments prior to 1981.

4. The capital-output ratios obtained using Penn World Tables have been found to be in the range 2.5 to 3.5 with high-income countries having higher values.
5. The final element in the calculations is, α , share of labour in the value added. These shares are not readily available either. But it is generally agreed that the share of labour is usually low in developing countries. So a range of acceptable values were considered. In particular two sets were used in assessing the sensitivity of the results to the choice of these shares. The first set of values considered has 40%, 50% and 60% as share of labour in low, middle and high income countries respectively. An alternative set with 50% for the low to middle income countries and 70% for the high income countries was also considered.

After a close examination of the productivity adjustments derived using different sets of values for the parameters and taking note of the general robustness of the resulting productivity adjustments, the Regional Advisory Board has recommended the use of the following sets of values in deriving productivity adjustments. The capital-output ratios are set at 2.5, 3.0 and 3.5 for the low, middle and high income countries respectively. The

² It is important to note that the Cobb-Douglas production function would refer to both quality and quantity of labor and capital. Whereas we can assume that quality of capital is reflected in its price and thus is included in our value estimates, quality of labor should reflect cross-country differences in professional composition, education, skills etc. For our purposes we assume that for the government sector we collect salaries for equivalent qualifications and thus L_G refers to standard quality of labor employed in the government sector across countries. So while for the whole economy $L = L^{Quality} L^{Quantity}$, for the government sector $L_G = L_G^{Quality} L_G^{Quantity} = L_G^{Quantity}$.

share of labour, α , is set at 50% for low and middle income countries and at 70% for high income countries.

The methodology used in deriving productivity adjustments here is transparent. Various steps involved and the assumptions made at each step are clearly stated. Given time and resources it should be possible to improve upon this methodology in the future. The results from the application of these productivity adjustments are presented and briefly discussed below.

Productivity Adjustments to Compensation of Employees data from the Asia Pacific countries

Effects of the adjustment for Asian economies are shown in the table below. Prior to the adjustment, Lao had the Compensation part of Government services to be at a much higher level than Hong Kong or Taiwan, Vietnam was higher than Thailand and so forth. That contributed to the overall government services [which include components other than compensation] in Lao being almost as high as in Thailand [56.1 vs. 60.5 of Hong Kong, respectively] and more than half of Hong Kong level. The picture significantly changes after the adjustment. The table below shows the total government services before and after adjustment, the compensation part, with labor input unadjusted and adjusted for capital intensity, and the adjustment itself. The adjustment for Lao, for example, is 0.19 which means that the compensation component in Lao gets adjusted by factor 0.19 when compared to Hong Kong. The relativities have changed significantly after productivity adjustments are made.

Effect of Productivity Adjustment on Asian ICP Results

per capita real expenditures, Hong Kong = 100

	HKG	TWN	BHU	IND	MNG	LAO	MYS	CHN	THA	VNM
<i>with adjustment for capital intensity</i>										
Government Services	100.0	121.4	39.7	7.9	21.4	20.3	61.4	24.2	32.2	14.2
of which:										
Compensation (Labor input adjusted)	100.0	96.2	38.0	7.3	25.9	29.7	51.3	20.6	29.0	17.6
<i>without adjustment for capital intensity</i>										
Government Services	100.0	140.4	87.4	20.4	51.3	56.1	93.4	54.9	60.5	38.3
of which:										
Compensation (Labor input unadjusted)	100.0	107.5	136.4	32.8	108.9	159.9	93.5	78.6	77.7	90.6
<i>reference</i>										
productivity adjustment	1.00	0.89	0.28	0.22	0.24	0.19	0.55	0.26	0.37	0.19
Individual Consumption	100.0	84.3	8.2	7.4	7.4	5.4	24.5	8.8	21.9	6.5