

Annual estimates of human capital at replacement cost in India, Indonesia, and Japan 1900-2000

Introduction

These data and descriptions are obtained from the following paper:

Bas van Leeuwen and Péter Földvári, 'Human Capital and Economic Growth in Asia 1890-2000: a time-series analysis,' version 2, 21 September 2007.

The data are constructed based on 'average years of education, wages, and government- and private expenditure on education. Here we give a brief overview of the data sources used. A more extensive description of the sources and calculations can be found in Van Leeuwen (2007).

For Japan we obtain the data on skilled and unskilled wages and CPI from Ohkawa (1967a), Bank of Japan (1966), Japan Statistical Association (1987a), Bureau of Statistics (various issues), and the ILO (various issues). As far as it is possible, we take the wages of unskilled construction workers and construction masons or carpenters. These wages are used to estimate foregone wages. The data on public and private expenditure on education and the number of students are available from the Bureau of Statistics (various issues), Japan Statistical Association (1987b), and Ohkawa (1967b). For private expenditure on education we use school fees and stationary. Enrolment rates per level of education, just as population per age class, were obtained from Japan Statistical Association (1987b; 1987c) and Bureau of Statistics (various issues).

For India the wages and CPI are obtained from Brahmananda (2001, p. 119, 123), for 1951-2001 the ILO (various issues), Mukerji (1960), Roy (1996, 352), Sivasubramonian (1977; 2000), and Williamson (1998). For 1873-1912 the unskilled and skilled wages are available in the, *Statistical Abstract of British India*. Public and private expenditure on education, the number of students, while the population per age class can be found in *Statistical Abstract of (British) India* (various issues) and Roy (2003). For the period prior to 1947, we calculate the variables for the Indian Territory only.

For Indonesia the data sources are quite fragmented. We use the CPI from Van der Eng (2002) for 1900-1941; 1949-1983. For the 1984-2000 period we use the CPI series of the ILO (LABORSTA).

The skilled and unskilled wage series are constructed using an array of scattered sources. For the period between 1875 and 1915 we use wage data for craftsmen and coolies on Java (Dros, 1992, table 5.4). As these are given per residency per year, we take the logarithmic average of all residencies as in general wages have a logarithmic distribution. From 1921 to 1940 we use the logarithmic average of workers at a sugar plantation (Dros, 1992, table 9.1, regular workers) as unskilled wages. As skilled wages we take the logarithmic average of the wages of factory foremen, canefield overseers, and fieldguards (Dros, 1992, table 9.1). For the years 1916-1920 the wages were interpolated by using the logarithmic average of the wages of male and female labourers in the sugar industry (Dros 1992, table 9.2).

After World War II, we use plantation wages supplied by Van der Eng (personal correspondence) as unskilled wages. The data on skilled wages from 1952-1957 and 1959 are wages in mining while in 1958 we took the wages in the metallurgical industry (Bank Indonesia, 1954-1960). For 1960 and 1961 the wages came from metal manufacturing (*BPS Statistical pocketbook*). For 1963 the skilled wage is that of bricklayers (ILO, 1964). For 1969, 1970, 1972, 1981-1984 the data are derived from the ILO (various issues). For the years 1985-1989 we use the wages of farm supervisors and for the years 1991 and 1992 we take wages of gas supervisors (ILO, various issues). For 1995-2000, we obtained manufacturing wages from the ILO (LABORSTA). For the remaining years with missing data on skilled wages (1964-1968, 1970-1971, and 1973-1978) we interpolated the skill premium (ratio of skilled and unskilled wages) and used these values to arrive at the skilled wages.

Population per age class, educational enrolments, and public expenditure on education in Indonesia are taken from Boomgaard and Gooszen (1991), *Colonial Report* (various issues), *Indies Report* (various issues), *BPS Statistical Yearbook/Pocketbook* (various issues), and the *Budget of the Netherlands Indies* (various issues). Unfortunately, no direct observations are available for private expenditure on education. For the period before 1970 there are household surveys available for some years and after 1970 we can

rely on a number of input-output tables. We use these sources to distil information on private expenditure on education (see references). The missing observations are interpolated using data on total consumption, public expenditure on education, and wages.

The construction of the dataset

Following Judson's (2002) cost-based method, we use expenditure on education to capture the quality of education. This allows us to estimate the human capital stock expressed in 1990 international USD, which makes it directly comparable to physical capital and GDP. Judson calculates the stock of human capital stock based on replacement costs with the following formula:

$$h_{it} = \sum_j d_{ijt} a_{ijt} \quad (1)$$

, where d_{ijt} is the public expenditure on education per level of education j in country i in year t , and a_{ijt} denotes the share of the labour force in year t with a certain level of education. h_{it} is the average per worker human capital stock. If one wishes to arrive at the total human capital stock, h_{it} must be multiplied with the labour force (L_{it}):

$$H_{it} = h_{it} L_{it} \quad (2)$$

Judson (2002, 216) identifies four problems concerning this method. First, current production costs may not be a good indicator of the value of human capital that has been produced earlier. Second, she does not use private expenditure on education since these data are usually difficult to obtain. Third, foregone income during the time of study is not taken into account. Fourth, while private expenditure is generally neglected, the available figures on students enrolled often include students entering private education. Consequently, if the private expenditures are differently distributed per level of education than public expenditures, the estimates may be biased. We may mention a fifth problem regarding this method. Judson's method uses d_{ijt} , the expenditure per level of education for year t and weighs this with the shares of primary, secondary, and higher educated in the working population. Hence, even after multiplying with the total working population she arrives at the replacement value of *a single year of education* instead of the total

accumulated stock of human capital. As such, the human capital stock by the original method of Judson is very likely to underestimate the value of the stock of human capital.

The above-mentioned weaknesses of the Judson method are serious but can be solved. We can address the second and third problem by adding private expenditure and foregone wages to the HC stock. Since foregone wages are likely to increase over time, including it will lead to a faster appreciation of human capital. As for the fourth problem, similarly to Judson, we assume that private expenditures are identically distributed to public expenditures. The fifth problem is corrected for by multiplying equation (2) with *average years of education*. The corrected stock of human capital is denoted by H^* :

$$H_{it}^* = H_{it} * Educ_{it} \quad (3)$$

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