Wage differentials and economic growth in India, Indonesia, and Japan, 1800-2000[1]

ABSTRACT

Many studies have been done on the relation between wage differentials and economic growth. These studies generally focus on either the Williamson thesis, in which there is a negative relation between economic growth and the skill premium due to increased investment in education, or on the Kuznets thesis which advocates a positive relation because economic growth tends to be skill-biased. Although the results were mainly obtained from developed countries, these theses were often also applied to developing countries. In this paper we therefore took a closer look at Japan, India, and Indonesia. Comparing Japan with India and Indonesia, we see that Japan over the last 125 years shows a positive relation between the skill premium and per capita GDP growth indicating the applicability of the Kuznets thesis. This is confirmed by a causality test which shows that there is two-way causality between the skill premium and economic growth, consistent with the Kuznets thesis. Both India and Indonesia have a negative relation while this relation in India is also insignificant. The causality tests show no significant relation in India. For Indonesia only in the period 1870-1930 GDP growth causes the skill premium which is consistent with the absence of skill-biased growth.

Except the possible (endogenous) relation with per capita GDP growth, the skill premium is also influenced by other factors such as the education system, the distribution of artisan and factory industries, the agricultural purchasing power, etc. Especially the education system is important in this respect. Not only is it a main source of skill development in the twentieth century, but it is also one of the main characteristics in which many developing countries differ from the more developed countries. The competing Western and indigenous education systems in India and Indonesia in the nineteenth and early twentieth century caused low enrolment ratios and a relatively bad connection with both the western and indigenous labour markets. If we regress the skill premium on the growth of educational attainment, we get a positive coefficient for Japan and an insignificant one for India and Indonesia. This corresponds with the conclusion drawn earlier that in India and Indonesia there is a far less clear relation between the education systems and economic growth than in Japan. Again in Japan we find over the entire period 1895-2000 that the skill premium causes attainment which corresponds with the Kuznets thesis and skill-biased growth.

1 INTRODUCTION

The present paper is a preliminary result of a PhD research and will focus on the relation between education, the skill premium, and per capita GDP growth in three Asian countries, i.e. Japan, India, and Indonesia. These countries were chosen because their growth characteristics are very diverse. This divergence in growth paths in general is touched upon by numerous authors among whom economists generally tend to focus on the (new) growth theories and the short-run dynamics, ignoring long-run factors such as technological and cultural change, population growth, and market creation. On the other hand the (economic) historians generally do focus on these factors but in those studies the theoretical structure is too often ignored in favour of the more specific cases. There are also some authors who try to integrate the economic and historical approaches (Williamson (2000), Wolcott and Clark (1999), Chandra and Vogelsang (1999)). Two other valuable contributions were made by Acemoglu, Johnson, and Robinson (2001 and 2002) who estimated the effect of institutions on economic growth. However, in these publications Acemoglu *et al* ignore the new growth theories predicting that the growth path of an economy not only depends on its institutional structure but also on the scale of labour and the possibility to innovate. The skill premium, on the other hand, relates to some extent to both the demand and scale of labour just as to the innovative capabilities of a country. The latter aspect is of course strongly related to the institutional structure. Therefore, ignoring the

[1] I would like to thank Pierre van der Eng and Jean-Pascal Bassino who kindly supplied data for estimating purchasing power parities between Indonesia and Japan. Furthermore Pierre van der Eng also supplied wage data of plantation workers for 1949-1994. Also I would like to thank Jan Luiten van Zanden, Oscar Gelderblom, and Wolter Hassink who gave valuable advice while we were writing this paper.

scale of labour and innovation possibilities might create an overestimation of the importance of institutions.[2]

The skill premium thus may have an influence on economic growth, at least in cross section regressions. However, there also may be a reverse causality. This point has been stressed by Williamson (1980). On the one hand there may be a Kuznets relation between wage inequality and economic growth.[3] This means that, as economic growth takes place, the skill premium also rises because new technologies are introduced which require a better trained labour force. In his 1980 article, however, Williamson points to the situation that it is also possible that economic growth coincides with decreasing wage inequality[4] which might be caused by increasing investments in skills. Besides these (endogenous) relations between the skill premium and GDP growth, there are also exogenous factors influencing the skill premium of which the education system is one of the most important. These two relations, between on the one hand education and the skill premium and on the other hand the skill premium and per capita GDP growth, have been studied for some, mostly developed, countries and are, sometimes without proper research, extended to developing countries. In cross section or panel regressions with schooling as an independent variable, this may lead to either an insignificant coefficient or a significant developing country dummy (Barro and Lee (1993); Easterly and Levine (1997); Collier and Gunning (1999)).

In this paper we therefore want to elaborate upon these two relationships as an important factor in explaining the growth and convergence/divergence of economies.[5] We chose India and Indonesia because these countries are still looked upon as developing countries although Indonesia has performed better than India after World War II. It would be interesting to see if the relations between, firstly, education and the skill premium and, secondly, skill premium and GDP growth, are the same in these developing countries as in the developed countries. Therefore, Japan was added for comparison because it is considered to exemplify a country with a successful transition to 'modern' intensive economic growth at the end of the nineteenth century. We will start with a short overview of the importance of the skill premium in the next section and the factors influencing it. This is based on several factors listed in the literature. We focus on trade, the shifts in the relation between labour intensive artisan industries and the more capital-intensive factory industries[6], the availability of an educated workforce, and skill biased technological growth. In section 3 to 5 we treat these influences on the skill premium where we focus on education. In section 3 we use a Granger causality test to see the direction of the relation between education and the skill premium. In section 4 and 5 some other qualitative evidence is given in support of the influence (or lack thereof) of education and the other (exogenous) factors on the skill premium. We see that especially in Japan there is over time an almost continuous causal relation in which the skill premium influences education. This indicates the importance of the Kuznets thesis. This causation is, however, far less clear for India and Indonesia. In section 6 we turn to the relations between skill premium and economic growth which are also estimated and defined using a Granger causality test. We end in section 7 with a brief conclusion.

2 CAUSAL RELATIONS BETWEEN EDUCATION, SKILL PREMIUM, AND GROWTH

Based on the theory and empirical observations (see footnote 2) and by authors as Van Zanden (paper for this conference), Williamson (1980 and 1998), and Aghion, Caroli, and Garcia-Penalosa (1999) we may conclude that the skill premium is important in two ways. On the one hand it may be the result of

[2] The two-stage least squares regressions that we performed, point to the situation that ignoring innovative and labour aspects creates an upward bias in the institutional coefficient.

[3] Simon Kuznets, 'Economic Growth and Income Inequality,' *The American Economic Review*, Vol. 45 (1) 1955, 1-28, 5.

[4] Jeffrey Williamson, Earnings Inequality in Nineteenth-Century Britain,' *The Journal of Economic History*, Vol. 40 (3) 1980, 457-475, 473.

[5] With convergence is meant σ-convergence. In this case the variance of the level of per capita GDP among countries diminishes over time. Catch-up, on the other hand, refers to β-convergence where countries with a lower GDP per capita experience faster growth than rich ones. As a consequence of this difference it is possible to have β-convergence without σ-convergence to occur.

[6] With artisan industries is meant in this paper the largely unmechanised industry, often performed as by-employment. With factory industry is meant more disciplined and mechanised and somewhat more large-scale industries.

other (institutional) influences such as trade, education, and skill biased technological growth. On the other hand, it may be the cause of faster economic growth. As the skill premium can influence economic growth and economic growth can influence the skill premium (and the factors influencing the skill premium) there may be a dual causality. For now we turn to the other factors influencing the skill premium, ignoring the relation between economic growth and the skill premium. These latter causal relations are treated in section 6. As mentioned before, four factors may influence skill premium and thus economic convergence through technological change. These are education, skill biased technological change, the relation between artisan and factory industries, and trade all of which are to some extent interdependent. Trade has been the subject of many studies (Acemoglu (2003), Williamson (2000), Huber (1971)). However interesting they may be, trade in the nineteenth and the

Table 1: Openness

	Japan	Indonesia	India
1870	±4.7%		11.7%
1900	19.5%	24.0%	14.7%
1930	26.8%	34.1%	14.5%
1960	26.6%	18-54.9%	11.6%
1990	17.0%	41.5%	15.9%

Changing Economy in Indonesia 12a (1991), Bank of Japan (1966), p. 115, Goldsmith (1983), Chaudhuri (1983), Agrawal (1998), Van der Eng (2002), Statistical Pocketbook Indonesia 74/75 (1976), Statistik Indonesia (2001)

start of the twentieth century was very marginal, especially for Japan. It was only in 1858 that the Japanese ports were opened. This becomes clear from table 1, which gives total imports plus exports divided by the GDP, which is a measure of openness of the economy. Japan's openness in 1870 was about 4.7% after which it grew until the 1930s when it decreased again. Furthermore, although Indonesia was the most open economy, both India and Indonesia were severely dependent on exports of raw materials in the nineteenth century. The Indonesian exports were dominated by agricultural products ranging from 90% in the 1870s to 70% around 1940. Even though in India the percentage of agricultural produce and raw materials in total exports was lower, it remained high with around 1960 still 52%. The Japanese exports, on the other hand, were dominated by fabricated or finished products. The share of these goods in total exports rose from 45.5% in 1868 to 84.2% in 1930, and 87.6% in 1952. All in all trade seems only marginally important for the economic development, either because of its small volume or because of its focus on agricultural produce. Furthermore estimations of the effect of trade on economic growth showed that this effect was negligible, although further research may be necessary.[7]

Besides trade, another factor influencing the skill differential is the relation between artisan and factory industries. This relation is of course strongly interdependent with education in the workforce and the availability of (cheap) technologies. However, the existence of a large artisan industry can form a basis for further (more skill and capital intensive) growth with factory industries. Furthermore, it can increase purchasing power, especially in the countryside, at least if artisan activities are also performed in the countryside which often takes the form of by-employment. This in turn can create a larger home market.

The third factor influencing the skill premium is education or, more broadly, skills. Both India and Indonesia saw an initially low, but later fast growing, number being educated in the Western education system. Although the numbers educated were fairly low around 1850, they were added with those from the indigenous schools, which, however, decreased rapidly in importance towards the end of the nineteenth century. The western schools educated largely for government work and, after 1910, also increasingly for private factories. In Japan the situation was different in that there was already a fairly high literacy rate around 1800, a situation that made it possible to achieve almost immediately after the Meiji Restoration in 1868 almost universal primary education. The availability of a relatively schooled workforce in Japan at the eve of her industrialisation was thus an important factor. Barro (1991) arrives at the same conclusion when he argues that the initial (in his case 1960) human capital

[7] Richard B. Freeman and Remco Oostendorp, NBER Working Paper #8058, Occupational Wages around the World Data File, *International Labour Review*, 2001, no. 4, 19.

is important for economic growth.[8] Countries with a higher initial human capital grow faster which seems particularly applicable to Japan.[9] This is mainly caused by the situation that in countries with a higher initial amount of human capital (i.e. a higher quality of the labour force) a shift to more skill intensive forms of production can take place.[10] This leads in general to higher economic growth. The availability of an educated workforce is thus no doubt important not only to provide educated labour for the government service, but also for the imitation and absorption of foreign technology. More specifically Lloyd-Ellis (1999) argues that the absorption of new technology depends on the level of the skills attained. Higher skilled persons are quicker to adapt to these new technologies. If the total skilled workforce is saturated, introduction of new technology leads to a higher skill differential. This he calls "technological immobility" of a society.[11] This problem is worsened when the division of skills is highly skewed.

The final important factor influencing the skill premium is skill biased technological change. This change is strongly correlated with the amount of skills already available. The new technologies and changes in production structure such as the shift from artisan to factory industries could influence the skill premium. The general argument is that skill biased technological change increases the demand for skills and as such increases the skill premium (the Kuznets thesis). Please note that this relation is exactly the opposite of those with skill development in the previous paragraph. In the latter technological change depends on the skills available and its division over the population, while in the former the technological development changes the supply and demand of skills. Both paths can of course coexist. Besides this problem there is another aspect associated with skill biased technological growth. Most literature arguing about the skill biased technological change and increase in skill premium focuses on the last fifty years. It remains doubtful whether technological change for earlier periods also has to be skill biased. Instead of complementing skills, physical capital together with unskilled labour substituted for skilled labour (Acemoglu (1998), Goldin and Katz (1998), James and Skinner (1985)). Acemoglu (1998) brings this argument one step further by arguing that even current technologies are not skill biased by nature but by design. He argues that if there is a sudden increase in the skill level (education), the economy moves first downwards from the relative demand curve for skilled labour. This increases the market for skill complementary technology. In turn this causes directed technological change, which moves up the relative demand curve. If the substitution effect is smaller than the directed technology effect, the skill premium (or college premium) would eventually increase after an initial decrease.

The interaction between the supply of skills and the skill (un)biased technological growth makes it necessary to view the influence these factors have on technology and thus economic convergence or divergence over time. As mentioned in the previous paragraph there are two causal relations. Firstly there is the problem that a low skill premium causes growth (Freeman and Oostendorp 2001) but, on the other hand, growth causes an increase in the skill premium mainly because growth requires skill-biased technologies. This latter assumption points to the second problem that skill biased growth is not a necessary condition but depends on the supply of skills. This dual process is in essence founded on two developments. On the one hand there is the supply of skills, largely determined by the education system, or as 'on-the-job training', and learning by doing. As economic growth increases, the supply of new skills may be larger than the demand due to increased investment. On the other hand there is the demand for skills, largely determined by (skill biased) technological development, which also includes changes in the production structure. New, (skill-biased) technologies may increase the skill premium and cause economic growth. This endogenous structure may change over time under influence of the (skill biased) character of technological

[8] Robert J. Barro, 'Economic Growth in a Cross Section of Countries,' *The Quarterly Journal of Economics*, Vol. 106 (2) 1991, 407-443, 416.
[9] Derek H. Aldcroft, 'Education and Development: The experience of the Four Little Tigers,' A.J.H. Latham and Heita Kawakatsu (eds.), *Asia Pacific Dynamism 1550-2000*, London and New York: Routledge 2000, 169-183, 176.
[10] Choudhuri, A., and C.H. Kirkpatrick, 'Human resources, factor intensity and comparative advantage of ASEAN,' *Journal of Economic Studies*, Vol. 17 (6) 1990, 22.
[11] Huw Lloyd-Ellis, 'Endogenous Technological Change and Wage Inequality,' *The American Economic Review*, Vol. 89 (1) 1999, 47-77, 48.

innovations. In figure 1 we see that Japan had a fairly low skill premium as from 1870. Prior to 1870 we took the index of the premium of agricultural labourers and carpenters in Kami-Kawarabayashi

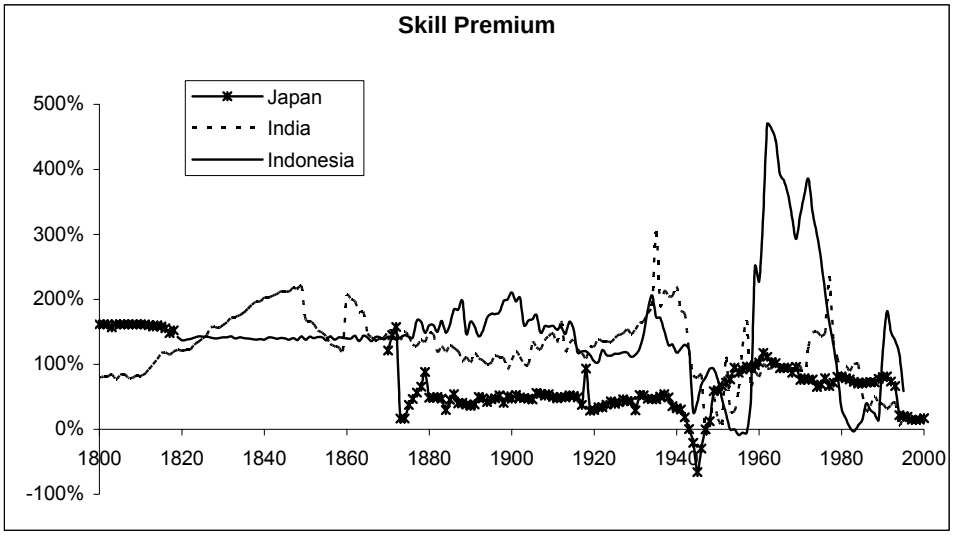


Figure 1 (Source: Appendix A and Saito (forthcoming))

from Saito (forthcoming) with the base of 1802-1804=100 being 2.6 *momme* for a carpenter and 1.0 *momme* for an agricultural labourer.[12] The skill premium could, however, be higher in urban areas. For example a Kyoto day labourer earned 0.92 *momme* a day while an Osaka carpenter earned 4.3 *momme*, resulting in a skill premium of about 367%. However, the differences in wage structure between these two cities make it likely that this was an over-estimation. In Japan it is thus likely that, although around 1800 the skill premium almost equalled that of Indonesia and India, while around 1870 it was reduced to about 50%. In India and Indonesia, however, the skill premium remained at around 100% until around World War II. It may therefore be the case, for example, that skill biased growth is less likely in nineteenth century developing economies such as Indonesia and India than in Japan, because they have relatively high skill premia and at any rate a low amount of skilled labour. This changed during the second half of the twentieth century although the skill premium of Japan in general remained below that of Indonesia and India. To review these developments we start in the next three sections with an overview of the factors influencing the skill premium over time, i.e. education, the role of artisan industries, and skill biased technological growth. Of course each factor is present in the last two centuries but the strength fluctuates according to time period and country. In section 6 we will focus on the relation between the skill premium and economic growth.

3 THE RELATION BETWEEN EDUCATION AND THE SKILL PREMIUM

In this section we will focus on the relation between education and the skill premium. It is especially important to note that in India and Indonesia in the second half of the nineteenth century there were two competing education systems, one indigenous and one western. Because the latter had the political support it eventually won supremacy.[13] An important consequence was that persons educated in the western education system were only were a minor share of the total population. This difference between Japan on the one and India and Indonesia on the other hand is looked at in this section. We will start with a regression of the skill premium on attainment to determine the sign of the coefficient.

[12] Saito, Osamu, "The Labor Market in Tokugawa Japan: Wage Differentials and the Real Wage Level, 1727-1830," *Explorations in Economic History*, Vol. 15, No. 1, 1978, pp. 84-100.

Saito, Osamu, "Wages, inequality and pre-modern growth in Japan, 1727-1894," in: R.C. Allen, T. Bengtson and M. Dribe (eds.), *New Evidence of Standard of Living in Pre-industrial Europe and Asia*, (forthcoming), table 1.

[13] Margaret S. Archer, *Social Origins of Educational Systems*, London, Beverly Hills, New Delhi: Sage publications 1984, 131.

Then we perform a Granger causality test to determine the direction of the causation. In section 4 and 5 we go on to interpret this relation on the basis of some qualitative data.

We start with a regression of the skill premium on the lags of an attainment variable. We used lags to avoid a simultaneity bias in the regression, i.e. skill premium influencing attainment. This attainment variable is constructed as a weighted sum of primary, secondary and higher attainment of the population of 15 years and older.[14] The weight attached to primary education was 1, to secondary education 2, and to higher education 3.[15] These weights reflect the situation that investments in higher education are in general far higher due to extra government spending, higher school fees, and higher foregone wages. We opted to use educational attainment of the population of 15 years and older instead of enrollment because this gives the stock of human capital which has a more direct relation to the skill premium. Furthermore, policy changes concerning education have a faster effect on enrollment than on attainment. As a consequence, if we would have used enrollment, we would have had to insert longer time lags. If we, however, use attainment, then a short term shift in policy has far less influence. The results of the regressions are given in table 2. We see that only Japan has a

Table 2 Regression of the Skill Premium on Attainment*

Dependent variable: $\Delta \ln Skill\ Premium$

	Japan		India		Indonesia	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
	1897-2000		1897-2000		1897-1995	
Constant	-1.122	-24.8	-0.099	-1.30	0.345	1.09
$\Delta \ln Attainment_{t-1}$			0.681	0.668		
$\Delta \ln Attainment_{t-2}$	3.549	1.71			-6.516	-1.21
Dummy1942	-0.556	-1.69				
Dummy1943	-3.696	-11.3				
Dummy1944	-5.850	-17.7				
Dummy1945	-5.718	-17.7				
Dummy1946	-5.707	-17.7				
Dummy1947	-5.572	-16.7	-9.161	-12.3		
Dummy1948			-3.191	-4.28		
Dummy1950			-1.739	-2.33		
Dummy1953					-4.860	-5.33
Dummy1954					-4.839	-5.31
Dummy1955					-9.476	-10.4
Dummy1956					-9.431	-10.4
Dummy1957					-9.433	-10.4
Dummy1983						
Dummy1994			-2.598	-3.48	-9.293	-10.2
R^2	0.938		0.651		0.838	
No obs.	104		104		97	

*All attainment variables are I(1).
Source: The skill premia were obtained from Appendix A.

significant long-term relation between educational attainment and the skill premium. However, also Indonesia has a coefficient that exceeds the t-value of 1 and thus should be included in the regression. Both Japan and India, the latter with an insignificant attainment coefficient, have a positive coefficient which points to the situation that an increase in investment on education does not lower the skill premium which is the case with skill biased growth. Indonesia on the other hand has a negative attainment variable which indicates that technological development is less important than investment in education.

[14] These attainment variables were calculated by the method outlined by Barro and Lee (2000). However, because of data limitations we opted to use the gross enrollment rate as input.
[15] These weights are to some extent arbitrary. However, these weights do reflect the approximate distribution of government spending between primary, secondary, and higher education.

The results from table 2, however, are only the long run relations which may be different for shorter periods. Visual inspection of the recursive graphs show that there may be breakpoints for all three countries around 1950 and for India also around 1995. To review these periods and their causality we will now estimate the direction of the relation, i.e. does the education system influence the skill premium or vice versa. This subject, which exists besides the sign of the relation (see table 2), is estimated using a Granger causality test.[16] This test is based on the idea that the past may influence the future but not the other way around. The dependent variable thus depends on the lags of the dependent and the other variable. If variable X (Granger-) causes Y, than should X precede Y because only the past determines the future. Thus if Y is regressed on its past values and the prediction

Table 3: Granger causality between Skill premium and growth of educational attainment

Economy	Years	Direction of causality	F value	Decision*
Japan	1895-2000	Attainment→ Skill premium	1.33	Attainment does not cause Skill premium
		Skill premium → Attainment	7.56	Skill premium causes Attainment
	1895-1950	Attainment → Skill premium	1.14	Attainment does not cause Skill premium
		Skill premium → Attainment	11.17	Skill premium causes Attainment
	1950-2000	Attainment→ Skill premium	0.65	Attainment does not cause Skill premium
		Skill premium → Attainment	5.72	Skill premium causes Attainment
India	1895-2000	Attainment → Skill premium	1.29	Attainment does not cause Skill premium
		Skill premium → Attainment	0.99	Skill premium does not cause Attainment
	1895-1950	Attainment→ Skill premium	2.16	Attainment causes Skill premium**
		Skill premium → Attainment	3.38	Skill premium causes Attainment
	1950-1995	Attainment → Skill premium	0.51	Attainment does not cause Skill premium
		Skill premium → Attainment	1.22	Skill premium does not cause Attainment
Indonesia	1899-1995	Attainment → Skill premium	0.46	Attainment does not cause Skill premium
		Skill premium → Attainment	0.79	Skill premium does not cause Attainment
	1899-1950	Attainment→ Skill premium	1.18	Attainment does not cause Skill premium
		Skill premium → Attainment	1.93	Skill premium causes Attainment**
	1950-1995	Attainment → Skill premium	0.56	Attainment does not cause Skill premium
		Skill premium → Attainment	1.87	Skill premium causes Attainment**

*When the null-hypothesis is rejected it means that variable A (Granger) causes variable B.
**At 25% significance.

improves when past X's are included, we say that X Granger causes Y.[17] In table 3 we see that for Japan for all periods the null hypothesis is rejected in the relation between skill premium and attainment (i.e. skill premium Granger causes attainment). This, combined with the negative relation between skill premium and attainment found in table 2, indicates that there might be a Kuznets situation with skill biased growth (see further section 6). Only in the period 1895-1950 India knows causality, be it that the causality of attainment influencing the skill premium is only significant at 25%. This does mean that Both the Kuznets as the Williamson hypothesis could be applied at the start of the twentieth century, while in Indonesia over the entire period there is only just (at 25%) a relation in which the skill premium influences attainment. However, for both India and Indonesia it is clear that the link between education and the skill premium is much weaker than in Japan as was indicated already in table 2.

[16] C.W.J. Granger, 'Investigating Causal Relations by Econometric Models and Cross-spectral Methods,' *Econometrica*, Vol. 37 (3) 1969, 424-438.

[17] The test involves the following regressions:

$$Attainment_t = \sum_{i=1}^{n} \alpha_i Skill_{t-i} + \sum_{j=1}^{n} \chi_j Attainment_{t-j} + u_{1t} \text{ and } Skill_t = \sum_{i=1}^{n} \lambda_i Skill_{t-i} + \sum_{j=1}^{n} \delta_j Attainment_{t-j} + u_{2t}$$

4 DEVELOPMENT OF EDUCATION AND THE ECONOMIC STRUCTURE 1850-1940

The first half of the nineteenth century had showed a rise of wage labour which only in Japan led to a lower skill premium (see figure 1). This was partially caused by the egalitarian distribution of artisan production between city and countryside, the relatively high agricultural purchasing power[18], low taxes on non-agricultural production, and possibly a better educated workforce. This was far less the case in Indonesia and India resulting in a higher skill premium. In Japan the skill premium had dropped to about 50% in the 1880s which was somewhat less than ½ of the skill premium of India and Indonesia. This was important for turning to more skill and capital intensive production and in relation to sustained development. For example Anderson and Bowman (1976) estimated that a literacy rate of 40% is required to lift a country from poverty. For sustained growth, a primary enrollment rate of about 70% to 80% is also a necessary, although not always sufficient, condition.[19] This was almost the case in Japan in the 1880s contrary to India and Indonesia.

Thus in the same way the first half of the nineteenth century in Asia was dominated by the growth and dynamics of wage labour, its development had to be backed up by increasing the skills in the populations involved. An especially good example is Japan, which had already at the start of the nineteenth century a relatively well educated population. The rise in demand for credit, the increase in wage labour, and the higher standard of living indicate that this meant that the development of a sufficiently schooled workforce was important for further artisan and industrial development. This in turn increased productivity by improving labour productivity either through managerial techniques or improved technologies. India, however, was more focussed on increasing scale than on increasing productivity. The increased scale caused extensive growth while increasing enrollment was especially important to supply the government service with skilled personnel and for the creation of a class of Indians that supported the British. The same can be said for Indonesia although, because of the racial difference, the formation of an indigenous elite had no real priority.

As a consequence the development of education started in all three countries but was economically far more important in Japan. Furthermore Japan also had a fairly large education system prior to 1850 contrary to India and Indonesia where the western education systems almost completely replaced the indigenous systems over time. This was a development that started in the second half of the nineteenth century, a half-century that for all countries had severe shocks. In India in 1857 the Mutiny caused the Crown to take over the Indian administration while in Indonesia the Cultivation System was replaced by a liberal era, more prone to let the indigenous population develop itself. The same development can be viewed in India as well. In Japan, especially after the opening of the ports, and the Meiji restoration, the development of skills became more and more important. The first Minister of Education, Mori Arinori (1847-1889), put great stress at education for national development and prosperity as '[*t*]*he things in daily use are steadily developing and changing. Is the spirit of our of our people sufficiently hardened and trained that they may withstand adversity, bear up and endure under pain, and shoulder the heavy burdens of the long road ahead? This must be doubted. Since the Middle Ages, in our country only the samurai have labored in civil and military matters and administered the affairs of the government'*.[20] He thus wanted also commoners to be able to develop to cope with the social and economic changes that took place. All these factors contributed to the growth of education systems, and created problems when economic crises hit Asia in the 1890s and 1930s.

As a consequence, the educational structure in India and Indonesia on the one hand, and Japan on the other was very different. After the rise of the Tokugawa family in Japan, there had been a steady rise in school enrollments, which caused a primary attainment of already 19.7% in 1870-75. This corresponds with an enrollment of circa 54% for boys and 19% for girls. Dore (1965) estimates the enrollment of boys and girls at the end of the Tokugawa period as being for boys about 50% of the

---

[18] Susan B. Hanley, 'A High Standard of Living in Nineteenth-Century Japan: Fact or Fantasy?,' *The Journal of Economic History*, Vol. 43 (1) 1983, 183-192, 184-185.
Yamamura, Kozo, 'Toward a Reexamination of the Economic History of Tokugawa Japan, 1600-1867,' *The Journal of Economic History*, Vol. 33 (3) 1973, 509-546, 519.

[19] C.A. Anderson, and M.J. Bowman, 'Education and Economic Modernization in historical perspective,' L. Stone (ed.), *Schooling and Society: Studies in the History of Education*, Baltimore: The John Hopkins University Press 1976, 3-19, 5.

[20] Op cit. Ministry of Education, Science and Culture, *Japan's Modern Educational System*, White-paper: Ministry of Education, Science and Culture 1972, chapter 3, p.3. (http://202.244.24.5/eng100n/index-13.html)

1875 enrollment and for girls 33%. He, however, warns that these figures may underestimate real attendance.[21] Therefore there does not really seem to be a breach in education between the Meiji and Tokugawa periods. This was also because, in general, the new educational structure after the Meiji restoration was based on the old schools; the *terakoya* for commoners became largely primary education while the fief schools for the samurai became largely secondary education although this distinction was not always that sharp. This made it possible to increase primary attainment to 30.3% in 1880 and more than 60% in 1940.[22] This contrasts strongly with attainment rates in India and Indonesia of 3.6% and 1% respectively in 1890 rising to 12.3% and 13.3% around 1940.[23] This low attainment was partly caused by the situation that Western education in India and Indonesia, although

Table 4: Enrollment in education (*1000)

	Japan			Indonesia			Indian Union		
	Primary	Secondary	Higher	Primary	Secondary	Higher	Primary	Secondary	Higher
1870	1.326[1]	2[1]	4.3[1]	66	0.1	0			
1880	2.349	19	7.3	76	0.5	0			
1890	3.096	107	16	115	0.5	0	2.367	390	14.5
1900	4.684	189	22	180	0.7	0	2.750	458	19.6
1910	6.862	681	47	484	1.3	0	3.910	788	27.9
1920	8.633	1.712	80	974	2.9	0	4.958	945	54.9
1930	10.112	3.349	180	1.813	5.0	0.5	7.278	1.752	81.2
1940	12.335	4.663	244	2.353	7.8	1.1	9.549	2.423	135.8

[1] 1873

Source: Japan: Japan Historical Statistics, Bank of Japan, 134, Indonesia: Koloniaal Verslag, various issues, etc, India: Statistical abstract, crudely corrected for East and West Pakistan by taking the division in enrollment for 1947 and extrapolate it backwards.

it did start in the first half of the nineteenth century, only got momentum after 1880. If we look the enrollment figures in schools approved by the government in table 4, we see that especially secondary enrollment was low in India and Indonesia while higher education in Indonesia was entirely absent until the 1920s. We can see that in Japan primary enrollment rose circa 7 times during the period 1870 to 1940, but this was relatively small compared to the 30 times in Indonesia. This is not surprising as in Indonesia, contrary to India and Japan, the government was almost not involved in education prior to 1850. Furthermore it was only after 1890 that education of Indonesians got their real attention. If we look, for example at the number of Indonesians educated in Java in 1870 we see that in 1870 in the Preanger Regentschappen one in every 523 Indonesians got education while in Bantam this was one in every 14.527 Indonesians. These are the two most extreme cases. In the other Regencies this was generally one in every two or three thousand Indonesians.[24] In India, on the other hand, enrollment expanded 4 times between 1890 and 1940, which is partly due to the fact that this period starts 20 years later and partly because it was only around 1930 that primary attainment in Indonesia was higher than in India which means that Indonesia started from a lower base. The complicating factor was that in India and Indonesia there was a large inheritance of indigenous education, which became overshadowed by Western education in the mid nineteenth century while in Japan the indigenous education system was simply expanded after 1868. Although it was clear that in both India and Indonesia indigenous education was in continuous decline from the late eighteenth century until the start of the twentieth century, it could still be as large as the enrollment in Western education around the middle of the nineteenth century.

Fortunately, some data on the presence of indigenous schools in India has been collected. Around 1840 it seemed that (based on some of the Collectorates) about 17% of all boys in Bombay followed education, while for Bengal this number is 15.5%. Of all boys entering primary education in

[21] R.P. Dore, *Education in Tokugawa Japan*, London: Routledge & Kegan Paul 1965, 318-319.
[22] Aaron Benavot and Phyllis Riddle, 'The Expansion of Primary Education, 1870-1940: Trends and Issues,' *Sociology of Education*, Vol. 61 (3) (1988), 191-210, 206.
[23] Benavot and Riddle, 'The Expansion of Primary Education, 1870-1940,' 206.
[24] Koloniaal Verslag 1872.

Bombay about 85% went to indigenous schools.[25] The same was true in Indonesia where in 1855 at Sumatra's Westcoast 464 pupils followed indigenous education while in 1856 this number had increased to 510 against almost none in official or subsidized private schools.[26] Nevertheless in both countries was clear that indigenous education would not be continued and would be replaced with a Western education system over time. There were three main reasons for this development. Firstly it was important for the colonial governments to create an indigenous upper class that would support the colonial regime. The second reason was the increasing administrative burden of the colonial governments. As a consequence the numbers of administrators had to be expanded and it was therefore necessary to educate new government employees. Finally, during the twentieth century the private industries began to grow and needed more skilled labour, especially during the first three decades of the twentieth century.

The first reason for the expansion of western education was that it became necessary in many colonial states to form a new elite. This process was different in India and Indonesia. At the start of the nineteenth century it became increasingly clear that the British in India needed the support of a class of Indians, especially after the East India Company took full administrative control. Contrary to Indonesia where the differences in social status became determined largely racial, in India the difference became native versus non-native. This meant that it was more important to involve the indigenous population in government and industry. Therefore in India it was more important to create an indigenous class that supported the British. Another difference is the share of foreigners (Eurasian and Chinese) in the indigenous societies. In Indonesia in 1880 still 98.7% was Indonesian, 0.13% European, and 1.17% consisted of Chinese and other Asian peoples.[27] If we compare this to India around 1850, we see that of the Presidency towns Calcutta had 5.9%, Madras 3.8%, and Bombay 1.3% European population (including Indo-Europeans).[28] This figure would likely be lower in the smaller towns and in the countryside. These reasons, and popular dissatisfaction forced the Board of Directors to undertake action in 1854. This got a concrete face with the plans of Sir Charles Wood. These plans came down to setting up an education system to create a class of lower Indian civil servants and the building of a class that would support the British in India.

In Indonesia the problem of establishing elites was very different. In the seventeenth century not much had changed in the normal indigenous structure, but when the Dutch took gradual control, the social stratification became based on race. Only the nobility held some standing due to its affiliation with the Dutch colonial authority while especially the Chinese focussed on retail trade, handicrafts and small-scale industry.[29] During the nineteenth and twentieth century another group arose, partly due to education and economic development, which was either educated and/or obtained a position in trade. This could only upset a society based on racial differences. The Eurasians feared for their positions in private industry and the government, the Chinese feared for their position in retail trade, and the Indonesian nobility feared for their position in the civil service. All this did not prevent the Dutch to cultivate the relation with the Indonesian aristocracy, the *priyayi*. The following setting up of schools for civil service and for sons of chiefs and rich natives, *hoofdenscholen*, as well as the changing economic structure, and the bureaucratization of the elite did alienate these groups more and more from the people.

---

[25] W.H. Sykes, 'Statistics of the Educational Institutions of the East India Company in India,' *Journal of the Statistical Society of London*, Vol. 8 (3) 1845, 236-273, 268.

[26] Hoofdcomissie van onderwijs, *Verslag van den staat van het schoolwezen in Nederlandsch-Indie*, Batavia: Landsdrukkerij 1856.

[27] These numbers are estimated using *Changing Economy in Indonesia, vol. 11 (population)*. For Java: table 2, 6a.2, 6b.2, and 6c.2. The population numbers of the Outer Provinces were estimated by interpolating the number of indigenous population in 1920 (table 16) and the total population number in 1850 (including Chinese and Europeans) of 10.473.500 obtained from National Archive, 'Statistieke aantekeningen', 2.10.36.012, inv. 870. The linear interpolation was used but it somewhat reduced because in 1850 also the Chinese and Europeans were included. The numbers Europeans, Chinese, and Foreign Asiatics in 1880 were again obtained from CEI 11, table 17a, 17b, and 17c.

[28] *Statistical Abstract Relating to British India, from 1840 to 1865*, Vol. 1, London: George Eyre and William Spottiswoode.

[29] Justus M. van der Kroef, 'The Changing Class Structure of Indonesia,' *American Sociological Review*, Vol. 21 (2) 1956, 138-148, 139.

A second reason for stimulating Western education in India and Indonesia was the shortage of capable administrators. Both in India and Indonesia not much Europeans were available. It was thus in India already at the start of the nineteenth century, directly after the total take-over of the East India Company, clear that there were problems with enough, and morally suitable, administrators joining the service. The problem was that there were only few officials and that many of the native officials were corrupt which damaged the standing of the administration. Therefore the idea was that the indigenous servants had to undergo the same transformation that the European civil service underwent under Cornwallis (Governor-General 1786-1793) and his successor Wellesley (Governor-General 1797-1805) some decades earlier. Now '[h]igh emolument put the European official beyond easy temptation. Formal instruction and indoctrination (…) provided a common education, élan, and elitist esprit de corps that galvanized the Indian Civil Service and that later gave it such prestige.'[30] This view was advanced by Thomas Munro, the governor of Madras (1820-1827), but in fact not much was done, partly due to his death in 1827. The period hereafter not much changed, although in the existing government schools already in 1840 23 Deputy collectors, 7 Sudder Ameens (second class native Judges), and 18 Munsifs (subordinate judicial officers) had been educated for government service. This totals 3.4% of the total number of graduates.[31] It was, however, only in the 1854 Woods' despatch that the Board of directors proposed an educational scheme for entire India including educating Indian administrators. Especially primary education had in 1854 been in the hands of the missionaries. The educational despatch finished this situation and made the government a direct competitor of the missionary schools. These were not altogether pleased and under pressure of the missionary circles the Hunter Commission was set up in 1882 to review this situation. Besides some other conclusions, the Hunter Commission advised to further more vocational aspects. Further the decentralisation of government influence in higher educations caused a spectacular rise in colleges, which also created a strong rise in unemployment among educated Indians. Politics and the army were altogether closed for educated Indians. Furthermore, neither agriculture did pose much temptation nor did commerce pose a real option. The covenanted civil service was in name open to Indians since 1853 but problems like the early age-limit of the examinations, going to London to do their examinations, prejudice etc stood in their way.[32]

The situation in Indonesia was somewhat different due to the more important racial factor. The Dutch made use of the existing aristocracy, the *priyayi*, by allowing them to join the colonial service. It was, however, in the second half of the nineteenth century that on the one hand more commoners could enter the service due to graduating for their civil servant exams and on the other hand increasing bureaucratization increased government demand for educated labour. Especially the withdrawal of the right to demand personal labour services in 1882 strengthened the bureaucracy. Despite this change in relation of the indigenous aristocracy with the population, the Dutch believed that the aristocracy would retain their prestige.[33] The indigenous elite remained necessary on the one hand to use the indigenous structures to obtain profits.[34] On the other hand it was also necessary to get more trained civil servants and trained labourers in business and industry as well. This, combined with the rising view within the European community at the end of the nineteenth century that there was a shift in the indigenous leadership, and the liberalism and Ethical Policy, led to the rise in educational opportunities for the Indonesian population (also outside the *priyayi* class).[35] This caused the government to turn the First Class Schools into Hollandsch-Inlandsche Scholen (HIS, Dutch Native Schools) with two additional years to include the teaching of Dutch. With the establishment of the MULO (More Extended Primary Education) in 1914 and the AMS (General Secondary School), there was for Indonesians the possibility to follow Dutch education from primary to tertiary level. Report

[30] Robert Eric Frykenberg, 'Modern Education in South India, 1784-1854: Its Roots and Its Role as a Vehicle of Integration under Company Raj,' *The American Historical Review*, Vol. 91 (1) 1986, 37-65, 40.
[31] W.H. Sykes, 'Statistics of the Educational Institutions of the East India Company in India,' *Journal of the Statistical Society of London*, Vol. 8 (2) 1845, 103-147, 130.
[32] Suresh Chandra Gosh, *The History of Education in Modern India, 1757-1998*, New Delhi: Orient Longman 2000, 104.
[33] Heather Sutherland, *The Making of a bureaucratic Elite*, Singapore: Published for the Asian Studies Association of Australia by Heinemann Educational books (Asia) 1979, 16.
[34] Sutherland, *The Making of a bureaucratic Elite*, Singapore, 5.
[35] Ibidem, 45-46.

No. 6 of the Dutch-Indies Education Commission estimated that about 50% of the Indonesians, educated in Western education, ended up in the government service in 1928.[36] In the following paragraphs we see that, of the remaining 50%, some ended up in Western enterprises but rarely in the indigenous sectors.

The final reason for stimulating Western education was the demand that arose from, largely western, (private) enterprises. As we have seen before, India and Indonesia did experience growth in educational attainment, but still in the first half of the twentieth century the attainment was low just as at the start of the nineteenth century. In India there fortunately are some data available of the employment of students who left the government schools and colleges up to 1839-40. Of the total number of 1420 graduates 3.4% went into government service, and 23.1% became teacher of which the largest groups were English, Sanskrit, Arabic, and Persian. A large percentage also went in private employment such as doctors and related (3.4%) and merchants (4.3%).[37] If we assume that the group 'miscellaneous' also largely found work in industry and handicraft, we can assume that about 35% of the graduates ended up in artisan or factory industry. This was a fairly large percentage, but we have to keep in mind that it was only a fraction of the total artisan workforce. This situation had not changed much in the early twentieth century. For example the 1931 report of the Royal Commission on Labour in India mentioned that in India almost the whole mass of industrial labour is illiterate.[38] Thus there remained a gap between Western and Indian enterprises, the latter being largely artisan in nature and as a consequence not so much suited for western educated Indians. The same can, actually be said of Indonesia, even at the start of the twentieth century. At the end of the 1920s the Hollandsch-Inlandsch Onderwijs-Commissie (Dutch-Indies Education Commission) describes in report 6a the employment of those who could speak Dutch (in general Western educated) in private enterprises. If we focus solely on the private enterprises, we can make a distinction between European and Indonesian enterprises. The survey into the position of Dutch speaking employees held by the European private enterprises got a return covering 151.000 regular employees. The commission has estimated that about 50% of all employees were reported. Keeping this in mind that about 49% of all Dutch-speaking employees in the private enterprises has a job in which he has to be capable of using the Dutch language, about 51% has a job in which he does not need to be literate in Dutch. In this last group there are almost no Dutch and only 9.8% Chinese.[39] As a consequence Dutch-speaking Indonesians, which were higher educated, were almost entirely working in the Government sector and only a small

Table 5: Indigenous employees in the metal industry in Soerabaja in 1926*

Education level	% employees
No education	92,6%
Indonesian primary school	5,4%
European primary school	0,7%
Dutch-Indies schooll	0,6%
K.E.S. Secondary technical school	0,0%
Indonesian vocational school	0,1%
Burgeravondschool	0,2%
Other schools	0,3%

* 28 enterprises
Source: A.G. Vreede 1926, 10

group in the European industries. Only a few were self-employed or had jobs in Indonesian enterprises.

[36] Hollandsch-Inlandsch onderwijs-commissie, *De werkgelegenheid in Nederlandsch-Indie voor Nederlandsch sprekenden: Enquete burgerlijke landsdienst*, Weltevreden: Landsdrukkerij 1930, 16.
[37] Sykes, 'Statistics of the Educational Institutions of the East India Company in India,' *Journal of the Statistical Society of London*, Vol. 8 (2) 1845, 130.
[38] Royal Commission on Labour in India, *Report of the Royal Commission on Labour in* India, London: His Majesty's Stationary Office 1931, 22.
[39] Hollandsch-Inlandsch onderwijs-commissie, *De werkgelegenheid in Nederlandsch-Indie voor Nederlandsch sprekenden*, Weltevreden: Landsdrukkerij 1930, 23.

As such it is not likely that Western education for Indonesians was a way for economic development of the indigenous economy.[40] This vision is confirmed in a report about the metal industry at Surabaya in 1926. This industry was largely European, but did employ a fairly large amount of Indonesians. Of these Indonesians there are data about their education level, not only western but also Indonesian education. Interestingly, in table 5 we see a fairly low level of about 7% of Indonesian employees in the metal industry was educated. Because the metal industry demanded a fairly high level of education, this figure is probably higher than it would be for all industries. We also see that from this 7% by far the largest share had been enrolled in Indonesian education.

The indigenous population in India and Indonesia thus was rarely employed in the Westernized sector of the economy, and almost none Western educated indigenous population worked in the indigenous economy while the overall literacy was low anyway. The wage labour, also in the indigenous economy, did, however, increase in both countries at the start of the twentieth century. This increase was largely caused by the monetization of the *desa* economy, the decline of the older dependency relationships[41], and the rise of especially indigenous industries. Nevertheless the share of the labour force working in agriculture remained large. Van der Eng (1996) has estimated for Indonesia that the share of agriculture in the total labour force, assuming a yearly increase of 1.5% in

Table 6: Estimates of the indigenous economically active population in Java (1926)

		Countryside	Small towns	Larger towns
		%	%	%
Civil servants		0.9	9.5	11
peasants		52.8	10.4	6.4
wage labour	Regular labour force in village agriculture	12.4	1.2	0.7
	Regular labour force in colonial enterprises	2.4	19.8	21.6
	Irregular labour force	19.6	40.2	30.8

Source: Meyer Ranneft and Huender 1926, 10.

the Outer Provinces, decreased from 76% in 1880 to 74% in 1940.[42] This contrasts with 65.2% working in agriculture in India in 1901.[43] However, largely due to the population growth, the number of Indonesians working outside agriculture did increase markedly over the period. Within agriculture, the number of labourers amounted to 38.7% in 1905. In 1926 this number had dropped to about 20%. Nevertheless table 6 shows that wage labour on Java in 1926 could amount to 34.4% in the countryside and even 53.1% in the city in 1926.

One of the most important factors of the increase in wage labour was the increased importance of the native industries. The manufacturing industries in Indonesia consisted largely of factories at plantations (mainly producing for exports), factories processing mining products (especially petroleum), and other industrial enterprises. This last group consisted of both Western and non-Western enterprises. The most important share of this latter category was machinery workshops (largely in Surabaya and Semarang), which were almost totally Western. Of those 'other industrial enterprises' non-western industries were for example weaving and spinning which was mainly done by women besides their work in agriculture to support their household and the products thus were rarely intended for sale. Batikking, contrary to weaving, took solely place in Java. It was already a large indigenous industry in the nineteenth century but was threatened by cheaper European imports. The introduction of a metal stamp (cap) after 1850 made it possible for the batikken to remain a large industry.[44] In Batavia the number of Batik factories for example increased from 103 in 1910 to 357 in

[40] Hollandsch-Inlandsch onderwijs-commissie, *De werkgelegenheid in Nederlandsch-Indie voor Nederlandsch sprekenden*, 26.
[41] Dros, Nico, *Changing Economy in Indonesia*, Vol. 13: Wages 1820-1940, Amsterdam: Royal Tropical Institute 1992, 20.
[42] Pierre van der Eng, *Agricultural Growth in Indonesia: Productivity Change and Policy Impact since 1880*, Basingstroke [etc]: MacMillan Press Ltd 1996, 274-277.
[43] Statistical Abstract, vol 45 (1900-01 to 1909-10, p. 14.
[44] W.A.I.M. Segers, *Changing Economy in Indonesia*, Vol 8: Manufacturing Industry 1870-1942, Amsterdam: Royal Tropical Institute 1987, 19.

1929. Of the number of 357, 74% was led by Chinese.[45] The Batik industry attracted many females (and some males) who worked in this industry in the low (agricultural) seasons. In Indonesia the harvest season attracted many helpers and villagers who went to work in other places. Especially native industries such as batik factories suffered from lack of labour in these periods.[46] Sometimes due to lack of coolies, other labourers in the batik factories such as tjappers (persons who make stamps on the cotton) were not able to perform their tasks and the factory had to be temporarily closed.[47] In general, however, there were enough labour surpluses in Java[48] for the batik factories, especially in the *desas* surrounding the batik centres.[49] As a consequence of this generally large surplus of labour, the wages were relatively low. This had already been the case since the 1850s when free wage labour became more important. Only the transitional phase to free wage labour (1864-1875) could wages be somewhat higher because there was some shortage of labour.[50] The surplus of labour, combined with the labour-intensive and capital extensive nature of the indigenous industries created fairly low wages. This can be read from below figure. The average daily wage around 1900 was 60 cents a day, which is, however, somewhat higher than most coolies earned in agriculture. However these wage rates are averages of Chinese and Indonesian coolies, experienced coolies, and mandoers, and as such overstate

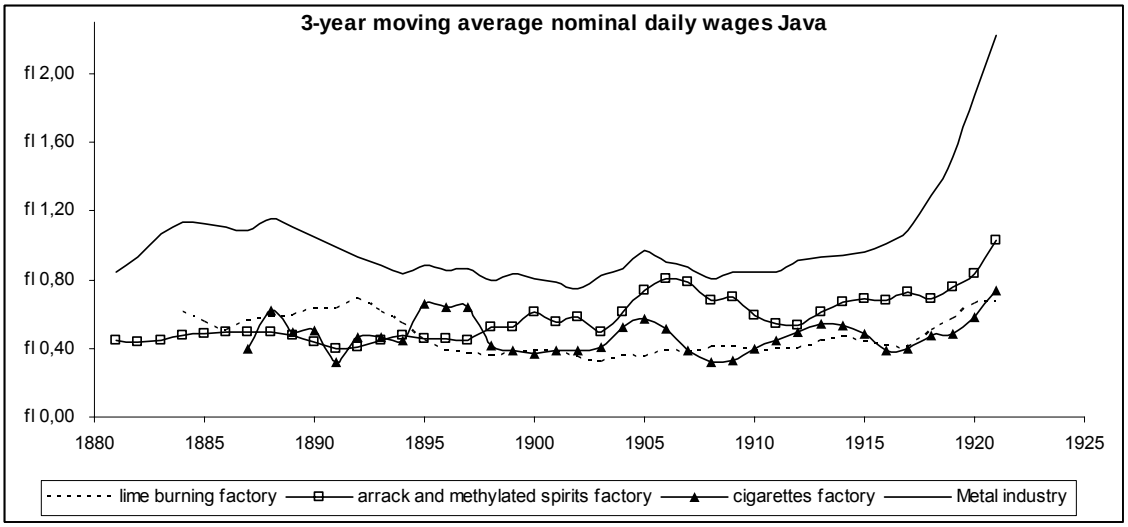


Figure 2: Table with wages Indonesians 1900-1920 Source: Colonial Report 1882-1921

the coolie wage. Figure 2 further shows that especially in the metal industry the wages were somewhat higher. This comes as no surprise since, as we mentioned before, the level of skills was probably higher in this industry and there was less seasonal labour. The general rise in wages after WOI in the manufacturing industry, the start of which can be seen in figure 2, was caused by increased productivity as a consequence of increased mechanization (the introduction of steam and later electricity) in western industries. The indigenous industries relied more on practical innovations such as the cap for batikken and the new handloom invented in the 1920s. We can also discern this development in the gross value added data for manufacturing of Ishiwata (2004). There was a

[45] P. De Kat Angelino, *Rapport betreffende eene gehouden enquete naar de arbeidstoestanden in de batikkerijen op Java en Madoera:, West-Java*, Publicaties Kantoor van der Arbeid 6, Weltevreden: Landsdrukkerij 1930, 4.
[46] P. De Kat Angelino, *Some Remarks on the Wages Paid in the Netherlands Indies*, Batavia: International Research Series; Report B, National Council for the Netherlands and the Netherlands Indies of the Institute of Pacific Relations 1936, 2.
[47] De Kat Angelino, *Rapport betreffende eene gehouden enquete naar de arbeidstoestanden in de batikkerijen op Java en Madoera:, West-Java*, 14.
[48] In the Outer Provinces in the late nineteenth and early twentieth century, however, there was a labour shortage.
[49] P. De Kat Angelino, *Batikrapport, Deel III: Oost*-Java, Publicaties Kantoor van der Arbeid 8, Batavia 1931, 103.
[50] Dros, *Changing Economy in Indonesia*, Vol. 13: Wages 1820-1940, 30.

moderate rise in the 1910s, a stronger rise in the 1920s, and a minor decline between 1930 and 1935 whereafter it increased again.[51]

Also in India the rise of indigenous, artisan, industries was a major cause in the rise of wage labour at the start of the twentieth century. However, contrary to Indonesia, there was a shortage of labour until circa 1920; afterwards there was an excess supply.[52] This was because the demand for wage labour grew faster than the supply, as a consequence of the increase in industries such as railways and the mines. The shortage of wage labour was, however, particularly pressing for skilled labour. For example the 1928 Report of the Royal Commission on Agriculture in India stated about unskilled labour that '[i]n no province, except possibly in Assam, is there any indication of a serious general shortage of labour.'[53] This view is supported by evidence given by W.H. Abel, Inspector of Factories, Punjab, and Dr. R.C. Rawlley, Director of Industries, Punjab to the Royal Commission on Labour. They stated that, although unskilled labour was, depending on the season, abundant in the Punjab '… the skilled worker in factories in the Punjab is mostly imported chiefly because he is expected to be a whole-time worker. The Punjabi has some interest in land; and whether he is getting more wages or not in a factory, when there is some work to be done on his land, he goes on to do it.'[54] The supply of wage labour thus depended, as in Indonesia, on the structure of agriculture. This development was probably a worldwide one in industrializing countries, where skilled workers were less tied to the land while unskilled labour only worked in the low seasons when less work was to be done in agriculture. As a consequence there also sprung up industries that were largely seasonal. These were of course industries which knew a lot of by-employment and thus were largely unskilled and indigenous. Some of these Indian, predominantly seasonal, industries were cotton ginning and pressing, and, somewhat less important, jute pressing. Jute pressing was mainly located in Bengal. Outside Calcutta they mainly produced for the home market using largely local labour from the surrounding villages. After the season (July till December) the labourers returned to their normal agricultural work.[55] Because East India had a virtual monopoly on cheap gunny bags, the industry could grow steadily until around 1900 when growth slowed down.[56] This was accompanied by almost steady nominal wages until the rise in demand pushed up wages during WOI. In jute textiles, the

Figure 3 Source: Mukerjee (1959, 1960, 1961, 1962)

[51] Shigeru Ishiwata, 'Estimating Gross Value Added in Indonesian Manufacturing Industries, 1917-1940,' *Discussion Paper Series No 27*, Hitotsubashi University Research Unit for Statistical Analysis in Social Sciences 2004, 7.
[52] Royal Commission on Labour in India, *Report of the Royal Commission on Labour in* India, 21.
[53] Royal Commission on Agriculture in India, *Report of the Royal Commission on Agriculture in* India, London: His Majesty's Stationary Office 1928, 579.
[54] Royal Commission on Labour in India, E*vidence Submitted to the Royal Commission on Labour in India, Vol. II-Part 2: Punjab, Delhi and Ajmer Merwara. Oral Evidence*, London: His Majesty's Stationary Office 1931, 45.
[55] Royal Commission on Labour in India, *Report of the Royal Commission on Labour in* India, 78.
[56] Dietmar Rothermund, *An Economic History of India From Pre-Colonial Times to 1991*, London and New York: Routledge 1993, 58.

wages rose slowly and than steeper after 1935. This was largely due to ad hoc allowances.[57] Just as the batik factories in Indonesia, cotton ginning and pressing was strictly seasonal. It was especially located in Bombay, Madras, the Central provinces, the United Provinces, and Punjab. The labourers worked there yearly between 2 and 7 months.[58] Labour was predominantly local from the surrounding villages. Mukerjee (1959, 1961, 1962) assembled the monthly average wage figure in cotton textile mills in Bombay, Ahmedabad, and West India in general although the latter is largely a combination of Bombay and Ahmedabad. Bombay contains the largest share of the industry (about 31% of the mills in 1913) while the industry in Ahmedabad also grew to about 30% in the 1920s thus together with Bombay covering the largest part of the cotton industry. This industry grew at a fairly constant rate until it got a boost in the First World War. At the beginning of the 1920s the wages remained constant. However, the yearly bonuses paid in Bombay during the boom period were discontinued in 1924.[59] This steady rate continued until the decline around 1934 after which growth again took off with a major boost during the Second World War. The wages were generally monthly, with bonuses and possibly other extras such as housing provided by the employer. This was a fairly long period which often necessitated the employee to borrow. This borrowing had to be done, however, largely outside the factory. The same can be observed in other industries were the European employers dominated or mostly employed skilled labour such as engineering, iron and steel, and printing. In Indian industries such as tanneries and brick factories, however, the payment was usually made daily or weekly and advances by the employer were more common.[60]

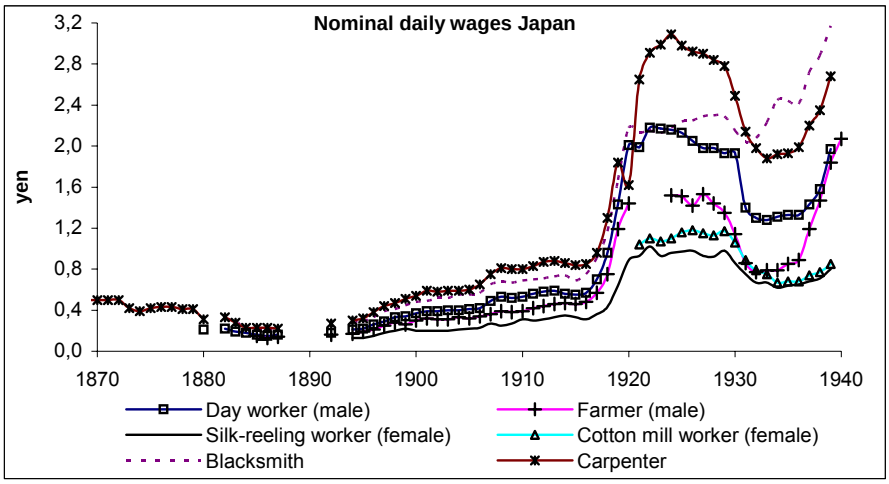
In India and Indonesia, there was a growth of wage labour, of industrial and especially artisan activities, and of educational enrollment. The latter was, however, weak and not directly related to either the western or the indigenous sector of the economy. The position of Japan during 1850-1940 was totally different, largely because of different educational structure. First, the rise in western education which dominated the employment of Indonesians and Indians in large-scale industries was absent because no such education competed with the indigenous system of education. Secondly, there was not so much a strong division between artisan and factory industries. Because a large share of the population was educated, and because this education was not divided in so-called superior and inferior education (western and indigenous), both the large-scale and small-scale industry could profit from a fairly large pool of skilled labour. Although Japan witnessed a rapid decline and dislocation of older crafts (sugar refining, cotton spinning) the artisan produce could maintain an important position next to the modern, government-sponsored industries as banking and iron. Roy (1999) distinguishes five factures that ensured the continuation of the small-scale labour intensive industries. These were a surplus of labour, the diversity of preferences in the home market, inherited artisan skills (especially in textiles), low economies of scale, and mass production of intermediate goods.[61] This continued existence of an artisan sector gave Japan's economy a dualistic character.

The position of these Japanese artisan industries can be seen in the position of the cotton industry, which was largely located in the Kinai region. As mentioned earlier, until around 1750 this industry was largely Osaka based, but afterwards an increased diffusion of technology to the surrounding villages and the supply of by-employment shifted processing of cotton also to the villages.[62] Thomas Smith (1969) has focused on the importance of this by-employment of farmers in the Kaminoseki county, in the extreme south of the main island Honshu. For this region a detailed economic survey for 1843, partly touching upon by-employment, has been spared. Kaminoseki had many trade relations but, since the improvement of a network of dikes and ditches around 1700, also started to become a main salt producer. The same is true for cotton, which the region started to

[57] Mukerjee, 'Jute Textile,' Artha Vijnana 1960, Vol. 2 (1) 1960, 59.
[58] Royal Commission on Labour in India, *Report of the Royal Commission on Labour in* India, 76.
[59] Mukerji, K. M. 'Trend in Real Wages in Cotton Textile Mills in Bombay City and Islands, from 1900 to 1951,' *Artha Vijnana*, vol. 1 (1) 1959, 82-95, 85.
[60] Royal Commission on Labour in India, Evidence, Vol. I_part 1: Bombay Presidency (including Sind). Written Evidence, London 1931, 93.
[61] Tirthankar Roy, *Traditional Industry in the Economy of Colonial India*, Cambridge: Cambridge University Press 1999, 53.
[62] The same reasoning is used for the Ina valley in middle Japan between Kyoto and Edo, see: Kären Wigen, *The Making of a Japanese Periphery, 1750-1920*, 82.

produce, and started ginning, spinning, and weaving in the eighteenth century.[63] It was, however, only in 1823 that the restrictive controls of the Osaka merchants on cotton processing were lifted which caused a boom in cotton by-employment in the villages.[64] The lifting of this restriction was caused by pressure from the villages. They saw that by-employment was profitable. On the one hand this was caused by technological change (more efficient looms) and on the other hand by increasing specialization. It was even so that some villages almost completely focused on cotton ginning, or carding, spinning, weaving, or dying.[65] As a consequence many farm workers started to participate in this non-farm work. As mentioned earlier, Kaminoseki had about 82% of families classified as farmers in 1843. Income from non-farm work, however, was much larger than 18%. Smith shows that income from artisan work, especially salt, could be as high for farmers as farm work.[66] The domestic industries were done largely by old people, children, and women. In general, at the start of the nineteenth century, more and more farmers practiced by-employment.[67] Also salaries thus changed. Skilled female weavers were expected to do all kinds of agricultural work and weave one *tan* of cloth per day in the off-season.[68]

In all industries modernization increased, especially after 1868. New industries arose and older disappeared, but generally new and old industries remained in existence side by side. As a



Source: Bank of Japan (1966) *Figure 4*

consequence, there was a steep rise in wage employment. Not only the artisan industries but also the 'modern' industries experienced a rise which increased the demand for both skilled and unskilled labour (see figure 4). This led to higher wages, which surpassed the level of Indonesia around 1900 while the skilled wage had already been almost equal to the Indian level and the unskilled somewhat higher in the nineteenth century (see appendix B). This is combined with the situation that Japanese agriculture is extremely labour intensive due to the generally small plots of land.[69] Many of those professions without land such as blacksmiths, day workers, or cotton mill workers, tended to be agricultural by-employment. As a consequence, wages in these professions remained almost equal to farm wages (see figure 4). This is especially the case for the production of cocoons for silk. These are

[63] Thomas C. Smith, 'Farm Family By-employments in Preindustrial Japan,' *The Journal of Economic History*, Vol. 29 (4) 1969, 687-715, 689.
[64] Hauser, 'The Diffusion of Cotton Processing and Trade in the Kinai Region in Tokugawa Japan,' 633-649, 644.
[65] Ibidem, 633-649, 647.
[66] Smith, 'Farm Family By-employments in Preindustrial Japan,' 687-715, 698.
[67] Ibidem, 687-715, 706.
[68] Hauser, 'The Diffusion of Cotton Processing and Trade in the Kinai Region in Tokugawa Japan,' 633-634, 638.
[69] Daniel H. Buchanana, 'The Rural Economy of Japan,' *The Quarterly Journal of Economics*, Vol. 37 (4) 1923, 545-578, 550.

largely produced as by-employment in agriculture but the reeling is done in mills.[70] This started to change in the 1920s when increased government sponsored industrialisation and increased skill levels separated not only factory industry but also artisan industries from agriculture. For example, as a rule only those who have completed the six year elementary course were employed at the mills.[71] The divergence of agricultural and industrial wages was further caused by increasing domestic and foreign demand which largely focussed on manufacturing products.[72] Because manufacturing products remained largely artisan (except to some extend in textiles), wages in these artisan industries rose compared to agriculture.

5 SKILLS, ECONOMIC STRUCTURE, AND INDUSTRIAL GROWTH

The availability of a surplus of skilled labour, the dualistic structure of the economy, and the availability of enough purchasing power to create a home market for artisan products caused in Japan a period of skill biased growth in the period 1850-1940. Indonesia and India had at best experienced extensive growth due to extension of scale. They also experienced on the one hand a shortage of skilled labour because of the missing link between their education systems and both the western and indigenous industries. On the other hand they found it increasingly troublesome to use migrating workers between city and countryside in their industries which, due to the egalitarian nature of the Japanese artisan industries, was far less the case in Japan. This situation worsened in the second half of the twentieth century, while Indonesia focused on both industries and artisan activities, and India focused on basic industries. That the Indian policy was not entirely successful was shown by the situation that, although both Japan and India did promote large-scale industries, this led in Japan to long-term growth but not in India. This was partly caused by the strong Indian focus on heavy industry. Furthermore there remained a lack of skilled labour, especially above primary education. Because of the division of successful growth (Japan and, to a certain extend, Indonesia) and India it is again important to make a difference between Japan on the one and India and Indonesia on the other hand for firstly educational enrollment and secondly the (policy towards) the structure of artisan and factory industries.

Concerning education, as mentioned in the previous section, India and Indonesia experienced a strong growth at the end of the nineteenth and the start of the twentieth century. This growth was especially profound because of the bad state of indigenous education and the start of European education almost from nil. As a consequence, the gross enrollment ratio[73] for India and Indonesia around 1940 was 13% versus 60% for Japan. This figure changed after independence. Both India and

Table 7: Gross Enrollment Ratio (%)

	India			Indonesia			Japan		
	Primary	Secondary	Tertiary	Primary	Secondary	Tertiary	Primary	Secondary	Tertiary
1970	77,8	24,2	4,9	80,0	16,1	2,5	99,5	86,6	17,6
1975	80,9	25,5	5,1	86,0	20,0	2,3	99,5	91,8	26,3
1980	83,3	29,9	5,2	107,2	29,0	3,8	101,1	93,2	30,5
1985	96,0	37,9	6,0	117,0	41,3	7,0	101,7	95,4	27,8
1990	97,2	44,4	6,1	115,2	44,0	9,2	99,7	97,1	29,6
1995	100,2	48,8	6,6	113,4	51,5	11,3	102,5	103,4	40,5*

* 1994

UNESCO World Education Indicators, http://www.uis.unesco.org/statsen//statistics/indicators/i_pages/indic_2.htm

[70] National Confederation of Industrial Associations of Japan, *Industrial Relations in Japan: Characteristic measures for workers' welfare in silk and cotton mills*, Tokyo: National Confederation of Industrial Associations of Japan 1937, 4.

[71] National Confederation of Industrial Associations of Japan, *Industrial Relations in Japan: Characteristic measures for workers' welfare in silk and cotton mills*, 7.

[72] Hollis B. Chenery, Shuntaro Shishido, and Tsunehiko Watanabe, 'The Pattern of Japanese Growth, 1914-1954' *Econometrica*, Vol. 30 (1) 1962, 98-139, 111.

[73] The gross enrollment ratio is the total number of children enrolled in a particular level of school in a year, divided by the total number of possible children for that level school in that year. If also some older children participate, the gross enrollment ratio could exceed 100%.

Indonesia knew a strong growth in the share of the population that had attended primary education. Remarkably, already in the colonial period Indonesia had surpassed India in primary attainment, but the same was done in secondary and higher attainment in the 1980s. This clearly improved the position of Indonesia relative to India in the availability of skilled labour. Nevertheless there remains no doubt that, even today, Indonesia is far behind Japan in secondary and tertiary education.

Concerning the relation between artisan and factory industry, the Japanese policy was not aimed directly at the labour force or even the unions. Nevertheless Japan's policy after 1900 was as important as before. Important were the development of investment options, and the creation of the education system to have an adequate supply of skilled labour.[74] This continued after independence where, as we have seen, especially secondary and tertiary attainment rose steeply. This was, however, mainly aimed at strategic industries such as mining, metal, and banking which were dominated by the *zaibatsu*. Nevertheless these sectors did not comprise of more than about 8% of the national economy around 1930.[75] The other sectors mainly consisted of agriculture and handicrafts. For example cotton spinning was fairly capital-extensive compared to the steel plants but could use a fairly large amount of cheap labour. These small enterprises do often, however, supply goods to the larger enterprises. These small establishments (5 workers or less) comprised of 95% of the total establishment with 58.2% of the labour force engaged in manufacturing employed in 1930. Especially unskilled (and often non-regular labour) is paid less. This is also estimated by Stoikov (1973). He estimated that formal education was important and increased in importance with rising skill levels. Not only formal

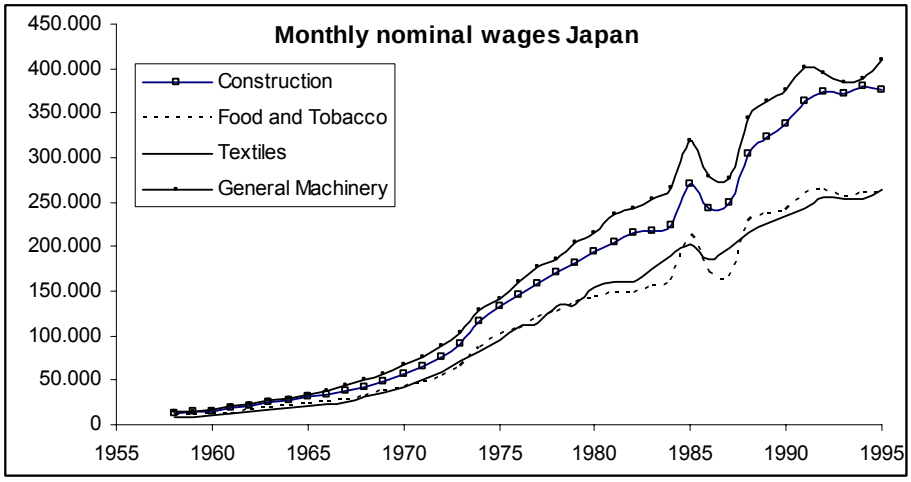


Figure 5 Source: Historical statistics of Japan, vol. 4 and Japan statistical yearbook 1987-1997

education did increase wages, but also extra earnings as a result of both length of service and experience.[76] As a consequence, wages in factory industries and large enterprises were generally higher than in agriculture or artisan industries. This can be seen from figure 5 where wages in textiles and food & tobacco are generally lower than in the more skill and capital intensive construction industries.

Compared to Japan, in Indonesia after the War there was only a small indigenous entrepreneurial class and a small capital market, the latter contrary to India. Furthermore, the Indonesian government stimulated other (new) manufacturing industries and tried to promote the entry of Indonesian entrepreneurs in the (largely foreign owned) industries. In India especially heavy industry was promoted to make visible the independence. However, also agriculture was spared because Congress promoted itself as an agricultural party. In both India and Indonesia these policies

[74] Carl Mosk, *Japanese Industrial History: Technology, Urbanization, and Economic Growth*, Armonk and London: M.E. Sharpe 2001, 182.
[75] Carlo Caldarola, 'Socio-Economic Dualism in Japan,' *Monumenta Nipponica*, Vol. 20 (3/4) 1965, 359-373, 361.
[76] Vladimir Stoikov, 'The Structure of Earnings in Japanese Manufacturing Industries: A Human-Capital Approach,' *The Journal of Political Economy*, Vol. 81 (2) 1973, 340-355, 348.

had little effect. In Indonesia in the 1950s there even remained distrust among the population towards non-agricultural enterprises. As a consequence they were nationalised around 1957. However, they were not given to Indonesians but remained largely state enterprises. [77] In India, on the other hand, the first five-year (1951-56) plan was very successful in creating growth in the basic industries and capital goods sector. However, the consumption industry together with the largest Indian industry, the cotton textile industry, stagnated. Although the number of looms and spindles had increased a little and the employment increased with almost 50%, production stagnated, indicating a decrease in productivity.[78]

Independence had caused major shocks in both India and Indonesia. In India, independence was followed by the partition of India and (East and West) Pakistan while Indonesia experienced problems with 'police actions' of the Dutch. It was therefore only in the 1950s that a real start could be made with the economic policy of the newly independent states. In both countries this was initially relatively successful partly because in Indonesia the Korea war caused an export boom while in India there was strong growth in basic industries. However, this changed in the 1960s. In Indonesia there came problems with foreign exchange which hampered crucial imports of several important industries while, at the end of the sixties industrial growth in India diminished. This was caused by a attack of Pakistan in 1965, the great drought causing failure of the harvest in 1965 and 1966, and a devaluation of the rupee causing prices even further to rise. Overall prices in India increased with 80% in the 1960s. Furthermore, in the mid 1960s both economies started to transform. It was characterized by rapid (although not always balanced) industrialisation in the manufacturing industry (including the oil boom for Indonesia), and a 'Green Revolution' in rice and wheat production.

Both in India and Indonesia already from the 1900s the government had tried to teach the peasants to use better crops and methods through the extension service. This met with little success, partially because there were too few administrators.[79] With increasing literacy and the spread of newspapers, also the knowledge of new agricultural techniques spread.[80] Initially it was especially irrigation and the expansion of the area under crops that let the production rise. However, at the end of the 1960s and early 1970s in Indonesia new high yielding rice varieties, sensitive to fertilisers, were developed. Especially in the 1970s and 1980s it was quickly disseminated by the government in smallholder food crop agriculture.[81] This was called the Green Revolution. This government action could, however, almost not be replicated in other sectors. Though, it did have other important effects. Because of the increased rice production, the average agricultural income rose strongly, be it that it was somewhat skewed to the higher incomes. For example the average paddy yield (ton/ha) on Java rose from 2.26 in 1955-61 to 3.92 in 1977-80 while total working hours decreased.[82] If we look at India the effect is also very visible. In 1966 the area under high yielding varieties (wheat, paddy, maize, jowar, and bajra) was still 1.9 million hectares but in 1980 this had risen to 43.0 million hectares, while production more than doubled.[83] However, in India it seems that the main effect of the Green Revolution in was an increase in 60% in wheat production.[84] This increase in agricultural income had no direct effect on industry, especially in India where the focus hadn't been on consumption industry but on the basic industry.

The Green Revolution, however, did create a larger demand for manufacturing products. Yet, the development of the manufacturing industries also had other causes. Between 1963 and 1985, much diversification in manufacturing took place in Indonesia, stimulated by an increase in purchasing power from agriculture after the Green Revolution. In 1963 (excluding oil and gas for the sake of comparability) food, tobacco (especially *kretek* cigarettes), and rubber were by far the largest

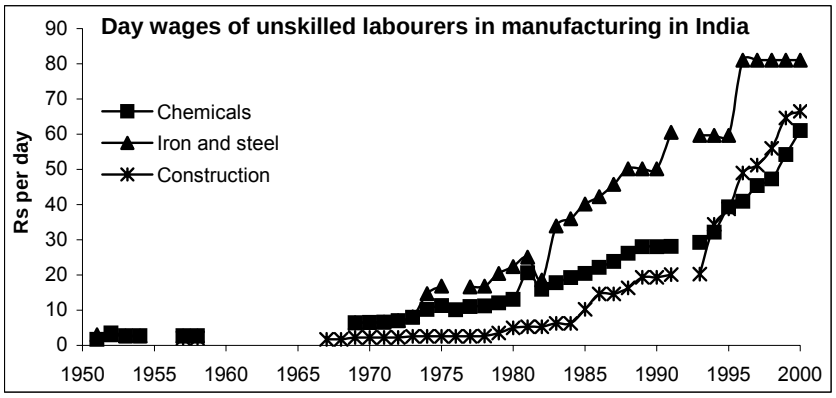
[77] Anne Booth, *The Indonesian Economy in the Nineteenth and Twentieth Centuries: A History of Missed Opportunities*, London [etc.]: Macmillan [etc.] 1998, 259-260.
[78] Rothermund, *An Economic History of India From Pre-Colonial Times to 1991*, 133.
[79] Royal Commission on Agriculture in India, *Report of the Royal Commission on Agriculture in* India, London, 107.
[80] Booth, *The Indonesian Economy in the Nineteenth and Twentieth Centuries*, 283.
[81] Howard Dick, Vincent J.H. Houben, J. Thomas Lindblad and Thee Kian Wie, *The Emergence of a National Economy: An Economic History of Indonesia, 1800-2000*, Leiden: KITLV Press 2002, 217.
[82] Van der Eng, *Agricultural Growth in Indonesia: Productivity Change and Policy Impact since 1880*, 179.
[83] A.N. Agrawal and Hari Om Varma (eds.), *Indian Economy: Statistical Yearbook 1998*, New Delhi: National Publishing House 1998, 120.
[84] Rothermund, *An Economic History of India From Pre-Colonial Times to 1991*, 139.

industries. Especially textiles, which had known already a large growth at the end of the 1930s partly due to a protective policy of the colonial government, continued to grow under the same policy after independence. As a consequence of the lack of competition, however, the number of powerlooms, even after independence, remained fairly small compared to the number of handlooms. At the end of the 1950s and the start of the 1960s this industry was using only a small part of its capacity. Problems were the shortage of spare parts, lack of skilled labour, and especially the shortage of raw material (both raw cotton and yarn).[85] This was caused by the fact that the spinning industry could not supply enough yarn. Furthermore, much yarn, imported by the State Trading Corporations, was sold on the free market. In addition, the yarn that did enter the producers' hands directly via quota had to be paid for in advance. Many smaller producers could not pay the quota and procured it by working for middlemen who paid the quota, or through selling their quota to larger and more efficient producers. In this way the larger producers got more raw materials.[86] Under Soekarno's licencing system it was thus profitable to have a licence for a loom even though it was a handloom. Then you could obtain a quotum of yarn, which could be sold to larger and more efficient producers.[87] This allocation system was abolished in 1967 and the channelling of yarn was entirely left to market forces. Nevertheless it was difficult for productivity to rise, even within the modern (powerloom) sector. In the larger factories that could have had economies of scale there were old looms often from the 1930s and 1940s while the smaller factories used more modern looms but had no economies of scale.[88] This separation between a 'modern' section and a 'traditional' unmechanized sector in textiles can also be viewed in other industries, even within the cottage industries such as roof tiles. This was especially caused by market segmentation. In a survey in two villages in a kabupaten in Central Java it became clear that in the smaller village, more isolated village, the roof tile industry was largely by-employment from people working in agriculture. It was capital extensive (both physical and human capital) and mainly aimed at the local market.[89] On the contrary in Karanggeneng, close to an urban centre, the roof tile industry was more capital intensive because, as they catered for the urban market, they had to produce higher quality, had to build kilns, and had to buy proper firing material. Furthermore for these producers this was generally their main occupation and their level of schooling was on average higher.[90]

The importance of the old industries as textiles, food, tobacco, and rubber reduced strongly in the 1970s and even further in the 1980s but these industries nevertheless remained the most important sector in Indonesian manufacturing. While in Indonesia the decline had set in especially in the unmechanised section of the 'old' traditional industries of weaving in the 1960s due to shortage of yarn and lack of efficiency, this decline set through in the 1970s with a decline in looms from 50% up to 60%.[91] This reduction in the share of the traditional, and the rise of the more mechanised textile industry was also caused by low official lending rates. At the end of the 1960s the labour-intensive aspect and inefficient technology (many handlooms were of the type invented in the 1920s) caused some sort of technological breakthrough as more power looms started to be used and output increased almost fourfold between 1968 and 1978.[92] This was accompanied by a doubling of the number of power looms. However, this even increased the difference between the cottage industries and the small, medium, and large-scale industries as the cottage industries did virtually not mechanize at all and also

[85] Ingrid Palmer and Lance Castles, 'The Textile Industry,' *Bulletin of Indonesian Economic Studies*, Vol. 1 (2) 1965, 34-48, 41.
[86] Palmer and Castles, 'The Textile Industry,' 34-48, 43.
[87] W. Boucherie, 'The Textile Industry,' *Bulletin of Indonesian Economic Studies*, Vol. 5 (3) 1969, 47-70, 55.
[88] Boucherie, 'The Textile Industry,' 47-70, 58.
[89] Henry Sandee and Hermine Weijland, 'Rural Cottage Industry in Transition: The Roof Tile Industry in Kabupaten Boyolali, Central Java,' *Bulletin of Indonesian Economic Studies*, Vol. 25 (2) 1989, 79-98, 85.
[90] Sandee and Weijland, 'Rural Cottage Industry in Transition: The Roof Tile Industry in Kabupaten Boyolali, Central Java,' 79-98, 89.
[91] Hal Hill, 'The Economics of Recent Changes in the Weaving Industry,' *Bulletin of Indonesian Economic Studies*, Vol. 16 (2) 1980, 83-103, 87.
[92] Hill, 'The Economics of Recent Changes in the Weaving Industry,' 83-103, 84.

did not participate in government credit and technology programs.[93] In India this was exactly the opposite. Due to high wages, labour unrest, taxation policy, and bureaucratic control it were the handloom weavers and the small powerloom operators that experienced rapid growth during this period while the larger-scale sector (textile mills mainly located in the metropolitan cities) declined. Wages in mills, for example, could be up to three times those with powerlooms.[94] In the mid 1980s



Source: ILO October Enquiries *Figure 6*

more market forces were let in but only to a certain extend. This did, however, not reverse the trend. In more advanced industries as steel, and motor vehicles often outdated technology and overstaffing caused high prices.[95] This was also caused by the initial Indian focus on basic and capital goods industries which also experienced a strong rise in nominal wages in the 1980s and 1990s as can be seen from figure 6. Also of importance was the shortage of energy, which caused the share of oil imports in total imports to increase to 41% in 1980 although in 1990 this had declined to 25%. Another problem for both India and Indonesia was the foreign exchange in the 1950s and 1960s. In Indonesia this caused problems in textiles because of the imports of yarn and raw cotton but also the largely unmechanised *kretek* industry suffered because of problems with the import of cloves, paper, and Virginia tobacco.[96] In India, however, the depreciation of the rupee in the 1960s especially increased the price of consumer goods and depressed purchasing power. For example real wages in the 1960s were almost stagnant while nominal wages almost doubled (see appendix A).

The reduction in Indonesia of the 'old industries', and especially the traditional sector, was in favour of other industries such as transport, basic metals, and wood products. Although these 'modern' industries grew less markedly in India, they did grow. In India, for example, in 1980 the largest manufacturing industries were textiles (19.5%), Chemicals & products (14.7%), and Basic metal alloys (12.3%).[97] However, around 1990 Chemicals had become the largest manufacturing industry. This was partly caused by the lower wages compared to other manufacturing industries such as construction. It were thus exactly these industries that did exhibit a high value added per employee and were more mechanized. These industries thus were also more concentrated as they generally had a high entry barrier due to their demand for technology and capital. Lower value added per employee can be seen in labour-intensive industries such as pottery and, to some extend, textiles.[98] However, the most important industry in Indonesia remained oil and gas, which accounts for over one-quarter of value added in manufacturing. Also the other important industries remained the same as in the pre-war

[93] Henry Sandee, Piet Rietveld, Hendrawan Supratikno, and Prapto Yuwono, 'Promoting Small Scale and Cottage Industries in Indonesia: An Impact Analysis for central java,' *Bulletin of Indonesian Economic Studies*, Vol. 30 (3) 1994, 115-142, 125.
[94] Supriya RoyChowdhury, 'Political Economy of India's Textile Industry: The Case of Maharashtra, 1984-89,' *Pacific Affairs*, Vol. 68 (2) 1995, 231-250, 233.
[95] Rothermund, *An Economic History of India From Pre-Colonial Times to 1991*, 147-148.
[96] Lance Castles, 'Cloves and Kretek,' *Bulletin of Indonesian Economic Studies*, Vol. 1 (2) 1965, 49-59, 53.
[97] Agrawal, p. 147.
[98] Hal Hill, 'Indonesia's Industrial Transformation: Part I,' *Bulletin of Indonesian Economic Studies*, Vol. 26 (2) 1990, 79-120, 90.

period even though they were less important than in the 1960s, i.e. food products, tobacco (mainly *kretek* cigarettes), and textiles. Nevertheless it is obvious that employment in factories, even including small-scale industry (between 5 and 19 employees), did not exceed 2.4% of the total workforce in 1985.[99] Nevertheless their numbers did grow, even though they stagnated in the 1960s. This low employment in factory industry indicates that indeed some separation is maintained between on the one hand the cottage industry (less than 5 employees), especially irregular household garment and batik production, and on the other hand factory work.

6 CAUSALITY BETWEEN SKILL PREMIUM AND GROWTH

In section 3 to 5 we looked briefly at the factors influencing the skill premium. Important factors were a balance between artisan and factory industries, the relation between industry and agriculture, and especially important was the presence of a skilled labour force. However, the relation between education and the skill premium is far more important in Japan than in India and Indonesia (see table 3). In this section we would like to look at the question how this relation affects the (possible) causation between the skill premium and economic growth. These latter two factors may have, as indicated in section 2, a double causality. For example economic growth may lead on the one hand to a higher skill premium as the introduction of skill biased technologies increase the demand for skilled labour. On the other hand economic growth may lead to increased investment in education and thus to a lower skill premium. We therefore need to explore the causality of the factors mentioned in the previous sections. To try to get a picture of the causality, we firstly estimate the long-run relations between the skill premium and GDP growth. Than we move on to estimate the direction of this relation with a Granger causality test, and finally we try to interpret these results.

The first step is to estimate the long-run relation between GDP per capita and the skill premium. Some studies have indicated that often there should be a negative relation (Freeman and Oostendorp (2001)), which takes place if increased economic growth induces investment in education (the Williamson thesis). If the relation is insignificant or even positive, this might be caused by the situation that economic growth goes hand in hand with technologies that require skills and thus increase the skill premium (the Kuznets thesis). To test the starting assumption of a negative relation

Table 8 Regression of GDP per capita on the skill premium*

Dependent variable: $\Delta \ln GDPcap$

	Japan		India		Indonesia	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
	1871-2001		1862-2001		1822-1996	
Constant	0.031	3.67	0.013	2.24	-0.001	-0.131
$\ln Skill\,\mathrm{Pr}emium_{t-1}$	0.009	1.64				
$\ln Skill\,\mathrm{Pr}emium_{t-2}$			-0.004	-1.15		
$\ln Skill\,\mathrm{Pr}emium_{t-3}$						
$\ln Skill\,\mathrm{Pr}emium_{t-4}$					-0.000001	-2.27
LevelDummy1870-1930					0.013	1.83
LevelDummy1930-1996					0.033	4.48
LevelDummy1895-1949			-0.012	-1.57		
LevelDummy1950-2000	0.025	3.27	0.012	1.48		
R^2	0.564		0.644		0.679	
AR 1-2 test	0.2867		0.3793		0.0982	
Normality test	0.0910		0.1416		0.2857	
Hetero test	0.6743		0.6217		0.1071	

* The dummies for outliers are not reported

Source: The skill premia were obtained from Appendix A, GDP per capita for Japan: Maddison (2003), Indonesia: Maddison (2003) and Van Zanden (2003), India: Maddison (2003) and Brahamanda (2001)

[99] Hill, 'Indonesia's Industrial Transformation: Part I,' 79-120, 85.

we simply estimate a regression of two stationary variables ($\Delta \ln$ GDPperCapita, and lnSkillPremium)[100] and insert dummies for those years that the skill premium is negative (generally the War periods) or where there are outliers. Because of the simultaneity bias, we decided to use only lags as independent variables. On the basis of visual inspection we also decided to include some period dummies to check whether there are some separate periods to include in the later causality test. For Japan we see in table 8 see a break around 1952, for India around 1960, and for Indonesia around 1875 and 1950. The most remarkable aspect is that the coefficient of the skill premium for Japan has a positive sign. This indicates that there could have been a period with skill biased growth, although we have to be careful with this interpretation as the regression is over a long period which may know several phases with changing relations between the skill premium and economic growth. It might even be the case that, even though for India the relation is not significant over the period 1862-2000, it may be significant for a sub period. Nevertheless the positive sign for Japan might be caused by the relative advanced state of the economy. As a consequence, when economic growth took place and more capital was accumulated, the demand for skilled labour rose. However, because compared to India and Indonesia enough skilled labour was available, the skilled real wages remained relatively low (see appendix B). In India this manifests itself in the absence of a relation between the skill premium and economic growth. Another reason why Japan experienced a positive relation between the skill premium and economic growth might be the relatively late start of the GDP per capita series (1870) compared to India and Indonesia, and the difference in wages between East (gold-using) and West (silver-using) regions within Japan. Nevertheless, table 8 indicates that a relation exist between GDP per capita and the skill premium in Japan, and now it is necessary to find out what the direction of that relation is.

The direction of the relation between the skill premium and economic growth is treated in table 9 below, which gives the F-values of the Granger causality test for India, Indonesia and Japan for

Table 9: Granger causality between GDP per capita growth and skill premium

Economy	Years	Direction of causality	F value	Decision*
Japan	1874-2001	GDP→ Skill premium	7.05	GDP causes Skill premium
		Skill premium → GDP	11.69	Skill premium causes GDP
	1874-1950	GDP → Skill premium	6.09	GDP causes Skill premium
		Skill premium → GDP	7.06	Skill premium causes GDP
	1950-2001	GDP → Skill premium	0.60	GDP does not cause Skill premium
		Skill premium → GDP	3.50	Skill premium causes GDP**
India	1866-2001	GDP → Skill premium	1.16	GDP does not cause Skill premium
		Skill premium → GDP	2.07	Skill premium does not cause GDP
	1866-1895	GDP → Skill premium	1.51	GDP does not cause Skill premium
		Skill premium → GDP	2.07	Skill premium does not cause GDP
	1895-1950	GDP → Skill premium	1.78	GDP does not cause Skill premium
		Skill premium → GDP	0.66	Skill premium does not cause GDP
	1950-2001	GDP → Skill premium	2.01	GDP does not cause Skill premium
		Skill premium → GDP	2.29	Skill premium does not cause GDP
Indonesia	1825-1996	GDP → Skill premium	1.16	GDP does not cause Skill premium
		Skill premium → GDP	0.23	Skill premium does not cause GDP
	1825-1870	GDP → Skill premium	0.88	GDP does not cause Skill premium
		Skill premium → GDP	1.79	Skill premium does not cause GDP
	1870-1930	GDP → Skill premium	4.23	GDP causes Skill premium
		Skill premium → GDP	0.40	Skill premium does not cause GDP
	1930-1996	GDP → Skill premium	0.10	GDP does not cause Skill premium
		Skill premium → GDP	0.21	Skill premium does not cause GDP

*When the null-hypothesis is rejected it means that variable A (Granger) causes variable B.
**Null hypothesis rejected at 10%

[100] The logarithm of the skill premium of India and Japan are stationary at 1%, Indonesia at 5%. The logarithm of the GDP per capita series are all I(1) series.

the entire period and the sub periods estimated in table 8. This is also done for India as it is not entirely clear if the absence of a relation found in table 8 also applies to all sub-periods. In table 9 we see that for Japan the null hypothesis is rejected (i.e. there is causality in both directions) for all periods except 1950-2000 where GDP growth does not cause skill premium. As expected, India does not show any relation between the skill premium and GDP growth either in the long series or in the sub periods. In Indonesia only in the 1870-1930 period GDP growth causes skill premium.

The final step is to try to interpret the results from table 8 and 9. There are three possible relations between GDP per capita growth and skill premium, i.e. no relation, a negative relation, or a positive relation. Note, however, that this relation may be different or switch sign when the sample is larger or smaller. Firstly, there can of course be no relation in which case there can be no causality. An example is India which has no significant relation over the entire 1862-2000 period and thus cannot have any causal relations over the entire period. The second option is that there is a negative relation as was the case for Indonesia. In this case economic growth induces increased investment in education, thus lowering the skill premium. In this case it is impossible that there are no relations. However, because of the small coefficient in table 8 it is possible that there are no relations over the entire sample but only in some of the sub-periods. Equally, when there is a negative relation it is not possible that there is two-way causality as this would increase the skill premium (as new technologies would increase growth) thus creating a positive relation. The only option is that GDP growth influences (lowers) the skill premium through extra investment in education, or that a rise in skill premium

Table 10: Relation between GDP per capita growth and skill premium

Relation between GDP per capita growth and skill premium	**Causality**
Negative: investment in education	No relations: Not possible
	GDP→ Skill premium: Extensive growth (no technology, production more capital intensive)
	Skill premium → GDP: skill neutral growth (technology focuses on unskilled labour)
	Skill premium ↔ GDP: Not possible
Positive: skill biased technological growth	No relations: Not possible
	GDP→ Skill premium: Not possible
	Skill premium → GDP: Not possible
	Skill premium ↔ GDP: Standard option
No relation	No causality possible

lowers GDP growth. The latter can be the case when there is too little investment in education combined with a tendency to skill biased growth. The third relation between the skill premium and GDP growth was a positive relation of which Japan provides an example. In this case the growth of GDP increases the demand for skills. This is the case when there is skill biased growth. Again, it is impossible that there are no relations. Equally it is impossible that there is one-way causality as GDP growth causes a demand for skill which is caused by newer technologies which again should increase the GDP growth. Therefore the only option is two-way causality. This situation can be seen in Japan in 1874-1952 where educational development and economic growth went hand in hand.

7 CONCLUSION

The growth and convergence of economies can only be studied in the long run. The creation of markets, the diffusion of technologies, and government policies all have their long run effects. In the new growth theory the long-run growth rate depends on the institutional structure, labour, and the possibility to innovate or adapt new technologies. The first aspect is studied by Acemoglu *et al* (2002) but because the latter two aspects are neglected, their estimates seem to suffer from an omitted variable bias. Both this estimation and the new growth theory thus indicate the importance of the skill premium as explanatory variable in long-run growth and convergence across economies. If we look at

the relation between the skill premium and per capita GDP growth we obtain a positive coefficient for Japan and a negative one for India and Indonesia be it that the coefficient for India is insignificant. This corresponds with the finding in section 3 where there is an absence of a relation between education and the skill premium for India. The positive coefficient points to the Kuznets hypothesis, which says that an increase in growth causes a larger demand of skills. In this case it is necessary that the skill premium and GDP growth influence each other mutually. A negative coefficient points to the Williamson thesis that during economic growth more investments are made in education and thus a decrease in the skill premium takes place. This means that either the skill premium influences GDP growth (technology is skill neutral) or that the GDP growth influences the skill premium (technology focuses on unskilled labour).

Within this framework several periods can be subdivided in India, Indonesia, and Japan. Somewhat generalized these periods are 1800-1850, 1850-1950, and 1950-2000. In section 3 to 5 we looked briefly at the important factors influencing the skill premium and thus the adoption and innovation of new technologies in these periods. Important factors were a balance between artisan and factory industries, the relation between industry and agriculture, and especially important was the availability of a skilled labour force. These factors increased in importance at the end of the eighteenth and start of the nineteenth century with a rise in wage labour. However, this did only in Japan cause a lower skill premium because the egalitarian distribution of artisan production between city and countryside. Other aspects were the relatively high purchasing power, lower taxes on non-agricultural production, and a better skilled labour force. This point to the situation that Japan in this period probably experienced skill biased growth. This is contrary to Indonesia, the only country where a causality test was performed for this period, which showed no relations. This is not surprising as the situation was totally different in India and Indonesia where the purchasing power was lower. Furthermore there was a drain from agriculture to the city of on the one hand labour (especially in Indonesia) and on the other hand products that were manufactured in the cities. The latter was more the case in India than in Indonesia.

With the increase in wage labour and technologies, education also became more important. In Japan there already existed a relatively well trained labour force. Furthermore, the Japanese education continued relatively undisturbed even after the Meiji Restoration reaching a high enrollment level and a high literacy rate which is argued to be necessary to industrialize (Anderson and Bowman (1976); Barro (1990)). Moreover, this educated labour could be used in both the artisan and factory industries causing innovation and increased productivity in both sectors which remained side by side. These aspects caused skill biased growth. In India and Indonesia the, already from the late eighteenth century declining indigenous education, was replaced in the nineteenth century by a European education system. As a consequence enrollment in the nineteenth century was relatively low. Furthermore, even when indigenous children finished European education they rarely came to work in the indigenous economy and thus could not create a way for further economic and technological development of these, largely artisan, industries. This lack of a relation between education and the skill premium was confirmed by the findings from table 2 and 3. As a consequence, in India this was manifested by an absence of relations between the skill premium and GDP growth. In Indonesia, however, the GDP growth did influence the skill premium, pointing to extensive growth. This was largely caused by an increase in the indigenous, artisan industries such as *kretek* and batikking after 1900 while in India these industries experienced some decline after 1920.

After 1950 the situation worsened, especially for India. Both India and Indonesia no longer had a relation between the skill premium and GDP growth. For India this was largely caused by a lack of educated labour and the focus on the basic and capital good industry while the artisan industries which provided work to a fairly large proportion of unskilled labour was not stimulated. Although education in Indonesia grew stronger than in India, the relation of education and skill premium with the labour market was also absent. The situation that Indonesia did perform better than India was largely caused by its focus on both large scale and on artisan industries such as textiles, food, tobacco, and roof tiles. This was especially the case in the new Order period. Interesting is that, after 1950 Japan experienced skill neutral growth. This was caused by the equal development of artisan and factory industry, which was, in turn, partly due to the egalitarian distribution of the artisan industry between city and countryside. The situation that the modern sector (zaibatsu) only comprised of a

fairly small part of the economy made it more important to develop technologies to improve productivity in the lower skill artisan industries.

References

Acemoglu, Daron, 'Patterns of Skill Premia,' *Review of Economic Studies*, Vol. 70 (2003), 199-230.

Acemoglu, Daron, Simon Johnson, and James Robinson, 'Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution,' *Quarterly Journal of Economics*, Vol. 117 (2002), 1231-1294.

Acemoglu, Daron, Simon Johnson, and James Robinson, 'The Colonial Origins of Comparative Development: An Empirical Investigation,' *American Economic Review*, Vol. 91 (2001), 1369-1401.

Acemoglu, Daron, 'Why Do New Technologies Complement Skills? Directed Technical Change and Wage Inequality,' *The Quarterly Journal of Economics*, 113 (4) 1998, 1055-1089.

Aghion, Philippe, Eve Caroli, and Cecilia Garcia-Penalosa, 'Inequality and Economic growth: The Perspective of the New Growth Theories,' *Journal of Economic Literature*, Vol. 37 (4) 1999, 1615-1660.

Agrawal, A.N., and Hari Om Varma (eds.), *Indian Economy: Statistical Yearbook 1998*, New Delhi: National Publishing House 1998.

Aldcroft, Derek H., 'Education and Development: The experience of the Four Little Tigers,' A.J.H. Latham and Heita Kawakatsu (eds.), *Asia Pacific Dynamism 1550-2000*, London and New York: Routledge 2000, 169-183.

Anderson, C.A., and M.J. Bowman, 'Education and Economic Modernization in historical perspective,' L. Stone (ed.), *Schooling and Society: Studies in the History of Education*, Baltimore: The John Hopkins University Press 1976, 3-19.

Archer, Margaret S., *Social Origins of Educational Systems*, London, Beverly Hills, New Delhi: Sage publications 1984.

Atkinson, Edwin F.T., *Statistical, descriptive and historical account of the North-Western Provinces of India*, Edwin F.T. Atkinson (ed.), 14 Vols., Vol. II: Meerut division (Sahranpur and Aligarh districts), Allahabad 1875.

Atkinson, Edwin F.T., *Statistical, descriptive and historical account of the North-Western Provinces of India*, Edwin F.T. Atkinson (ed.), 14 Vols., Vol. III: Meerut division (Meerut, Bulandshahr, and Muzaffarnagar districts), Allahabad 1876.

Badan Pusat Statistik, *Statistik Indonesia* (Statistical Year Book of Indonesia), Jakarta: Badan Pusat Statistik 2001.

Barro, Robert J. and Xavier Sala-i-Martin, *Economic Growth*, Cambridge: The MIT Press 2004.

Barro, Robert J., 'Economic Growth in a Cross Section of Countries,' *The Quarterly Journal of Economics*, Vol. 106 (2) 1991, 407-443.

Barro, Robert J. and Jong-Wha Lee, "International Data on Educational Attainment: Updates and Implications," manuscript, Harvard University, February 2000.

Barro, Robert, and Jong-Wha lee, 'Losers and Winners in Economic Growth,' *Proceedings of the Annual World Bank Conference on Development Economics, 1993*, 1994, 267-296.

Benavot, Aaron and Phyllis Riddle, 'The Expansion of Primary Education, 1870-1940: Trends and Issues,' *Sociology of Education*, Vol. 61 (3) (1988), 191-210.

Biro Pusat Statistik, *Statistical pocketbook Indonesia*, 1974/1975, Jakarta: Biro Pusat Statistik 1976.

Boomgaard, P. and A.J. Gooszen, *Changing Economy in Indonesia*, Vol. 11: Population Trends 1795-1942, Amsterdam: Royal Tropical Institute 1991.

Booth, Anne, *The Indonesian Economy in the Nineteenth and Twentieth Centuries: A History of Missed Opportunities*, London [etc.]: Macmillan [etc.] 1998.

Boucherie, W., 'The Textile Industry,' *Bulletin of Indonesian Economic Studies*, Vol. 5 (3) 1969, 47-70.

Brahmananda, P.R., *Money, Income, Prices in 19th Century India. A historical, Quantitative and Theoretical Study*, Mumbay etc.: Himalaya Publishing House 2001.

Buchanana, Daniel H., 'The Rural Economy of Japan,' *The Quarterly Journal of Economics*, Vol. 37 (4) 1923, 545-578.

Bureau of Statistics, Office of the Prime Minister, *Japan Statistical Yearbook*, Tokyo: Japan Statistical Association (etc.), 1987-1997.

Caldarola, Carlo, 'Socio-Economic Dualism in Japan,' *Monumenta Nipponica*, Vol. 20 (3/4) 1965, 359-373.

Campbell, James M. (ed.), *Gazetteer of the Bombay Presidency, Vol. XI: Kolaba and Janjira*, Bombay: Government Central Press 1883.

Castles, Lance, 'Cloves and Kretek,' *Bulletin of Indonesian Economic Studies*, Vol. 1 (2) 1965, 49-59.

Chandra, Siddharth and Timothy J. Vogelsang, 'Change and Involution in Sugar Production in Cultivation-System Java, 1840-1870,' *The Journal of Economic History*, 59 (4) 1999, 885-911.

Chaudhuri, K.N., 'Foreign Trade and Balance of Payments,' in: Dharma Kumar (ed.), *The Cambridge Economic History of India*, Vol II, *c. 1757-c. 1970*, Cambridge 1983.
Chenery, Hollis B., Shuntaro Shishido, and Tsunehiko Watanabe, 'The Pattern of Japanese Growth, 1914-1954' *Econometrica*, Vol. 30 (1) 1962, 98-139.
Choudhuri, A., and C.H. Kirkpatrick, 'Human resources, factor intensity and comparative advantage of ASEAN,' *Journal of Economic Studies*, Vol. 17 (6) 1990.
Collier, Paul, and Jan Willem Gunning, 'Explaining African Economic Performance,' *Journal of Economic Literature*, Vol. 37 (1) 1999, 64-111.
De Kat Angelino, P., *Batikrapport, Deel III: Oost*-Java, Publicaties Kantoor van der Arbeid 8, Batavia 1931.
De Kat Angelino, P., *Rapport betreffende eene gehouden enquete naar de arbeidstoestanden in de batikkerijen op Java en Madoera:, West-Java*, Publicaties Kantoor van der Arbeid 6, Weltevreden: Landsdrukkerij 1930.
De Kat Angelino, P., *Some Remarks on the Wages Paid in the Netherlands Indies*, Batavia: International Research Series; Report B, National Council for the Netherlands and the Netherlands Indies of the Institute of Pacific Relations 1936.
Dick, Howard, Vincent J.H. Houben, J. Thomas Lindblad and Thee Kian Wie, *The Emergence of a National Economy: An Economic History of Indonesia, 1800-2000*, Leiden: KITLV Press 2002.
Dore, R.P., *Education in Tokugawa Japan*, London: Routledge & Kegan Paul 1965.
Dros, Nico, *Changing Economy in Indonesia*, Vol. 13: Wages 1820-1940, Amsterdam: Royal Tropical Institute 1992.
Easterly, William, and Ross Levine, 'Africa's Growth Tragedy: Policies and Ethnic Divisions,' *Quarterly Journal of Economics*, 112 (4) 1997, 1203-1250.
Eng, Pierre van der, *Agricultural Growth in Indonesia: Productivity Change and Policy Impact since 1880*, Basingstroke [etc]: MacMillan Press Ltd 1996.
Eng, Pierre van der, 'Indonesia's Growth Performance in the Twentieth Century,' Angus Maddison, D.S. Prasada Rao, and William F. Shepherd (eds.), *The Asian Economies in the Twentieth Century*, Cheltenham: Edward Elgar 2002, 143-179.
Freeman, Richard B., and Remco Oostendorp, NBER Working Paper #8058, Occupational Wages around the World Data File, *International Labour Review*, 2001, no. 4.
Frykenberg, Robert Eric, 'Modern Education in South India, 1784-1854: Its Roots and Its Role as a Vehicle of Integration under Company Raj,' *The American Historical Review*, Vol. 91 (1) 1986, 37-65.
Gleditsch, Kristian Skrede. 2003. Modified Polity P4 and P4D Data, Version 1.0., URL: http://weber.ucsd.edu/~kgledits/Polity.html.
Goldin, Claudia and Lawrence F. Katz, 'The Origins of Technology-Skill Complementarity', The *Quarterly Journal of Economics*, 113 (3) 1998, 693-732.
Goldsmith, Raymond W., *The Financial Development of India, 1860-1977*, New Haven and London: Yale University Press 1983.
Gosh, Suresh Chandra, *The History of Education in Modern India, 1757-1998*, New Delhi: Orient Longman 2000.
Granger, C.W.J. 'Investigating Causal Relations by Econometric Models and Cross-spectral Methods,' *Econometrica*, Vol. 37 (3) 1969, 424-438.
Gujarati, Damodar N., *Basic Econometrics*, Boston [etc.]: McGraw Hill 2003.
Hanley, Susan B., 'A High Standard of Living in Nineteenth-Century Japan: Fact or Fantasy?,' *The Journal of Economic History*, Vol. 43 (1) 1983, 183-192.
Hill, Hal, 'Indonesia's Industrial Transformation: Part I,' *Bulletin of Indonesian Economic Studies*, Vol. 26 (2) 1990, 79-120.
Hill, Hal, 'The Economics of Recent Changes in the Weaving Industry,' *Bulletin of Indonesian Economic Studies*, Vol. 16 (2) 1980, 83-103.
Hollandsch-Inlandsch onderwijs-commissie, *De werkgelegenheid in Nederlandsch-Indie voor Nederlandsch sprekenden*, (Rapport 6a) Weltevreden: Landsdrukkerij 1930.
Hollandsch-Inlandsch onderwijs-commissie, *De werkgelegenheid in Nederlandsch-Indie voor Nederlandsch sprekenden: Enquete burgerlijke landsdienst*, (Rapport 6) Weltevreden: Landsdrukkerij 1930.
Hoofdcomissie van onderwijs, *Verslag van den staat van het schoolwezen in Nederlandsch-Indie*, Batavia: Landsdrukkerij 1856.
Huber, J. Richard, 'Effect on Prices of Japan's Entry into World Commerce after 1858,' *The Journal of Political Economy*, Vol. 79 (3) 1971, 614-628.
International labour Office, *Bulletin of Labour Statistics*, 1965-…, Geneva: ILO various issues.
International labour Office, *International Labour Review*, 1921-…, Geneva: ILO various issues.
Ishiwata, Shigeru, 'Estimating Gross Value Added in Indonesian Manufacturing Industries, 1917-1940,' *Discussion Paper Series No 27*, Hitotsubashi University Research Unit for Statistical Analysis in Social

Sciences 2004.
James, John A. and Jonathan S. Skinner, 'The Resolution of the Labor-Scarcity Paradox,' *Journal of Economic History*, 45 (1985), 513-540.
Koloniaal Verslag (KV), various issues.
Korthals Altes, W.L., Changing Economy in Indonesia, Vol. 12a: General Trade Statistics, 1822-1940, Amsterdam: Royal Tropical Institute 1991.
Kroef, Justus M. van der, 'The Changing Class Structure of Indonesia,' *American Sociological Review*, Vol. 21 (2) 1956, 138-148.
Kuznets, Simon, 'Economic Growth and Income Inequality,' *The American Economic Review*, Vol. 45 (1) 1955, 1-28.
Lloyd-Ellis, Huw, 'Endogenous Technological Change and Wage Inequality,' *The American Economic Review*, Vol. 89 (1) 1999, 47-77.
Meyer Ranneft, Jan Willem, and W. Huender, *Onderzoek naar den belastingdruk op de Inlandsche bevolking*, Weltevreden 1926.
Ministry of Education, Science and Culture, *Japan's Modern Educational System*, White-paper: Ministry of Education, Science and Culture 1972.
Mohan Jawalia, Brij, *Socio-Economic Conditions in Rajasthan*, Jodhpur: Books Treasure 2002.
Mosk, Carl, *Japanese Industrial History: Technology, Urbanization, and Economic Growth*, Armonk and London: M.E. Sharpe 2001.
Mukerji, K. M. 'Trend in Real Wages in the Cotton Textile Industry in Ahmedabad from 1900 to 1951,' *Artha Vijnana*, Vol. 3 (2) 1961, 124-134.
Mukerji, K. M. 'Trend in Real Wages in Cotton Textile Mills in Bombay City and Islands, from 1900 to 1951,' *Artha Vijnana*, vol. 1 (1) 1959, 82-95.
Mukerji, K. M. 'Trends in Real Wages in the Jute Textile Industry from 1900 to 1951,' *Artha Vijnana*, Vol. 2 (1) 1960, 57-69.
Mukerji, K. M. 'Trend in Textile Mill Wages in Western India: 1900 to 1951,' *Artha Vijnana*, Vol. 4 (2) 1962, 156-166.
National Archive (N.A.), Ministerie van Koloniën Archive nr. 2.10.01, inv. 2972-2988.
National Archive, 'Statistieke aantekeningen', 2.10.36.012, inv. 870
National Confederation of Industrial Associations of Japan, *Industrial Relations in Japan: Characteristic measures for workers' welfare in silk and cotton mills*, Tokyo: National Confederation of Industrial Associations of Japan 1937.
Palmer, Ingrid and Lance Castles, 'The Textile Industry,' *Bulletin of Indonesian Economic Studies*, Vol. 1 (2) 1965, 34-48.
Rothermund, Dietmar, *An Economic History of India From Pre-Colonial Times to 1991*, London and New York: Routledge 1993.
Roy, Tirthankar, *Traditional Industry in the Economy of Colonial India*, Cambridge: Cambridge University Press 1999.
Royal Commission on Agriculture in India, *Report of the Royal Commission on Agriculture in* India, London: His Majesty's Stationary Office 1928.
Royal Commission on Labour in India, *Report of the Royal Commission on Labour in* India, London: His Majesty's Stationary Office 1931.
Royal Commission on Labour in India, *Evidence Submitted to the Royal Commission on Labour in India*, Vol. I-Part 1: Bombay Presidency (including Sind). Written Evidence, London: His Majesty's Stationary Office 1931.
Royal Commission on Labour in India, E*vidence Submitted to the Royal Commission on Labour in India, Vol. II-Part 2: Punjab, Delhi and Ajmer Merwara. Oral Evidence*, London: His Majesty's Stationary Office 1931.
Royal Commission on Labour in India, *Evidence Submitted to the Royal Commission on Labour in India, Vol. IV-Part 1:Bihar and Orissa with coalfields. Written Evidence*, London: His Majesty's Stationary Office 1931.
Royal Commission on Labour in India, *Evidence Submitted to the Royal Commission on Labour in India,* Vol. XI: Supplementary, London: His Majesty's Stationary Office 1931.
RoyChowdhury, Supriya, 'Political Economy of India's Textile Industry: The Case of Maharashtra, 1984-89,' *Pacific Affairs*, Vol. 68 (2) 1995, 231-250.
Saito, Osamu, "The Labor Market in Tokugawa Japan: Wage Differentials and the Real Wage Level, 1727-1830," *Explorations in Economic History*, Vol. 15, No. 1, 1978, pp. 84-100.
Saito, Osamu, 'Wages, inequality and pre-modern growth in Japan, 1727-1894,' *Manuscript for R.C. Allen, T. Bengtsson and M. Dribe (eds), New Evidence of Standard of Living in Pre-industrial Europeand Asia*, (forthcoming).

Sandee, Henry, Piet Rietveld, Hendrawan Supratikno, and Prapto Yuwono, 'Promoting Small Scale and Cottage Industries in Indonesia: An Impact Analysis for central java,' *Bulletin of Indonesian Economic Studies*, Vol. 30 (3) 1994, 115-142.

Sandee, Henry and Hermine Weijland, 'Rural Cottage Industry in Transition: The Roof Tile Industry in Kabupaten Boyolali, Central Java,' *Bulletin of Indonesian Economic Studies*, Vol. 25 (2) 1989, 79-98.

Sastry, Ch. Sitarama, 'The Economic Disintegration in the First Half of the Nineteenth century,' *Indian Journal of Economics*, Vol. 15 (4) 1935, 511-521.

Segers, W.A.I.M., *Changing Economy in Indonesia*, Vol 8: Manufacturing Industry 1870-1942, Amsterdam: Royal Tropical Institute 1987.

Smith, Thomas C., 'Farm Family By-employments in Preindustrial Japan,' *The Journal of Economic History*, Vol. 29 (4) 1969, 687-715.

Statistical Abstract Relating to British India, from 1840 to 1865, Vol. 1, London: George Eyre and William Spottiswoode.

Statistics Bureau, Management and Coordination Agency, Japan Statistical Association, *Historical Statistics of Japan*, *1868-1985,* Vol. 5: Economic Statistics, Statistics Bureau, Tokyo: Japan Statistical Association 1987.

Statistics Department, the Bank of Japan, *Hundred-year Statistics of the Japanese Economy*, Bank of Japan: 1966.

Sutherland, Heather, *The Making of a bureaucratic Elite: The Colonial Transformation of the Javanese Priyayi*, Singapore: Published for the Asian Studies Association of Australia by Heinemann Educational books (Asia) 1979.

Statistics Department, the Bank of Japan, *Hundred-year Statistics of the Japanese Economy*, Bank of Japan: 1966.

Stoikov, Vladimir, 'The Structure of Earnings in Japanese Manufacturing Industries: A Human-Capital Approach,' *The Journal of Political Economy*, Vol. 81 (2) 1973, 340-355.

Sykes, W.H., 'Statistics of the Educational Institutions of the East India Company in India,' *Journal of the Statistical Society of London*, Vol. 8 (2) 1845, 103-147.

Sykes, W.H., 'Statistics of the Educational Institutions of the East India Company in India,' *Journal of the Statistical Society of London*, Vol. 8 (3) 1845, 236-273.

UNESCO World Education Indicators, http://www.uis.unesco.org/statsen//statistics/indicators/i_pages/indic_2.htm

Vreede, A.G., *Rapport van het Hoofd van het Kantoor van Arbeid over de arbeidstoestanden in de metaalindustrie te Soerabaja*, Publicaties van het Kantoor van Arbeid; No. 1, Weltevreden: Landsdrukkerij 1926.

Walton, H.G., *Gazetteer of Dehra Dun*, New Delhi: Gayatri Offset Press 1911, reprinted 1995.

Williamson, Jeffrey G., 'Earnings Inequality in nineteenth-Century Britain,' *The Journal of Economic History*, Vol. 40 (3) 1980, 457-475.

Williamson, Jeffrey G., 'Globalization, factor prices and living standards in Asia before 1940,' A.J.H. Latham and Heita Kawakatsu (eds.), *Asia Pacific Dynamism 1550-2000*, London and New York: Routledge 2000, 13-45.

Williamson, Jeffrey G., 'Real Wages and Relative Factor Prices in the Third World 1820-1940: Asia,' *Harvard Institute of Economic Research Discussion Paper No. 1844*, Cambridge (Mass.): Harvard University 1998.

Wolcott, Susan, and Gregory Clark, 'Why Nations Fail: Managerial Decisions and Performance in Indian Cotton Textiles, 1890-1938,' *The Journal of Economic History*, Vol. 59 (2) 1999, 397-423.

Yamamura, Kozo, 'Toward a Reexamination of the Economic History of Tokugawa Japan, 1600-1867,' *The Journal of Economic History*, Vol. 33 (3) 1973, 509-546.

Zanden, Jan Luiten van, 'Economic Growth in Java 1815-1939. The reconstruction of the historical national accounts of a colonial economy,' paper 2002, Kuala Lumpur, unpublished.

Zanden, Jan Luiten van, 'Rich and Poor before the Industrial Revolution: a comparison between Java and the Netherlands at the beginning of the 19th century', *Explorations in Economic History*, 40 (1) 2003, 1-23.

Zanden, Jan Luiten van, 'The European skill premium in international comparative perspective,' Paper to be presented at the Utrecht Conference on Prices and Wages, 19-21 August 2004.

Appendix A: Wages and price Indices: Japan, India, Indonesia 1800-2000[101]

In this appendix we try to compose a rough series of the skilled and unskilled wages and the CPI for Japan, India, and Indonesia over the period of circa 1800-2000. In this initial effort to construct these series, we used largely published data which are often very crude. For example there are many other sources of data available which we did not consult. Furthermore, we focused on cash earnings, ignoring payments in kind. However, as far as possible the skilled wages are represented by carpenters, in some cases added with bricklayers or masons. These groups represent a stable workforce, which developed markedly between 1850 and 1950. The unskilled workers are generally represented by 'unskilled labour' or 'agricultural labour'. The table at the end of this appendix gives the real wages in 1913 prices and the consumer price indices. This makes it possible to also construct the nominal wages. Furthermore, it was decided not to use indices of wages because in this way it is possible, by using PPP's, to compare the level of wages, which might give an indication of the level of development and the skill premium across the three countries. The latter is done in appendix B.

Japan

The skilled wage for Japan is available from 1727 (Saito 1978 and 2003). Because in the East a gold base was used, as was the case after 1868 in entire Japan, while west Japan was based on silver, linking these indexes with the data after 1868 is problematical. Furthermore in the 1850s and 1860s there were several currency debasements. Therefore we opted to start the Japanese wages from 1870. The *skilled wage* for Japan for the period 1870-1880, the daily carpenter wages, came from the Bank of Japan (1966, table 16) and for the period 1882-1887; 1892; 1893-1939 from *Long-Term Economic Statistics (LTES)* (1967). The LTES series are identical to the series from the Bank of Japan only go further forward in time. Furthermore 1881 was linearly interpolated while for the period 1888-1891 we interpolated the 1887 and 1892 relations between the LTES data and the Edo Index from Saito (2003). This interpolated relation was multiplied with the Edo index for the inbetween years. Finally, estimating for 1892 and 1894 the relation with unskilled day labour, interpolating this relation, and multiplying it with the unskilled wage filled 1893. For the period 1940-1949 we used the *ILO Year Book of Labour Statistics*, wages in manufacturing. For 1950-1985 we used the wages from the *Historical Statistics of Japan* (1987). Finally for the period 1986-2000 we used the general carpenter wages from the Statistical Yearbooks of Japan.

The data for Japan for *unskilled workers* pose a problem. For 1865-1880 we took the ratio of unskilled and Chosi (Saito (2003) for 1865 and 1880 and interpolated these because Chosi was a gold region and thus much less likely to suffer because of currency debasements. The results were multiplied with the Chosi series for the years 1866-1879. For 1880; 1882-1887; 1892; 1894-1939 we used the figures of the *Bank of Japan* (1966). Just as for the skilled wage series, 1881 was linearly interpolated. The period 1888-1891 was obtained by taking the relation between the skilled and unskilled wages in 1887 and 1892 and then taking a linearly interpolation and multiplying it with the skilled wages. The year 1893 was obtained from the *Historical Statistics* (1987). Furthermore 1940-2000 was obtained from the *ILO Year Book of Labour Statistics*, the male agricultural day worker.

To arrive at a *CPI* for Japan we took the Edo index for 1870-1878 (Saito 2003). For 1879-1938; 1946-1947 and 1939-1944 (only Tokyo) the LTES (1967) was used. Only 1945 was linearly interpolated. From 1948 to 1969 we took the Historical Statistics of Japan (1987). From 1970 to 2000 we used the *ILO Year Book of Labour Statistics*.

India

The *skilled* and *unskilled wages* for India for 1951-1954; 1957-1958; 1967-2000 were taken from the *ILO Year Book of Labour Statistics* (1951-1958), the *International Labour Review* (1959-1961), and the *Bulletin of Labour Statistics* (1962-2001). These were, where possible, constructed as an average of bricklayers and carpenters in construction versus unskilled labour. For 1955-1956, and 1959-1966 we took for unskilled and skilled wages the relation with agricultural wages and manufacturing wages of the ILO respectively for 1954, 1957, 1958, and 1968. The relations were calculated with the wages in agriculture and manufacturing respectively, next these relations were interpolated, and finally

[101] Pierre van der Eng kindly supplied wage data for coolies on plantations for 1949-1994.

multiplied with the agricultural and manufacturing wages. For the period 1913; 1919-1946 we took the data of Sivasubramonian (1977). For both the skilled and unskilled wages we averaged of urban and rural areas. Again for the unskilled wage, we interpolated the relation with ILO agricultural wages for 1947-1950 and multiplied this interpolated relation with the agricultural wages. For the skilled wage we used the manufacturing wage in 1950, and the relation between the skilled wage from Sivasubramonian (1977) and ILO wages in manufacturing in 1946 multiplied with the ILO manufacturing wage in 1947 for the year 1947. For 1947 and 1950 we interpolated the relation between the wages in the jute textile industry (Mukerjee 1960) and the 1947 and 1950 skilled wage. Multiplying this interpolation with the jute textile industry wages gave the skilled wage for 1948 and 1949. For 1873-1912 the unskilled and skilled wages were obtained from the *Statistical Abstract of British India*, which draws from the *Prices and Wages in India* series. We only used the series mentioned in the *Statistical Abstract* that belong to present day India. The wages were for selected stations (i.e. cities) and were per State weighted by the inverse population of the city because in general there are higher wages in more populous cities while the countryside is far larger. Then the States were weighted for their population as in general middle India was somewhat more populous with higher wages. For 1800-1872 we used several sources, mainly gazetteers, historical memoirs and Divekar (1989b) to obtain unskilled and skilled wages for North, and Middle India. For South India not many figures were found yet but these wages seem to correspond to those in North India (see table

Table 1: Day wages

		1810	1830	1850	1871	1876
North India	coolies/labourers	0,11	0,08	0,09	0,14	0,14
	bricklayers	0,16	-	0,19	0,25	0,28
	carpenters	0,13	-	0,16	0,25	0,31
	Blacksmiths	-	-	0,13	0,19	0,31
Middle India	coolies/labourers	0,11	0,11	0,15	0,22	0,16
	bricklayers	0,31	0,31	0,43	0,66	0,66
	carpenters	0,31	0,31	0,43	0,66	0,66
	Blacksmiths	0,31	0,31	0,43	0,66	0,66
South India	coolies/labourers	-	-	0,05	0,10	0,13
	bricklayers	-	-	0,17	0,25	0,38
	carpenters	-	-	0,17	0,25	0,38
	Blacksmiths	-	-	0,17	0,25	0,38

Sources*:*
North India: 1810, 1830 and 1871 Meerut (Atkinson Vol III, p. 303), 1850 and 1871 Banda (Atkinson Vol. I, p. 119)
Middle India: Kolaba (Campbell, Vol. XI, p. 106-107), labour 1876 Khandesh (Campbell, Vol. XII, p. 200-201).
South India: Ganjam District (Leman 1882). Ganjam is in the extreme Northeast of the Madras Presidency, almost at the same latitude as Bombay. However as Middle India is defined as the line going northeast from Bombay to Calcutta, Ganjam falls under South India.

1). For unskilled labour, we chose mainly coolies, labourers and agricultural labourers, which exhibit the same trend. The same goes for skilled labour where we chose carpenters and bricklayers. These wage series were weighted for the population to obtain the all-India average.

The Indian *CPI* for 1949-2000 was obtained from the *ILO Year Book of Labour Statistics*. For 1961-1968 the cities of Jamshedpur, Bombay and Delhi were averaged to obtain one series. For 1969-2000 the average of the agricultural workers, industrial workers, and urban non-manual employees series was used. For 1900-1946; 1948, we used the index of Sivasubramonian (2000, p. 437). We obtained the 1947 number by calculating the relation of the Sivasubramonian index with the series of Roy (1996, p. 352) for 1946 and 1948. This relation was linearly interpolated and multiplied with the 1947 figure of Roy. For 1861-1899 we used the revised series from Brahmananda (2001, p. 123). This series strongly resembles the Government of India's series, but here some more consumer goods are

included.[102] To link the Sivasubramonian and the Brahmananda index we used the index from Williamson (1998). The Indian prices prior to 1863 were taken from gazetteers and from Divekar (1989a and b). Unfortunately there is a clear difference between South, Middle and North India in terms of the quantity of each good consumed, especially concerning rice and wheat that constitute a large share of cereals in the class 'food'. To identify this we took a survey of middle class government employees in 1948 to compare these parts of India (see table 2). Of course the goods consumed differed from those consumed by the lower classes and furthermore the income was higher than in 1860. However, because the data before 1860 relate largely to food items, this causes no problem.

Table 2 India percentage expenditure by groups

	North United Provinces	East/Middle Bengal & Assam excluding Calcutta	Middle Bombay Province excluding Bombay city	South Madras Province excluding Madras city
Food	38,7%	41,6%	39,8%	40,6%
Fuel & lighting	5,1%	4,7%	5,9%	5,2%
Clothing	9,7%	7,6%	10,3%	10,3%
Furniture and household requisites	2,4%	1,6%	2,0%	2,1%
Housing	6,2%	6,3%	7,4%	7,4%
Miscellaneous	37,9%	38,2%	34,6%	34,4%
Total	100,0%	100,0%	100,0%	100,0%

Interestingly the difference between the several 'food' categories in table 2 is not large. This changes somewhat if we look at the division of the category 'food' in table 3. The largest difference however, constitutes rice, which is in North India only 14.9% of total food consumption while in South India it is 39.2%. We constructed our CPI for the period 1800-1861 for South, Middle, and North India. To this end we took the available price series and classifying them by group of expenditure and (within

Table 3: India: percentage expenditure food groups

	North United Provinces	East/Middle Bengal & Assam excluding Calcutta	Middle Bombay Province Excluding Bombay city	South Madras Province excluding Madras city
Cereals	44,4%	47,7%	38,8%	43,2%
Pulses	13,0%	5,9%	11,1%	8,1%
Milk & fats	25,2%	24,0%	33,0%	37,0%
Vegetables	8,5%	9,5%	8,3%	4,0%
Condiments	2,0%	2,4%	2,1%	2,8%
Animal food	1,6%	5,7%	0,0%	0,0%
Miscellaneous	5,4%	4,8%	6,6%	4,9%
Total	100%	100%	100%	100%

the group 'food') by classes (cereals, pulses, etc.). Within each class we further subdivided when possible. For example cereals could be divided in rice, wheat, and other cereals. Each of these groups, classes and sub-classes was weighed on the basis of the *Survey of Middle Class Government Employees*. If products within a class were not available, it was assumed that the weights attached to those products were spread over the other products in the class concerned. The same method was used for the weighing of expenditure groups. As a consequence, if there is only one series for one group, then the product is assumed to be representative for the entire group. Equally, if no data are present for a group, the importance of the other groups is increased to 100% and the series thus created are linked (see table 4).

[102] Brahmananda 2001, p. 119.

Table 4: Construction of CPI India 1800-1880

		North India					*Middle India*			*South India*		
		1800-1822	1822-1823; 1846-1867	1823-1846	1867-1872	1872-1880	1800-1830	1830-1859	1859-1876	1800-1857	1857-1858	1858-1876
food	Cereals	100,0%	49,3%	42,8%	49,3%	77,3%	42,4%	45,6%	74,7%	84,2%	43,3%	39,9%
	Pulses	-	14,4%	12,5%	14,4%	22,7%	12,1%	13,1%	21,3%	15,8%	8,1%	7,5%
	Milk & fats	-	28,0%	24,3%	28,0%	-	36,0%	38,8%		-	37,1%	34,2%
	Vegetables	-	-	-	-	-	-	-		-	-	
	Condiments	-	2,2%	1,9%	2,2%	-	2,3%	2,5%	4,0%	-	-	2,6%
	Animal food	-	-	1,5%	-	-	-	-		-	-	
	Miscellaneous	-	6,0%	5,2%	6,0%	-	7,2%	-		-	-	4,5%
	Total	100,0%	100,0%	88,4%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	88,6%	88,7%
Fuel and lighting		-	-	11,6%	-	-	-	-		-	11,4%	11,4%
Total		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Number of products		2	9	13	8	3	8	7	5	3	5	7

Indonesia

The *wages* for Indonesia for 1819-1880 came from the government. As from 1870-1917, there are data on the yearly wages of Indonesian writers and 'oppassers' (guards) in the Dutch colonial service. Both wage series remained constant except for two increases in 1874 and 1900 of the wage of Indonesian writers. In 1870 the yearly wage of the Indonesian writer was about fl 244 while that of the 'oppasser' remained constant over the entire period at fl 120. Interestingly there are data about these wages in the period 1819-1830 (NA, Ministerie van Koloniën 2.10.01, inv. 2972-2988). These seem to be almost identical to the wages in 1870, being monthly fl 10 for 'oppassers' and around fl 300 for an Indonesian writer per year. It is very unlikely that any important changes in the wages have taken place between 1830 and 1870. We therefore assume that the wages remained constant at these rates. This corresponds to a rate of 34 cents a day for unskilled and 83 cents for skilled labour. We can compare this with some other available figures for 1820-1860 (CEI 13, table 1, 3.25.1, 5.2, Van Zanden (2003)). Although the data used is very rough, table 5 does provide an indication that, although there might be some fluctuations in the nominal wage of skilled and unskilled labour, these are not significant between 1820 and 1870. The data that Van Zanden (2003) uses, indicate an upward

Table 5: Nominal wages

	Unskilled			Skilled	
	Koloniaal Verslag/ National Archive*	CEI	Van Zanden	Koloniaal Verslag/ National Archive**	CEI
1820	fl 0,34	fl 0,27		fl 0,83	fl 0,73
1824-29	fl 0,34		fl 0,23	fl 0,83	
1855	fl 0,34	fl 0.20	fl 0,33	fl 0,83	fl 0,62
1860	fl 0,34	fl 0,25		fl 0,83	fl 0.73
1870	fl 0,34	fl 0.33	fl 0,45	fl 0,83	
1875	fl 0,34	fl 0,34		fl 0,83	fl 0,83
1880	fl 0,35	fl 0,35		fl 0,89	fl 0,89

* 'oppassers'
** Indonesian writers
CEI table 1, 3.1, 3.2, 4.2, 5.2, 5.4.
Van Zanden (2003)

movement in wages in the private sector. However, wage labour was especially important in the government sector due to 'forced labour' during the Cultivation System. Van Zanden (2003) however, does stress the high wages of skilled labour in the more skill intensive industries. This corresponds with the skill premium of around 100% that we find.

From 1875-1915 we took the data from craftsmen and coolies at Java (CEI 13, table 5.4). These data are given per residency per year. For each year for both craftsmen and coolies we took the logarithmic average of all residencies as in general wages have a logarithmic distribution. For both skilled and unskilled labour, the figure for 1896 was interpolated per residency and afterwards averaged just as indicated before. From 1921 to 1940 the data were obtained for unskilled labour from the logarithmic average of workers at a sugar plantation (CEI 13, table 9.1, regular workers). For skilled labour the data were obtained from log average of a factory foreman, canefield overseers, and fieldguards (seasonal, CEI 13, table 9.1). The years 1916-1920 were obtained by using the logarithmic average of the wages of male and female labourers in the sugar industry (CEI 13, table 9.2) to interpolate these years.

The wage data for 1940-1950 are very scanty. Data until 1942 were available, but from 1942-1948 we entirely have to rely on sporadic accounts. An interesting source is formed by notes 12 and 13 about increase in prices and expenditure from Europeans outside the Japanese camps respectively (*Rijksinstituut voor Oorlogsdocumentatie* (014614-014637)). The expenditure of Europeans was based on 014614-014625, which was a note from the Centraal Kantoor voor de Statistiek in which fifteen households were asked in August/September 1946 to give an overview (by memory) of the costs of living during 1942-1945. Some results are given in table 6. It seems that the nominal wages remained

Table 6: Expenditure and wages 1942-1945

	European*		Indonesian			
	Expenditure		Expenditure (per household)		Day Wages	
	Total per month	% on food	Total per month	% on food	Unskilled	Skilled
1942	fl 25.88	62.54%	fl 5.71	53,07%	fl 0.20**	fl 0.45
1943	fl 24.21	74.83%				
1944	fl 36.17	83.01%			fl 0.44	
1945	fl 50.71	86.18%			fl 0.45	fl 0.65

* Of those whose 1942 income was fl50-fl200.
** minimum wage
Rijksinstituut voor Oorlogsdocumentatie (Nr. 014619-014623)
Sato (1994), p. 96, 167, 169

relatively constant during the War. Only after 1943 the Japanese decided to make the wages higher for the romusha (forced Indonesian labour (Sato 1994, p. 1670)). Nevertheless it is clear that as the normal wages remained more or less constant and there was an increasing inflation as from 1943, these wages became less important in providing for total expenditure. Agricultural labour and trade became more important as was the selling of possessions (clothes, jewellery etc.) for Europeans (*Rijksinstituut voor Oorlogsdocumentatie* (014628)). All in all the nominal unskilled wages seem to have doubled during the occupation (Sato 2000, p. 18 note 41).

The unskilled wage were plantation wages supplied by Van der Eng 1949-1994 added with Estate wages for 1995 (Wage trend of Estate Workers 1993-1995). The data for 1943 and 1944 came from Sato (1994) while the nominal unskilled wages were assumed to be constant during 1941-1943. The skilled wage for 1945 also came from Sato (1994) while the years 1941-1944 were assumed to be constant. The skilled wages directly after the occupation are scanty, partially because of the two 'police actions' of the Dutch. From 1952-1957 and 1959 it are wages in mining. 1958 were wages in the metallurgical industry (Bank Indonesia 1954-1960). For 1960 and 1961 the wages came from metal manufacturing (Statistical pocketbook). For 1963 the skilled wage was bricklayers (International Labour Review 1964). For 1969, 1970, 1972, 1981-1984 the data came from the ILO Bulletin. The years 1985-1989 were farm supervisors and 1991-1992 gas supervisors (ILO bulletin). As from 1995-2000 the data were manufacturing wages from the ILO (LABORSTA). The remaining years were interpolated where 1964-1968, 1970-1971, and 1973-1978 were obtained by calculating the ratio with unskilled labour for the year before and after the gap, interpolating the ratio, and finally multiplying this ratio with the unskilled wage.

To arrive at the CPI we took the CPI from Van der Eng (2002) for 1900-1941; 1949-1983. The data for 1942-1945 were filled with *Rijksinstituut voor Oorlogsdocumentatie* 014623, while 1945-1948 was interpolated. As from 1984-2000 the data were obtained from LABORSTA. For 1827-1855 and 1863-1873 there ware data on rice and some other products as coconut oil, beef, and firewood (CEI 15, table 3A). Assuming a ratio with 10% firewood, 10% beef, 10% cooking oil, and 70% rice we calculated the index number for this period. For the years 1856-1862, 1874-1899, and before 1827 we used rice prices. This constitutes no problem as rice was by far the largest consumer good.

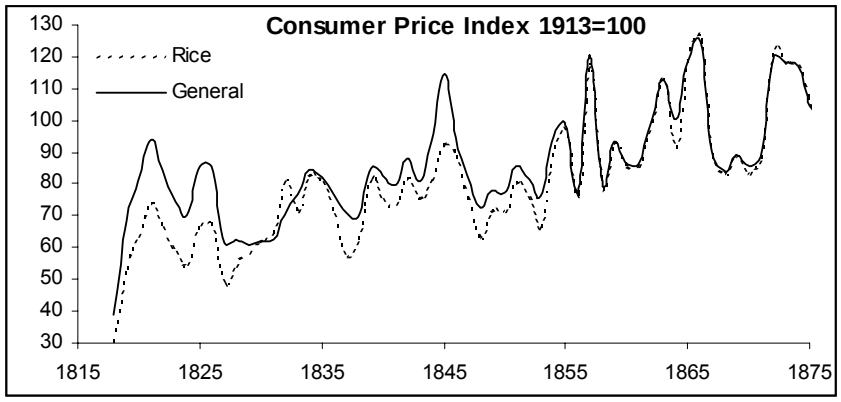


Figure 1

Furthermore it had a low price elasticity and therefore there is not much difference between rice index and general index (see figure 1). Therefore we can use rice to link these series.

Real 1913 Day wages and prices

	Japan			India			Indonesia		
	Unskilled wage 1913 Yen	Skilled wage 1913 Yen	CPI Index 1913=100	Unskilled wage 1913 Rupee	Skilled wage 1913 Rupee	CPI Index 1913=100	Unskilled wage 1913 Guilder/rupiah	Skilled wage 1913 Guilder/rupiah	CPI Index 1913=100
1800				0,24	0,43	43,93			
1801				0,27	0,49	39,40			73,46
1802				0,21	0,38	51,05			
1803				0,19	0,35	57,59			
1804				0,13	0,23	86,50			
1805				0,18	0,33	61,71			
1806				0,20	0,37	56,83			
1807				0,24	0,43	49,24			
1808				0,29	0,52	41,32			44,79
1809				0,34	0,62	35,58			
1810				0,28	0,51	43,67			
1811				0,27	0,50	45,36			81,83
1812				0,25	0,48	48,62			
1813				0,23	0,46	51,47			
1814				0,25	0,52	46,37			
1815				0,29	0,63	38,92			45,25
1816				0,28	0,61	40,78			
1817				0,26	0,56	44,38			
1818				0,26	0,57	44,18			38,67
1819				0,27	0,60	42,01	0,50	1,21	68,49
1820				0,24	0,53	48,07	0,43	1,02	80,98
1821				0,27	0,60	42,61	0,37	0,88	94,07
1822				0,31	0,69	37,49	0,41	0,98	84,31
1823				0,30	0,69	37,69	0,46	1,11	74,56
1824				0,23	0,54	48,37	0,49	1,19	69,95
1825				0,25	0,60	44,52	0,40	0,97	85,71
1826				0,27	0,66	40,26	0,40	0,97	85,71
1827				0,30	0,77	35,17	0,56	1,35	61,46
1828				0,33	0,85	32,08	0,55	1,32	62,75
1829				0,32	0,82	33,25	0,57	1,37	60,76
1830				0,35	0,91	30,20	0,55	1,33	62,22
1831				0,46	1,22	22,75	0,55	1,33	62,40
1832				0,39	1,06	26,43	0,49	1,19	69,99
1833				0,33	0,90	31,54	0,45	1,08	76,98
1834				0,37	1,02	27,85	0,41	0,99	84,14
1835				0,39	1,09	26,34	0,42	1,01	81,81
1836				0,42	1,20	24,03	0,45	1,08	76,97
1837				0,36	1,05	27,70	0,49	1,17	70,95
1838				0,29	0,86	34,10	0,50	1,19	69,58
1839				0,33	0,98	30,20	0,41	0,98	84,79
1840				0,40	1,21	24,73	0,42	1,00	82,82
1841				0,39	1,18	25,53	0,43	1,04	79,71
1842				0,38	1,16	26,01	0,39	0,94	87,80
1843				0,39	1,20	25,39	0,43	1,03	80,79
1844				0,33	1,03	29,78	0,37	0,89	93,07
1845				0,32	1,00	30,97	0,30	0,72	114,85
1846				0,33	1,03	30,14	0,37	0,88	94,38
1847				0,34	1,08	28,75	0,42	1,01	82,50
1848				0,31	0,98	31,96	0,48	1,14	72,54
1849				0,29	0,93	33,63	0,44	1,07	77,70

1850				0,38	1,02	30,49	0,45	1,07	77,37
1851				0,36	0,96	32,54	0,40	0,97	85,81
1852				0,42	1,10	28,52	0,42	1,01	81,76
1853				0,42	1,06	29,49	0,45	1,09	76,01
1854				0,35	0,87	36,00	0,36	0,87	94,81
1855				0,33	0,80	39,03	0,35	0,83	99,46
1856				0,38	0,88	35,51	0,44	1,07	77,63
1857				0,36	0,82	38,23	0,29	0,69	120,30
1858				0,38	0,86	37,28	0,43	1,04	79,47
1859				0,35	0,77	41,35	0,37	0,89	93,58
1860				0,30	0,92	48,19	0,40	0,96	86,43
1861				0,30	0,90	50,04	0,40	0,96	86,16
1862				0,31	0,92	49,43	0,34	0,83	100,10
1863				0,26	0,73	62,11	0,31	0,73	112,96
1864				0,20	0,56	81,16	0,34	0,83	100,40
1865				0,23	0,57	81,35	0,29	0,70	118,09
1866				0,24	0,58	81,88	0,28	0,66	124,89
1867				0,27	0,64	74,14	0,38	0,92	90,52
1868				0,30	0,72	66,06	0,41	0,99	84,00
1869				0,29	0,70	68,12	0,39	0,93	89,04
1870	0,47	1,04	47,86	0,28	0,70	68,99	0,40	0,97	85,58
1871	0,51	1,25	40,14	0,34	0,86	56,55	0,39	0,94	88,33
1872	0,66	1,70	29,34	0,31	0,77	62,65	0,29	0,69	119,84
1873	1,21	1,41	29,78	0,32	0,76	65,07	0,29	0,70	118,30
1874	0,97	1,13	34,61	0,28	0,70	71,84	0,29	0,71	117,20
1875	0,80	1,10	38,20	0,33	0,80	63,25	0,33	0,80	104,30
1876	0,92	1,35	31,97	0,36	0,83	62,87	0,34	0,82	101,50
1877	0,83	1,30	32,99	0,28	0,64	81,22	0,31	0,83	105,80
1878	0,67	1,11	36,93	0,24	0,57	87,29	0,26	0,69	128,60
1879	0,44	0,83	49,23	0,26	0,61	79,93	0,31	0,77	112,90
1880	0,37	0,55	56,40	0,29	0,72	69,58	0,30	0,78	114,30
1881	0,35	0,52	62,13	0,33	0,81	62,97	0,30	0,78	112,90
1882	0,38	0,57	57,82	0,37	0,81	61,59	0,36	0,90	107,20
1883	0,38	0,56	49,68	0,36	0,82	62,14	0,39	1,04	97,20
1884	0,37	0,48	48,06	0,36	0,79	66,08	0,49	1,22	75,80
1885	0,33	0,48	48,08	0,37	0,85	65,33	0,50	1,31	70,10
1886	0,35	0,54	42,40	0,40	0,90	63,30	0,45	1,28	70,10
1887	0,35	0,49	45,09	0,40	0,88	64,80	0,44	1,25	67,10
1888	0,37	0,52	44,32	0,38	0,78	69,52	0,43	1,28	67,10
1889	0,37	0,51	46,93	0,36	0,76	73,75	0,47	1,16	67,10
1890	0,36	0,49	50,04	0,36	0,73	73,45	0,38	1,01	75,90
1891	0,39	0,54	47,94	0,35	0,76	74,69	0,38	0,98	77,40
1892	0,40	0,60	44,70	0,33	0,69	81,93	0,35	0,85	89,00
1893	0,46	0,68	45,24	0,33	0,68	81,09	0,39	0,98	77,40
1894	0,45	0,64	46,68	0,36	0,72	77,38	0,42	1,14	71,50
1895	0,43	0,63	51,09	0,36	0,73	76,16	0,45	1,25	64,20
1896	0,46	0,68	56,22	0,31	0,66	82,47	0,44	1,22	65,70
1897	0,46	0,70	62,64	0,27	0,57	98,66	0,31	0,87	92,00
1898	0,49	0,69	67,94	0,33	0,69	79,62	0,37	1,10	74,40
1899	0,53	0,80	64,11	0,39	0,75	70,70	0,39	1,17	70,10
1900	0,51	0,75	72,03	0,31	0,64	84,81	0,37	1,15	70,03
1901	0,55	0,84	70,46	0,30	0,66	84,45	0,32	0,95	86,87
1902	0,53	0,79	73,19	0,34	0,72	83,04	0,34	1,03	80,47
1903	0,52	0,77	76,85	0,37	0,74	79,51	0,30	0,78	84,18

1904	0,51	0,75	78,63	0,38	0,76	77,39	0,34	0,91	75,42
1905	0,50	0,73	81,66	0,33	0,77	86,22	0,36	0,97	72,73
1906	0,50	0,78	83,27	0,34	0,77	87,99	0,33	0,91	77,10
1907	0,53	0,82	91,98	0,34	0,76	92,23	0,31	0,77	87,21
1908	0,60	0,91	88,81	0,30	0,71	103,89	0,29	0,75	91,92
1909	0,61	0,94	85,36	0,32	0,78	95,41	0,31	0,80	86,20
1910	0,62	0,93	85,58	0,34	0,84	91,87	0,32	0,83	86,20
1911	0,61	0,90	91,96	0,36	0,84	88,34	0,30	0,76	94,95
1912	0,60	0,90	97,06	0,30	0,80	93,99	0,26	0,67	109,43
1913	0,59	0,88	100,00	0,33	0,73	100,00	0,30	0,74	100,00
1914	0,61	0,93	92,12	0,31	0,72	100,35	0,32	0,85	96,97
1915	0,64	0,97	86,22	0,29	0,69	106,36	0,34	0,86	94,95
1916	0,61	0,91	93,15	0,34	0,76	102,47	0,33	0,72	102,36
1917	0,61	0,84	114,27	0,35	0,76	104,59	0,30	0,66	109,43
1918	0,62	1,20	153,81	0,33	0,69	119,43	0,25	0,55	140,07
1919	0,70	0,90	204,64	0,27	0,61	165,72	0,27	0,58	140,40
1920	0,94	1,22	214,06	0,29	0,66	170,67	0,21	0,43	228,28
1921	1,01	1,35	196,17	0,31	0,74	168,20	0,27	0,55	191,58
1922	1,13	1,51	193,19	0,37	0,87	157,24	0,27	0,60	166,67
1923	1,13	1,56	191,45	0,42	0,99	142,76	0,28	0,60	149,16
1924	1,12	1,60	193,16	0,44	1,03	140,99	0,30	0,64	137,37
1925	1,09	1,52	195,50	0,44	1,06	147,70	0,31	0,67	130,98
1926	1,10	1,56	186,63	0,42	1,03	150,53	0,31	0,67	130,64
1927	1,08	1,58	183,77	0,46	1,14	145,58	0,32	0,70	126,26
1928	1,12	1,61	176,79	0,46	1,17	143,11	0,33	0,72	123,91
1929	1,12	1,61	172,74	0,49	1,21	137,81	0,34	0,72	123,23
1930	1,24	1,60	155,19	0,56	1,42	113,43	0,34	0,73	120,20
1931	1,02	1,56	137,30	0,55	1,45	98,59	0,37	0,83	107,41
1932	0,94	1,43	138,83	0,56	1,49	92,58	0,37	0,91	89,90
1933	0,89	1,31	143,07	0,56	1,56	86,57	0,35	0,99	79,46
1934	0,90	1,32	145,09	0,52	1,51	88,69	0,33	1,01	73,06
1935	0,89	1,30	148,68	0,44	1,78	93,64	0,33	0,90	70,03
1936	0,87	1,31	152,12	0,43	1,25	91,52	0,32	0,87	67,68
1937	0,87	1,34	163,99	0,39	1,22	93,29	0,31	0,78	72,39
1938	0,88	1,31	179,73	0,41	1,25	91,17	0,34	0,78	74,07
1939	0,98	1,33	200,97	0,38	1,16	96,47	0,26	0,60	96,30
1940	0,89	1,18	233,65	0,35	1,12	98,23	0,33	0,72	77,44
1941	0,98	1,28	236,92	0,35	0,99	111,31	0,29	0,65	85,52
1942	1,14	1,35	243,45	0,27	0,75	150,88	0,20	0,46	122,22
1943	1,44	1,45	258,16	0,23	0,51	265,72	0,22	0,49	114,35
1944	1,69	1,34	349,27	0,36	0,66	259,72	0,26	0,33	170,82
1945	0,47	0,16	3.756,89	0,43	0,77	260,42	0,19	0,27	239,45
1946	0,47	0,33	7.164,51	0,43	0,79	280,57	0,16	0,27	413,76
1947	0,46	0,46	16.143,56	0,47	0,44	330,44	0,15	0,27	588,08
1948	0,65	0,73	28.400,95	0,53	0,55	353,36	0,14	0,27	762,39
1949	0,63	1,00	37.457,27	0,47	0,70	363,96	0,14	0,27	936,70
1950	0,58	0,93	34.885,19	0,64	0,74	363,96	0,33	0,58	1.097,64
1951	0,51	0,85	41.153,28	0,67	0,72	378,09	0,28	0,41	1.830,30
1952	0,53	0,91	43.206,62	0,68	1,44	371,02	0,25	0,31	1.931,31
1953	0,56	0,99	46.038,07	0,73	0,93	381,63	0,27	0,27	2.052,19
1954	0,58	1,13	48.999,21	0,76	0,97	367,49	0,28	0,28	2.180,81
1955	0,62	1,16	48.415,62	0,69	1,12	348,15	0,23	0,21	2.887,88
1956	0,63	1,21	48.631,77	0,48	1,09	382,96	0,20	0,19	3.307,07
1957	0,65	1,28	50.144,75	0,41	1,10	402,31	0,19	0,18	3.629,97

1958	0,68	1,32	49.928,61	0,39	0,66	421,65	0,16	0,24	5.285,19
1959	0,69	1,37	50.360,90	0,34	0,64	440,99	0,12	0,42	6.389,90
1960	0,71	1,44	52.306,17	0,36	0,65	448,73	0,11	0,36	7.870,71
1961	0,80	1,74	55.116,00	0,34	0,68	477,68	0,09	0,39	10.774,41
1962	0,94	1,99	58.790,40	0,34	0,66	505,94	0,10	0,57	29.966,33
1963	1,03	2,10	63.329,37	0,33	0,64	526,47	0,08	0,45	67.003,37
1964	1,14	2,30	65.706,92	0,32	0,64	548,40	0,09	0,49	142.087,54
1965	1,20	2,33	70.029,74	0,33	0,66	584,73	0,14	0,69	575.084,18
1966	1,24	2,41	73.704,14	0,33	0,64	643,06	0,12	0,58	6.734,01
1967	1,32	2,57	76.513,98	0,33	0,65	688,14	0,13	0,60	17.845,12
1968	1,49	2,79	80.620,66	0,31	0,60	735,86	0,12	0,51	40.067,34
1969	1,57	3,08	84.943,48	0,33	0,64	772,83	0,14	0,55	46.801,35
1970	1,76	3,10	91.427,72	0,31	0,61	810,17	0,16	0,69	52.861,95
1971	1,86	3,32	96.976,80	0,31	0,54	823,09	0,16	0,74	54.882,15
1972	2,00	3,53	101.468,91	0,29	0,66	882,06	0,20	0,97	58.585,86
1973	2,13	3,77	113.095,56	0,31	0,77	1.020,21	0,21	0,91	76.767,68
1974	2,28	3,77	140.840,97	0,24	0,60	1.316,70	0,20	0,80	108.080,81
1975	2,31	3,90	157.488,21	0,23	0,56	1.412,34	0,20	0,72	128.619,53
1976	2,24	4,00	172.285,76	0,25	0,62	1.259,82	0,16	0,50	154.208,75
1977	2,39	3,98	186.026,34	0,17	0,57	1.368,08	0,17	0,45	171.043,77
1978	2,39	4,11	193.160,88	0,24	0,57	1.395,69	0,17	0,39	184.848,48
1979	2,39	4,33	200.031,17	0,30	0,63	1.470,93	0,18	0,34	222.558,92
1980	2,34	4,25	216.149,93	0,32	0,57	1.659,55	0,25	0,33	256.902,36
1981	2,35	4,20	226.719,60	0,30	0,59	1.876,71	0,29	0,34	279.124,58
1982	2,38	4,21	232.797,17	0,29	0,55	2.008,43	0,32	0,33	304.040,40
1983	2,40	4,16	237.025,04	0,33	0,66	2.231,18	0,32	0,31	336.700,34
1984	2,41	4,11	242.309,88	0,31	0,62	2.367,04	0,32	0,34	371.877,98
1985	2,42	4,13	247.066,24	0,43	0,66	2.491,68	0,34	0,39	389.187,62
1986	2,46	4,24	248.651,69	0,60	0,77	2.674,46	0,35	0,49	412.081,01
1987	2,51	4,34	248.915,93	0,55	0,75	2.897,44	0,34	0,44	450.050,53
1988	2,54	4,38	250.765,62	0,54	0,81	3.194,17	0,33	0,41	486.344,93
1989	2,55	4,53	256.314,70	0,63	0,88	3.436,01	0,34	0,39	517.613,95
1990	2,54	4,59	264.241,96	0,59	0,82	3.682,75	0,35	0,77	558.375,35
1991	2,56	4,65	272.961,95	0,54	0,71	4.241,30	0,38	1,07	610.304,26
1992	2,67	4,63	277.454,06	0,48	0,66	4.826,86	0,40	1,00	656.091,04
1993	2,73	4,55	281.153,45	0,46	0,65	5.053,97	0,41	0,97	720.304,20
1994	2,77	3,37	283.003,14	0,71	0,76	5.580,60	0,44	0,95	781.167,12
1995	2,82	3,40	282.738,90	0,74	0,87	6.153,88	0,58	0,92	855.431,04
1996	2,90	3,46	283.003,14	0,77	0,85	6.702,61		0,98	922.436,08
1997	3,00	3,44	288.023,74	0,75	0,85	7.148,22		1,07	983.857,37
1998	3,00	3,45	289.873,43	0,73	0,83	7.949,84		0,83	1.552.841,85
1999	3,02	3,47	289.080,71	0,81	0,91	8.377,04		0,80	1.871.115,80
2000	3,01	3,52	286.966,77	0,81	0,91	8.658,15		1,01	1.940.354,34

Appendix B: Purchasing Power Parities 1913-1990[103]

Comparing wages over time has been very complicated. Using simple exchange rates creates biases due to export because it gives the purchasing power of tradable items. These items rarely make up a large part of domestic consumption. Furthermore, because of trade, their prices converge between countries. Non-exportables however, which make up the major part of the expenditure, are much cheaper in developing countries. As a consequence, the exchange rate generally underestimates the purchasing power of developing countries. Using grain/rice wages, on the other hand, could overstate the income in land-abundant countries (Van der Eng and Bassino 2002) and is, due to the changing consumption basket, in any case hardly suited for a comparison between 1800 and 2000. That is the reason that several authors tend to prefer to use purchasing power parities (PPPs) (Van der Eng and Bassino 2002, Maddison 1995).

The estimation of PPPs is based on matching the products in the two countries concerned, weighted for a share in the total consumption basket. This is done using the data supplied by Van der Eng and Bassino (2002) for Indonesia and Japan (1913, 1922, 1930, 1952, 1958, 1969), added with he data for 1990 from the ILO Bulletin of Labour Statistics. Further we added price data for India. For 1913 -1938 the data came from the *Labour Gazette* (Bombay). For 1913 we used the data of July 1914. The Data for 1952, 1958, 1969, and 1990 came from the ILO Statistical Yearbook, the ILO International labour Review, and the ILO Bulletin of Labour Statistics. The quantity consumed is taken from *Report on an Enquiry into the Family Budgets of Middle Class Employees of the Central* Government (1949, table XXII).

It is clear from below table that the number of product matches is relatively low (between 6 and 18). Because they are largely food and fuel items they do comprise a large share in total expenditure. Also the matches are not always entirely uniform. Furthermore, because the data for India from 1952 onwards are obtained from the ILO they are October prices instead of year averages. Nevertheless the PPPs seem to behave conform expectations (see table 1). There was an increase in

Table 1: Exchange rates and PPPs of India and Indonesia per 100 Japanese Yen

		1913	1922	1930	1938	1952	1958	1969	1990
Indonesia (guilder/rupiah									
Exchange rate		124,13	129,75	123,25	51,19	3,16	10,00	91,25	1270,90
PPP	PPP	69,65	73,14	52,71	31,73	3,49	7,02	28,54	167,30
	Matches	11	16	13	18	13	14	13	6
India (rupee)									
Exchange rate		151,75	165,50	136,32	77,74	1,32	1,32	2,11	12,06
PPP	PPP	74,78	59,39	75,58	45,57	1,07	0,88	1,09	2,07
	Matches	9	10	10	9	9	10	14	8

Source: Indonesia (Van der Eng and Bassino), India and Indonesia 1990 (calculated in this appendix)

the conformation between PPP and exchange rate after the 1930s and a decrease again after 1952. Nevertheless both the guilder/rupiah as the rupees were undervalued compared to the yen, except the rupiah for a short period around 1952.

There are also several reasons for wanting to use wages to give an indication of the economic position of a country. One reason is that wage data are generally more frequently available. An important problem is that unskilled labour is no good measure for economic development as skilled labour becomes increasingly important during industrialization (Van der Eng and Bassino 1998). If one includes also skilled labour, it becomes possible to compare the relation between the skilled and unskilled wage and the possibility to use (cheap) skilled labour to implement new technologies. There are three ways to compare the wages between countries. One way is to use exchange rates. As indicated above, the exchange rate is based on tradable items which only for a fairly small part make

[103] Data on Japan and Indonesia was kindly supplied by Pierre van der Eng and Jean-Pascal Bassino.

up the domestic consumption basket. Furthermore they generally underestimate the purchasing power of developing countries which can be seen in both table 1 and 2. Rice wages on the other hand are difficult because they become increasingly less representative over time, especially when countries develop and the share of luxury goods and other products increase. Secondly, rice prices are generally lower in land-abundant countries and in those countries wages are thus overestimated. The latter can be seen in Indonesia where the rice wages, are son average higher than the purchasing power parities, except during the agrarian

Table 2: Nominal wages of skilled and unskilled workers 1913-1969

		1913		1922		1930		1938		1952		1958		1969		1990	
		Unskilled	Skilled	Unskilled	Skilled	Unskilled	Skilled	Unskilled	Skilled	Unskilled	Skilled	Unskilled	Skilled	Unskilled	Skilled	Unskilled	Skilled
In current Japanese yen																	
rice wages (kg)	Japan	3,1	4,6	6,9	9,2	8,1	10,4	5,2	7,8	3,7	6,4	3,3	6,5	7,4	12,4	13,6	24,6
	Indonesia	2,3	5,7	2,1	4,5	2,3	4,9	3,1	7,1	2,1	2,5	1,2	1,7	1,2	4,7	3,4	7,6
	India	2,2	4,9	2,9	6,9	4,0	10,1	3,4	10,4	3,9	8,2	2,1	3,6	1,9	3,7	2,5	3,4
Exchange rate	Japan	0,6	0,9	2,2	2,9	1,9	2,5	1,6	2,4	230,0	394,0	340,0	661,0	1.333,0	2.253,0	6.711,8	12.128,7
	Indonesia	0,2	0,6	0,4	0,8	0,3	0,7	0,5	1,1	154,7	189,9	85,5	127,1	70,1	280,5	153,8	338,3
	India	0,2	0,5	0,4	0,8	0,5	1,2	0,5	1,5	190,9	406,1	125,0	212,1	119,4	235,1	180,1	250,4
PPP	Japan	0,6	0,9	2,2	2,9	1,9	2,5	1,6	2,4	230,0	394,0	340,0	661,0	1.333,0	2.253,0	6.711,8	12.128,7
	Indonesia	0,4	1,1	0,6	1,4	0,8	1,7	0,8	1,8	140,1	171,9	121,8	181,1	224,1	897,0	1.168,2	2.569,9
	India	0,4	1,0	1,0	2,3	0,8	2,1	0,8	2,5	235,5	500,9	187,5	318,2	231,2	455,0	1.049,7	1.458,9
Index, Japan=100																	
Rice wages	Japan	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Indonesia	74	123	30	49	28	47	59	92	55	40	35	26	16	38	25	31
	India	71	105	42	74	49	96	64	133	104	129	64	56	26	30	18	14
Exchange rate	Japan	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Indonesia	41	68	16	26	17	29	31	48	67	48	25	19	5	12	2	3
	India	37	55	16	28	24	47	30	62	83	103	37	32	9	10	3	2
PPP	Japan	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Indonesia	73	121	29	47	40	67	50	78	61	44	36	27	17	40	17	21
	India	75	111	45	79	44	86	51	106	102	127	55	48	17	20	16	12

Source: Wages see appendix A, PPP converters see previous table.

crises in the 1930s. A final way to compare wages are PPPs. Although it might be difficult to get a large enough and comparable basket, it does give a fairly
good representation of the purchasing power in these three countries.

An overview of the skilled and unskilled nominal wages for some base years in Japanese yen is given in table 2. We see that the wages based on exchange rates are structurally lower than the wages based on both the rice wages and the PPPs. Both the rice wages and the PPPs show that unskilled wages in India and Indonesia were lower than those of Japan already in 1913 but remarkably, the skilled wages in both countries were higher, be it only marginally for India. This changed after 1913, but in 1938 the skilled wages in India were higher than those in Japan, as were the Indian skilled and unskilled wages in 1952.

Based on the previous table we now estimate the unskilled and skilled wages for Indonesia, India, and Japan in 1913 yen. We estimate between each benchmark PPP estimate the nominal unskilled wage in yens. This means that for the period 1913-1930 we estimate the unskilled wage in yen using the 1922 PPP. For the period 1922 to 1938 we use the 1930 PPP. The overlapping years are averaged. This is done for the entire 1800-2000 period. Then we estimate an index of nominal wages in yen with the unskilled wage of Japan is set to 100. To obtain 1913 constant yen, we fill in the 100 (Japanese) for the 1913 real Japanese unskilled wage. In this way the unskilled wages for India and Indonesia were calculated. The same method was used for the skilled wages. The results are given in below figures.

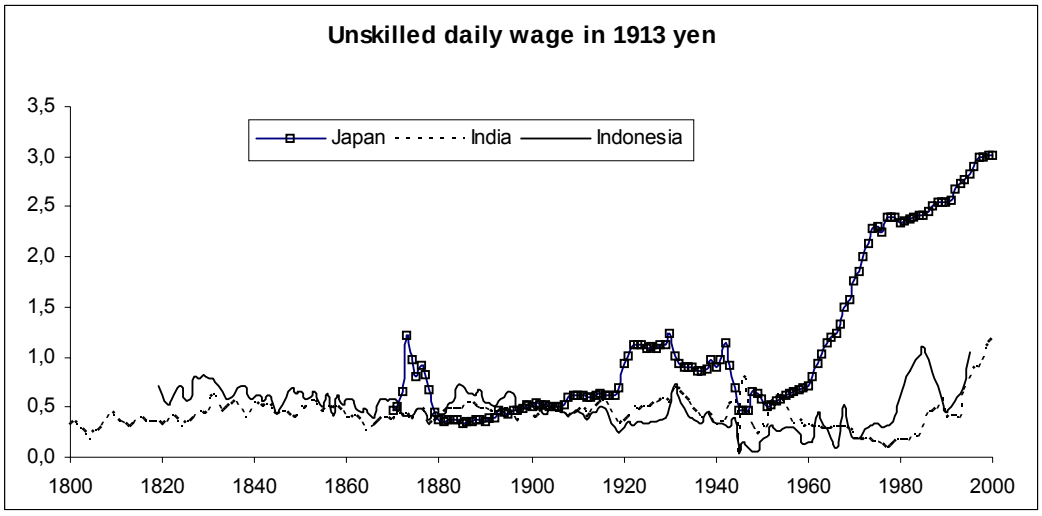


Figure 1

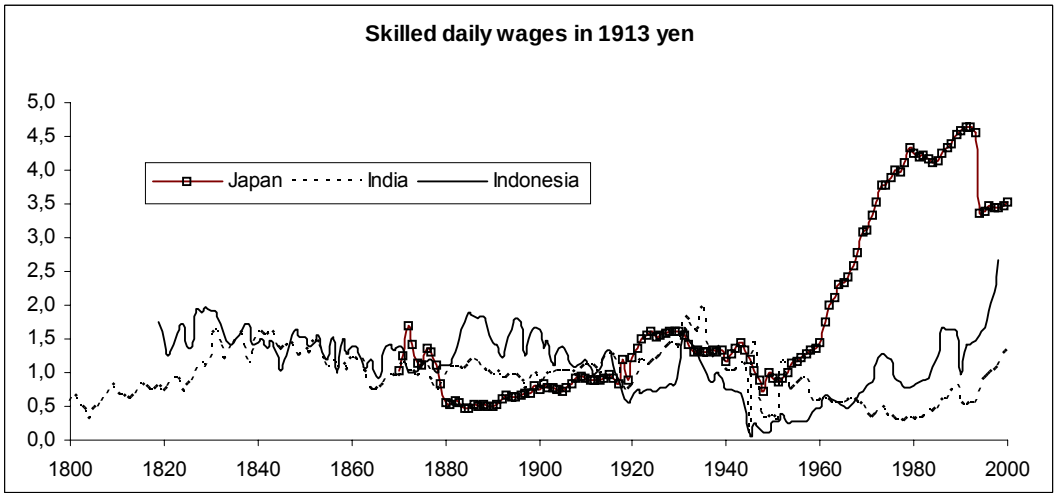


Figure 2

Sources appendix A and B

Atkinson, Edwin F.T., *Statistical, descriptive and historical account of the North-Western Provinces of India*, Edwin F.T. Atkinson (ed.), 14 Vols., Vol. I: Bundelkhand division, Allahabad 1874.

Atkinson, Edwin F.T., *Statistical, descriptive and historical account of the North-Western Provinces of India*, Edwin F.T. Atkinson (ed.), 14 Vols., Vol. II: Meerut division (Sahranpur and Aligarh districts), Allahabad 1875.

Atkinson, Edwin F.T., *Statistical, descriptive and historical account of the North-Western Provinces of India*, Edwin F.T. Atkinson (ed.), 14 Vols., Vol. III: Meerut division (Meerut, Bulandshahr, and Muzaffarnagar districts), Allahabad 1876.

Atkinson, Edwin F.T., *Statistical, descriptive and historical account of the North-Western Provinces of India*, Edwin F.T. Atkinson (ed.), 14 Vols., Vol. IV: Agra division, Allahabad 1876.

Badan Pusat Statistik (BPS), *Perkembangan Upah Pekerja Perkebunan (Wage trend of Estate Workers) 1993-1995*, Jakarta: BPS 1999.

Bassino, Jean Pascal and Pierre van der Eng, 'Economic Divergence in East Asia: New Benchmark Estimates of Levels of Wages and GDP, 1913-1970,' Paper Presented at the XIIIth International Economic History Association Congress in Buenos Aires 2002.

Biro Pusat Statistik, *Statistik Indonesia: Statistical Pocketbook of Indonesia*, Jakarta: BPS 1962-1964.

Brahmananda, P.R., *Money, Income, Prices in 19th Century India. A historical, Quantitative and Theoretical Study*, Mumbay etc.: Himalaya Publishing House 2001.

Bank Indonesia, *Report of the Governor of Bank Indonesia for the Financial Year…*, Jakarta: Bank Indonesia 1954-1960.

Bureau of Statistics, Office of the Prime Minister, *Japan statistical yearbook*, Tokyo: Japan Statistical Association [etc.] 1987-2001.

Campbell, James M. (ed.), *Gazetteer of the Bombay Presidency, Vol. IV: Ahmedabad*, Bombay: Government Central Press 1879.

Campbell, James M. (ed.), *Gazetteer of the Bombay Presidency, Vol. VIII: Káthiáwar*, Bombay: Government Central Press 1884.

Campbell, James M. (ed.), *Gazetteer of the Bombay Presidency, Vol. XI: Kolaba and Janjira*, Bombay: Government Central Press 1883.

Campbell, James M. (ed.), *Gazetteer of the Bombay Presidency, Vol. XII: Khándesh*, Bombay: Government Central Press 1880.

Campbell, James M. (ed.), *Gazetteer of the Bombay Presidency, Vol. XXIII: Bijápur*, Bombay: Government Central Press 1884.

Divekar. V. D., Hundred years of commodity prices in Pune market, 1761-1860 A.D., Pune: Gokhale Institute of Politics and Economics 1989a.

Divekar. V. D., *Prices and wages in Pune region in a period of transition, 1805-1830 A.D.*, *Gokhale Institute mimeograph series*, no.29, Pune: Gokhale Institute of Politics and Economics 1989b.

Dros, Nico, *Changing Economy in Indonesia*, Vol 13: Wages 1820-1940, Amsterdam: Royal Tropical Institute 1992.

Eng, Pierre van der, 'Indonesia's Growth Performance in the Twentieth Century,' Angus Maddison, D.S. Prasada Rao, and William F. Shepherd (eds.), *The Asian Economies in the Twentieth Century*, Cheltenham: Edward Elgar 2002, 143-179.

International labour Office, *Bulletin of Labour Statistics*, 1965-…, Geneva: ILO various issues.

International labour Office, *International Labour Review*, 1921-…, Geneva: ILO various issues.

International Labour Office, LABORSTA (http://laborsta.ilo.org/).

International Labour Office, *Year Book of labour statistics*, Geneva: ILO, various issues.

Kelsall, John, *Manual of the Bellary District*, Madras: Lawrence Asylum Press 1872.

Koloniaal Verslag, 1870-1876.

Korthals Altes, W.L., *Changing Economy in Indonesia*, Vol 15: Prices (non-rice) 1814-1940, Amsterdam: Royal Tropical Institute 1994.

Labour gazette, Government of Maharastra: Office of the Commissioner of Labour Bombay, (1921-1940), various issues.

Lachman Singh, Kuar, *Historical and statistical memoir of Zila Bulandshahar*, Allahabad 1874.

Le Fanu, J.H., *A manual of the Salem District in the presidency of Madras*, Vol. 1: The district, Madras: Keys, Government Press 1883.

Maddison, Angus, *Monitoring the World Economy 1820-1992*, Paris: Organisation for Economic Co-operation and Development 1995.

Mansvelt, W.M.F. (Re-edited and continued by P. Creutzberg), *Changing Economy in Indonesia*, Vol 4: Rice Prices, The Hague: Martinus Nijhoff 1978.

Maltby, Thomas James and George Downton Leman, *The Ganjam District manual*, Madras:

Government 1882.
Montgomery, Robert, *Statistical report of the district of Cawnpore*., Calcutta: official 1849.
Mukerji, K. M. "Trends in Real Wages in the Jute Textile Industry from 1900 to 1951," *Artha Vijnana*, vol. 2, no. 1, March 1960.
Narain, Brij, 'Eighty Years of Punjab Food Prices, 1841-1920,'*Punjab Board of Economic Enquiry*, No. 13, Lahore: 1926.
National Archive (N.A.), Ministerie van Koloniën Archive nr. 2.10.01, inv. 2972-2988.
Office of the Economic Advisor to the Government of India, *Report on an Enquiry into the Family Budgets of Middle Class Employees of the Central Government*, Simla: Government of India Press 1949.
Ohkawa, Kazushi, Miyohei Sinohara, and Mataji Umemura (eds.), *Estimates of Long-Term Economic Statistics of Japan since 1868*, Vol. 8: Prices, Tokyo: Tokyo Keizai Shinposha 1967.
Rijksinstituut voor Oorlogsdocumentatie, *Nota nr. 12 van het Plv. Hoofd C.K.S. (Centraal Kantoor Statistiek) met 5 bijlagen en 2 grafieken aan de Back-Pay Commissie*, (Number: 014614-014625).
Rijksinstituut voor Oorlogsdocumentatie, *Nota nr. 13 van het Plv. Hoofd C.K.S. (Centraal Kantoor Statistiek) met bijlage 1a, I, II, III aan de Back-Pay Commissie*, (Number: 014626-014637).
Roy, Bina, *An Analysis of Long Term Growth of national Income and Capital Formation in India (1850-51 to 1950-51)*, Calcutta: Firma KLM Private Limited 1996.
Saito, Osamu, "The Labor Market in Tokugawa Japan: Wage Differentials and the Real Wage Level, 1727-1830," *Explorations in Economic History*, Vol. 15, No. 1, 1978, pp. 84-100.
Saito, Osamu, "Wages, inequality and pre-modern growth in Japan, 1727-1894," in: R.C. Allen, T. Bengtson and M. Dribe (eds.), *New Evidence of Standard of Living in Pre-industrial Europe and Asia*, (forthcoming).
Sato, Shigeru, 'Labour Relations in Japanese Occupied Indonesia,' CLARA Working Paper No.8, Amsterdam 2000.
Sato, Shigeru, *War Nationalism and Peasants. Java Under the Japanese Occupation 1942-1945*, New York: M.E. Sharpe 1994.
Sivasubramonian, S., 'Income from the Secondary Sector in India, 1900-1947,' *The Indian Economic and Social History Review*, Vol. XIV No. 4 (1977), 427-492.
Sivasubramonian, S., *The National Income of India in the Twentieth Century*, New Delhi: Oxford University Press 2000.
Statistical Abstract relating to British India from … to …, Nr 1(1840-1865) – 55 (1910/11-1919/20), London: His Majesty's Stationary Office, various volumes.
Statistics Bureau, Management and Coordination Agency, Japan Statistical Association, *Historical Statistics of Japan*, *1868-1985,* Vol. 4: Economic Statistics, Statistics Bureau, Tokyo: Japan Statistical Association 1987.
Statistics Department, the Bank of Japan, *Hundred-year Statistics of the Japanese Economy*, Bank of Japan: 1966.
Stuart, A.J., *A manual of the Tinnevelly district in the presidency of Madras*, Madras: Official 1879.
Sykes, W.H., 'Prices of the Cerealia and other Edibles in India and England Compared,' *Journal of the Statistical Society of London*, Vol. 10 No. 4 (1847), 289-316.
Williamson, Jeffrey, 'Real Wages and Relative factor Prices in the Third World 1820-1940: Asia,' *Harvard Institute of Economic Research, Discussion Paper No. 1844*, 1998.
Wright, F.N., E.B. Alexander, and H.C. Conybeare, *Statistical, descriptive and historical account of the North-Western Provinces of India*, Edwin F.T. Atkinson (ed.), 14 Vols., Vol. VI: Cawnpore, Gorakhpur, and Basti districts, Allahabad 1881.
Zanden, Jan Luiten van, 'Rich and Poor before the Industrial Revolution: a comparison between Java and the Netherlands at the beginning of the 19th century', *Explorations in Economic History*, 40 (1) 2003, 1-23.