

Comments on
Estimates of the Long-run Economic Growth of Taiwan
Based on Revised SNA (1901–2000) Statistics*

Tsong-Min Wu
National Taiwan University

September 2005

Professor Mizoguchi has been working on the estimation of Taiwan's long-term GDP and other macro data since 1970s. This paper is a summary of the main results on GDP estimation from this research project, which is a joint works of many scholars. Earlier results on Taiwan and Korea's long-term economic statistics were published in Mizoguchi and Umemura (1988). Most of the time series of Taiwan contained in that volume cover the period of 1903–1938. The result shown in the current paper is a revision and an extension of the early works. The GDP time-series is extended to 1901–2000.

My comments will be divided into two parts. In the first part, I will give an interpretation of the GDP series obtained by Prof. Mizoguchi. This interpretation would allow us to check the accuracy of the estimates in a certain way. In the second part, I will point out a source of raw data which might be used to improve the GDP estimates of the early period.

1 An interpretation of Taiwan's Long-term GDP

A major contribution of this paper is the link of the pre-WWII estimates to the post-WWII official series to produce a GDP series of one hundred years. This give us a complete view of Taiwan's economic development in the 20th century.

Using the GDP estimates by Mizoguchi (2005), Figure 1 shows Taiwan's per capita GDP in 1901–2000. The lower line covering the period of 1903–1938 is from the earlier estimates published in Mizoguchi and Umemura (1988). The average growth rate of per

*By Professor Toshiyuki Mizoguchi. Conference on *Technology and Long-run Economic Growth in Asia* by N.W. Posthumus Institute of Economics and Social History, Groningen and Hitotsubashi University 21st Century Program. September 8–9, 2005.

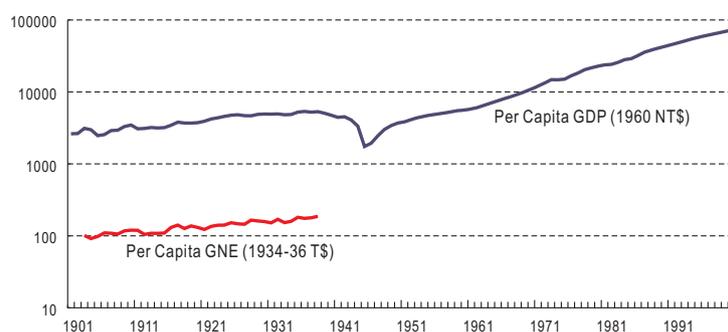


Figure 1: Taiwan's Per Capita GDP (1960 NT\$)

capita GDP was 1.73% in 1902–1940, and 6.21% in 1950–2000. The former was less than one third of the latter, but it is still higher than the world average. According to Maddison (1995, p. 212), during 1903–1938, the average growth rate of per capita GDP in the 12 Western European countries was 1.12%, while the world average (56 countries) was 1.03%.

During the one hundred years in the 20th century, Taiwan's per capita GDP expands by about 29.3 times, from 2,466.2 dollars in 1905 to 72,264.7 dollars in 2000 (in 1960 NT\$). Comparing with other countries, the expansion in national income is quite remarkable. An alternative way to view the expansion in national income is to look back into history from today. In the international GDP data set compiled by Maddison (2001), Taiwan's per capita GDP in 1999 was 15,720 dollars (in 1990 international currency). So the 29.3 times increase from 1905 to 2000 implies that Taiwan's per capita GDP in 1905 was 536.5 dollars in 1990 international currency. Can we make any sense out of this number?

Maddison (2001, p. 45) argues that the per capita GDP of a traditional agricultural economy was about 600 dollars (in 1990 international currency). Lucas (2002) makes a similar claim from the GDP data set he compiles. So a per capita GDP level of 536.5 dollars means that in the beginning of the 20th century, Taiwan was a traditional agricultural economy. This result is not surprising because it is consistent with the general descriptions in the literature about Taiwan of the time. A quantitative estimate of the long-term GDP, however, allows us to make some inference on Taiwan's economic development during the Dutch and the Ch'ing periods, which is not possible with the previous estimation of only the per-War period.

Taiwan's economic development under the Japanese administration was very well-documented. In contrast, the economic development during the Dutch period (1624–

Table 1: Taiwan average per capita GDP growth rate

1624–1900	1902–1940	1950–2000
0.026%	1.73%	6.21%

1662) and the Ch'ing dynasty (1684–1895) was relatively unknown. In terms of GDP, there are two general characteristics of a traditional agricultural economy. One is the lower level of per capita GDP as mentioned above, the other is the near-zero growth rate. For example, Maddison (2001, p. 264) conjectures that the average growth rate of China's per capita GDP was zero from the 17th to the 19th century. Applying this argument, the average growth rate of Taiwan's GDP per capita can be conjectured to be near zero. Furthermore, Pritchett (1997) argues that the lowest subsistence level of per capita GDP in any human society was about 300 dollars (in 1990 international currency). In 1998, for example, Tanzania's per capita GDP was 553 dollars, and Rwanda was 704 dollars (Maddison, 2001, pp. 325–326).

Now suppose that Taiwan's per capita GDP in the early Dutch period was 500 dollars, this then implies that the long-term average of per capita GDP growth rate from 1624 to 1900 was about 0.026%. Table 1 displays the average growth rates during the three periods. As is well-known, the growth rate during the post-WWII period was the most remarkable. Another remarkable feature was that the growth rate changes from near zero to a positive value in the beginning of the 20th century. The average growth rate in 1902–1910 is 3.66%, while the average growth rate in 1902–1940 was 1.73%.

Figure 2 compares Taiwan's long-term per capita GDP with other countries. And it is easy to see that there was a structural change in Taiwan's economy in the beginning of the 20th century. It is interesting to compare Taiwan and China. Taiwan was part of China since the late 17th century. And so it is reasonable to assume that Taiwan's per capita GDP would be close to that of Fukien and Kwangtung at the end of the Ch'ing dynasty. About forty years after Taiwan became a colony of Japan, Taiwan's per capita GDP increased to about two times of Fukien and Kwangtung. At the end of the 20th century, Taiwan's per capita GDP was about four times of China.

For the study of economic growth, Taiwan is a valuable case deserving careful research. And Prof. Mizoguchi has shown the existence of a structural change in the beginning of the Japanese colonial period. How to explain the structural change is an important topic

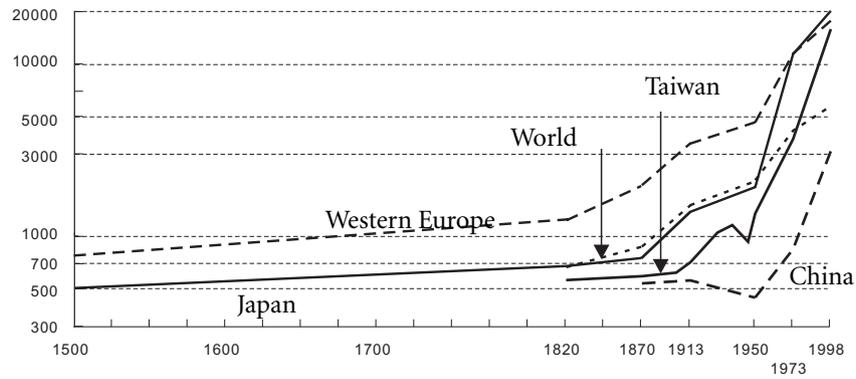


Figure 2: Per capita GDP (in 1990 international dollars)

Unit: 1990 international dollars.

Sources: Maddison (2001), except Taiwan. Taiwan's GDP from Mizoguchi (2005), and per capita GDP in 1700 was assumed to be 500 dollars.

for future research.

2 Data Set from the Land Tax Reform of 1898–1904

The validity of the above interpretation depends on how accurate the GDP estimates are, which in turn depends crucially on what raw data are available in the early period. As pointed by Mizoguchi (2005), “Data are scarce and less reliable for period (a) [1901–1911], so our estimates here remain preliminary.” In this section, I would point out a data set which might be useful to the GDP estimation for the pre-WWII period in general, and for the early 20th century in particular.

By the estimates of Mizoguchi (2005), Taiwan nominal GDP in 1905 was 111.2 million dollars, of which the share of the agriculture sector was 41%. This amounts to 45.59 million dollars. The agriculture sector consists of crops and livestock. Mizoguchi (2005) does not provide the share of crops and livestock. In Wu (2001), the production value of livestock was estimated to be 26.19% of crops in 1905. Using the ratio, the crops production in 1905 was 36.13 million dollars.

Most of the estimation of the national income statistics was based on the data published in the *Annual Statistics of the Taiwan Government General*. In the earlier issues of the *Annual Statistics*, however, only quantity data were available. There was no value data. An important source of the output value of the agriculture sector in the early period was

Table 2: Crop production of 1904

	total	paddy field	dry field
Mizoguchi (2005)	36.13		
Wu (2001)	38.58	23.90*	–
Land census	50.72	33.13	17.60

Unit: million Taiwan dollars. Mizoguchi's (2005) estimate is for 1904. * indicates rice output. Wu's (2001) estimate contain rice, sugar cane, beans, and so on. It also contains vegetable and fruits, which was estimated indirectly. For land census, crop value of paddy field from 臨時臺灣土地調查局 (1905b), and dry field from 臨時臺灣土地調查局 (1905c).

臺灣行政長官公署 (1946), which was based on the *Annual Statistics*. This source gives the annual aggregate value of the rice production in 1901–1911, but no output value for individual rice breed was provided. It is also not clear how the data were collected or estimated.

The first row of Table 2 shows the crop production as estimated by Mizoguchi (2005). The second row was from Wu (2001), which is also based on *Annual Statistics of TGG*, but adding the value of agriculture side products. Since both of the estimates were based on the same data source, the discrepancy between the two numbers are small. The data from the Land census would be explained below.

Taiwan was ceded to Japan in 1895, and in 1898 the Land Census Bureau was established with an aim to reform the land tax system. After six years of hard works, a new system of land tax rate was erected by the Taiwan Government General in November 1904. The new tax rate system was based on the census data conducted by the Land Census Bureau. To assign a tax rate to a land, the Bureau has to estimate, among other things, the value of crop output of each single land in Taiwan. The Bureau started with drawing a detailed map of Taiwan. It then identified the owner of each land, and finally estimated its average crop output. The Bureau collected a lot of data, and fortunately much of the data was published. As a result, a large data set of the crop value from the paddy and dry fields in 1904 are available.

The crop production census was done in 1903 and 1904, and the price data used to compute the crop value was taken to be the average of 1898–1902.¹ During this period,

¹See 臨時臺灣土地調查局 (1905a), p. 1, and 臨時臺灣土地調查局 (1905b).

there is a slight inflation in Taiwan, so the crop value of 1904 might be somewhat underestimated. As shown in Table 2, the value of crop output from the paddy field was 33.13 million dollars, and the value of the dry field was 17.60 million dollars. The sum was 50.72 million dollars, which was much higher than the estimate by Mizoguchi (2005) and Wu (2001).

The big discrepancy between the two data sets is puzzling. And this is an issue which is worthy of further investigation. Besides the 1898–1904 land tax reform, Taiwan Government General conducted three more reforms during the colonial period. And each reform was based a similar island-wide census. The results from the other censuses were published in 1920, 1936, and in 1945. These are potentially useful data set for the GDP estimation.

Finally, suppose that the data in the *Annual Statistics of TGG* is a underestimation of the crop value, how would the per capita GDP estimates be affected? If we use the estimate by the Land Census Bureau to substitute for the original crop output, then the estimate of per capita GDP in 1905 would be raised by 13.09% to 606.7 dollars (in 1990 international currency). This is still the level of per capita GDP of a traditional agricultural economy, and so the interpretation in the first section is not affected.

References

- 臺灣行政長官公署 (1946), 《臺灣省五十一年來統計提要》, 台北: 行政長官公署。
- 臨時臺灣土地調查局 (1905a), 《田收穫步合、收得步合、粃玄米比較步合調查書》, 台北: 臨時臺灣土地調查局。
- (1905b), 《田收穫及小租調查書》, 台北: 臨時臺灣土地調查局。
- (1905c), 《畑收穫及小租調查書》, 台北: 臨時臺灣土地調查局。
- Lucas, Robert E., Jr. (2002), “The industrial revolution: Past and future”, in *Lectures on Economic Growth*, 97–188, Cambridge: Harvard University Press.
- Maddison, Angus (1995), *Monitoring the World Economy, 1820–1992*, Paris: Development Centre of the OECD.
- (2001), *The World Economy: A Millennial Perspective*, Paris: Development Centre of the OECD.
- Mizoguchi, Toshiyuki and Umemura, Mataji (1988), *Basic Economic Statistics of Former Japanese Colonies, 1895–1938*, Tokyo: Toyo Keizai Shinposha.
- Pritchett, Lant (1997), “Divergence, big time”, *Journal of Economic Perspectives*, 11(3), 3–17.

Wu, Tsong-Min (2001), "Taiwan's agricultural production: 1902–52", *Taiwan Economic Review*, 29(3), 302–338.