**When Tenants Got Their Own Land:**

**The Effect of Land Reform on Agricultural Output in Taiwan in 1953**

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**Introduction**

Literature has pointed out the important role of land reform in economic development, especially, in the development of East Asian economies. Studwell (2013) argues, by comparing the successes in Northeast Asia economies (postwar Japan, Korea, and Taiwan) and the laggards in Southeast Asia (Indonesia, Malaysia, the Philippines, and Thailand), that land reform is the key for sustainable economic growth. He argues that land reform incentivized small farmers, raised agricultural production and savings, and hence provided an initial productive surplus for future industrial development in those Northeast Asia economies. Boyce et al. (2005) argue that land reform brough relatively egalitarian distribution of wealth and income and, by citing Rodrik’s (1995, pp. 92-93) idea, that such an egalitarian stage enabled governors to implement economic growth policy more effectively without compromising to interest groups.

Many researchers have studied the effects of land reforms in different economies. For instance, Dore (1966) studies the land reform in Japan; Koo (1968) studies the case in Taiwan; Lippit (1974) studies the case in China; Jeon and Kim (2000) study the case in Korea. However, few research could quantify the effect of land reform on economic outcomes such as agricultural production. The main difficulty lies in isolating the effects of the land reform from the effects from other concurrent policies. Nonetheless, more and more recent studies have tried to deal with such a problem by resorting to micro-level data. First type of literature utilizes the detailed measurement of input and output from household survey data. For instance, Adamopoulos and Restuccia (2020) use farm-level data in the Philippines to calibrate a model that can quantitatively isolate the impact of the reform on aggregate productivity. Second type of literature utilizes the variation in implementation of land reform across districts within an economy. For instance, Banerjee et al. (2002) use village-level data to identify the effect of the land reform in the Indian state of West Bengal on the agricultural productivity by utilizing the variation of program intensity across different villages. This paper follows the second type of literature and uses a continuous difference-in-differences method to identify the effect of the land reform in Taiwan in 1953 on agricultural output by utilizing the different implementation levels of land reform in different districts in Taiwan.

It is worth noting that while Banerjee et al. find a positive effect of land reform on agricultural productivity, Adamopoulos and Restuccia find a negative one. Whether land reform could truly raise agricultural productivity remains inconclusive and may depend on contexts of different economies. Hence, this paper would like to study the land reform in Taiwan, a usually mentioned successful example graduating from developing economies to advanced economies. We want to ask whether the land reform really boosted agricultural production as mentioned by Studwell, and, if so, by how much.

Some empirical work has also tried to use micro-level date to estimate the effects of land reform in Taiwan on agricultural output. Yeh (2012) uses a differences-in-difference approach to estimate the effect of the first phase of land reform in 1949 on agricultural production efficiency by comparing the self-cultivated farms and tenanted farms before and after 1949. This paper differs from Yeh’s in two main points. First, Yeh estimates the effect of first phase of land reform in 1949, whose main goal was to reduce the rent burden on tenants, while this paper studies the effect of the third phase of land reform in 1953, whose main goal was to transferring land ownership from landowners to tenants. Second, Yeh uses the farm-level data in 1925-1927 and 1950-1951, whose time gap is large, while I use district-level data in 1950-1956. Although it might ignore the long-term effect, the focus on the time points close to the land reform in 1953 may allow me to exclude the influence of some potential factors. Duan (2015) uses fixed effect model with district-level panel data from 1950s to 1960s to estimate the effect of land redistribution on rice productivity and real capital accumulation by utilizing the variation in percentage of owner-cultivator among all farmers in different districts. However, even after controlling the regional fixed effect, the model may still suffer severely from the omitted variable bias since agriculture in Taiwan was under a significant change in the period. Also, the change in percentage of owner-cultivator in each region can hardly be exogenous. On the contrary, this paper uses only the sharp effect of land reform in 1953 and only data in a short period from 1950 to 1956 to minimize the endogenous problem. In addition, the paper tries to analyze the production of other crops to give a more comprehensive picture of how the land reform in 1953 affected the agricultural output in Taiwan.

**The Land Reform in Taiwan**

Since 1947, the government in Taiwan had implemented a series of policies to improve tenants’ economic condition. The most important policy was the three-phase land reform: farmland rent reduction, sale of public land, and land-to-the-tiller program. During the first phase, the government set a legal maximum percentage of farmland rent and formally implemented in 1949. At the same time, the government started to force tenants and landowners to register their tenure contracts to assure the rent reduction policy was implemented properly. In 1951, the government stared to sell the public arable lands for those tenants who rented the lands in cheap prices while restricting the amount of area each tenant could buy. Finally, in 1953, the government implemented the land-to-the-tiller program. The program imposed a ceiling on land holdings of arable land. Then, government would buy those above-ceiling lands and sell to those tenants who rented the lands in cheap prices. For a more detailed discussion on how the land reform was implemented and other detail related to the land reform, one can refer to Tang’s (1957) report published by Chinese-American Joint Commission on Rural Reconstruction (JCRR). JCRR was a bilateral agency funded by the United States for the rural reconstruction of Taiwan. The land reform was also implemented with the help of JCRR.

This paper focuses on how the third phase of the land reform affect agriculture productivity through the transfer of farmland ownership from large landowners to tenants. Although tenants could buy land from landowners even without such a policy, the total amount of area of such trades was small (Tang 1957). Similarly, the amount of area the government sold to tenants was also small. The main way of tenants got their own land, then, was by the land-to-the-tiller program implemented in 1953. Since the government started to track the private tenure contracts in 1949, we can find that the main drop of the total amount of area in private tenure contracts happened in 1953 as Figure 1 shows. Also, we should note that the government still allowed landowners to own around one to four hectares of paddy fields and two to eight hectares of dry lands, depending on the land productivity calculated from the past yields (but such a process might be manipulated). As a result, certain amount of private tenure would still exist after the land-to-the-tiller program. In addition, even if a tenant got his own land, he might still be willing to be a tenant for another land at the same time. Although we cannot find data for the exact area of such a case, it was not uncommon according to the number of farmers that were classified as part-owner (owner and tenant at the same time). Hence, the amount of private tenure area transferred in 1953 may depend on the situation in each district. Figure 2 provides a general view of the Chart, line chart

Description automatically generatedamount of private tenure area transferred during 1953 in each district.

Figure 1: Private Tenure Land Area Over Time[[1]](#footnote-1)

The land reform was closely related to the political condition in the late 1940s to 1950s in mainland China and Taiwan. After World War II, Japanese government retroceded Taiwan to Chinese government in 1945. In the meantime, the second phase of Chinese Civil War fought between the Nationalist government of the Republic of China (ROC) and Chinese Communist Party (CCP) continued until the Nationalist government retreated to Taiwan in 1949. As mentioned by Chu (2015), the land reform in Taiwan may serve the purpose of reducing the number of tenants to prevent CCP mobilizing peasant revolt in Taiwan and the purpose of gaining the leading position of China’s modernization. In this historical context, the timing of the land reform may be treated as exogenous to the agricultural development in Taiwan.

Chart, bar chart

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Figure 2: Decrease in Area of Private Tenure Land during 1953 (positive value indicates decrease)[[2]](#footnote-2)

**Agriculture in Taiwan**

Taiwan is a small island with a total area of roughly 36,000 square kilometers. However, the island is predominated by mountains. Roughly, two thirds of the area in Taiwan is composed of mountains and only one third of area is composed of plains. Hence, only about one fourth area is arable, which was around 880,000 hectares in the 1950s and 1960s. Most of the arable area had been fully cultivated over the long history of agricultural development in Taiwan (Figure 3).

Chart

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Figure 3: Cultivated Land Area Over Time[[3]](#footnote-3)

Taiwan’s agriculture started as early as the 17th century under the ruling of Qing dynasty. Then, the Japanese government introduced modern agricultural technology to Taiwan in the early 20th century. Large scale of water resources was also developed during the Japanese colonial period (1895-1945). As a result, Taiwan became an important colony exporting rice and sugar to Japan. After Taiwan’s retrocession to the ROC, even though WWII caused certain damage to Taiwan’s agriculture, its productivity quickly recovered to the pre-war level in 1951 (Figure 4).

The main crops in Taiwan were rice and sugarcane. Rice was mostly cultivated in paddy field and sugarcane was mostly cultivated in dry land. Among all cultivated land, roughly 60% was paddy field and 40 % was dry land (Figure 3). Although fewer production of sugarcane was in the Northern Taiwan, both rice and sugarcane were cultivated in most of districts (Figure 5 and Figure 6).

Diagram, schematic

Description automatically generatedFigure 4: Agricultural Productivity Over Time[[4]](#footnote-4)

Map

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Map

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Figure 6: Average Production of Sugarcane in Taiwan Over Districts (1950-1954)[[6]](#footnote-6)

**Methods & Data**

This paper uses a difference-in-differences method with a continuous treatment to identify the effect of the land-to-the-tiller program on agricultural productivity in Taiwan. The first difference is before and after the treatment in 1953. The second difference is the different intensity of implementation in different districts, which is measured by the percentage of decrease in private tenure area (decrease in private tenure area during 1953 / private tenure area in 1952) in each district. Note that if the percentage of decrease in private tenure area is positive for a district, it means that the district experienced a decrease in private tenure area in 1953. The basic model is as follows:

*YieldPerUnitit* is the average yield per hectare of an agricultural product in district *i* in year *t*. *αi* is the fixed effect of each district. *AfterLandReformt* is a dummy that is 1 when year is equal to or larger than 1953. *PercentageDecreasePrivateTenantArea1953­i* is the percentage of decrease in private tenure area in 1953 in district *i*. *Xit* are the other control variables, including the number of farmers in district *i* in year *t*, the area that was irrigated in district *i* in year *t*. Note that since the land-to-the-tiller program were implemented in the middle of 1953, and it took some time to fully implemented the program, this paper decides to drop the observations in 1953. *δ* is the coefficient of the effect of the land reform through percentage of decrease in private tenure area. If it is positive, the coefficient means that a 1% decrease in private tenure area would increase *δ* amount of the yield per hectare.

Our focus crops are rice and sugarcane, which were the most two important crops in Taiwan. In addition, since rice and sugarcane were cultivated in most of regions, they provide enough variation across different districts for us in the model. Since rice waw mostly cultivated in paddy field and sugarcane was mostly cultivated in dry land, the paper will also show the results of replacing the *PercentageDecreasePrivateTenantArea1953­i* with *PercentageDecreasePrivatePaddyTenantArea1953­I* or *PercentageDecreasePrivateDryTenantArea1953­i* , which were measured by the percentage of decrease in area of private tenure paddy field (decrease in area of private tenure paddy field during 1953 / area of private tenure paddy field in 1952) and percentage of decrease in area of private tenure dry land (decrease in area of private tenure dry land during 1953 / area of private tenure dry land in 1952) respectively.

This model utilizes the sharp decline in the private tenure area in 1953 and its variation in different districts as we have seen in Figure 1 and Figure 2. Under the land-to-the-tiler policy, we should expect a decrease in private tenure area in each district. However, we could find that the decreases in private tenure area were extremely small or even negative for some districts. Most of them are cities, which were classified as city because their higher urbanization. Hence, they tended to have fewer arable land. Even if some landowners did own arable lands in cities, those lands were small. Hence, it explains why these districts had such different figures. The left unexplained is Penghu prefecture. Penghu is an archipelago of 90 islands and islets in the Taiwan Strait as shown in Figure 5 and Figure 6. There were no much arable land in Penghu. Also, the climate in Penghu was not suitable for agriculture. We should also find that almost no rice and sugarcane were cultivated in Penghu. Hence, the paper will drop the observations of Penghu prefecture.

The paper also tries to control the number of farmers in each district and the area that was irrigated different districts in the period. For the number of farmers, as the Nationalist government retreated to Taiwan in 1949, a large number population followed the government to Taiwan. Such an inflow of population may differ in different districts. For area that was irrigated different districts, we want to exclude the effect of new built irrigation infrastructures in certain districts. However, we do not have the data for most of cities, Penghu prefecture, and Yangmingshan. Also, we do not have the data in 1951. Hence, when we include irrigation area as our control, our number of observations will drop from 126 (21 districts \* 6 years) to 75 (15 districts \* 5 years).

To check whether the parallel trend assumption is hold for the model. This paper also uses a dynamic difference-in-differences. The dynamic model is as follows:

*γt* is the year fixed effect and *Yeart* are the dummies for each year. *δ­t* shows the effect of percentage of decrease in private tenure area in 1953 in year *t*. If the parallel trend assumption does hold, we shall see the coefficients before 1953 close to 0.

For the unit yield of rice and sugarcane (kilogram / hectare) (calculated by total yield (kilogram) / total crop area (hectare)), agricultural population (number of farmers), and irrigated and drained area (hectare), the paper uses the data from Taiwan Agricultural Yearbook from the Department of Agriculture and Forestry. Taiwan Agricultural Yearbook collected these data in each district since 1947. The agricultural output was the compilation of the estimation of each village. The agricultural population was collected from household registrations of each prefecture and city and can be divided into three categories: owner-cultivator, part-owner, tenant. Owner-cultivators cultivate their own land; part-owners cultivate their own land and others’ land at the same time; tenants only cultivate others’ land. Finally, the irrigated and drained area was collected by the commission on water conservancy in different regions. However, as mentioned earlier, it misses the data for some districts and the data in 1951. For the private tenure area in each district (hectare), Taiwan Land Bureau calculated the area through the registered tenure contracts after 1949 (Yearbook of the Republic of China, 1955-1958).

**Results**

Table 1 shows the results of the basic model for rice. We can see that as we include our control variables, the coefficient of the interaction term changes from insignificant to significant and keeps negative. The result suggests that the transferring of the land ownership through the land-to-the-tiller program had a negative effect on the unit yield of rice. On average, a 1% decrease in tenure area would decrease the unit output by about 500 kilograms. As we mentioned before, rice was mostly cultivated on paddy field. Table 2 shows the results of basic model for rice with the focus on private tenure paddy field. The results are similar as Table 1’s. The average unit yield of rice was around 2,000 kilograms. Hence, the drop of 500 kilograms implies a 25 % decrease in yield.

Table

Description automatically generatedTo check the results robustness, we use a dynamic model. Table 3 shows the results of the dynamic model. The coefficients of the interactions before 1953 are insignificant as we include our control variables. The coefficients of the interactions after 1953 are significant and negative, with roughly the same magnitude as the results of Table 1 and Table 2. These results show that the effects of transferring of the land ownership are roughly the same after 1953 and not away from 0 largely before 1953, suggesting our results from the Table 1 and Table 2 are robust.

Table 1: Results of Basic Model for Rice

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Table 2: Results of Basic Model for Rice (Paddy Field)

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Table 3: Results of Dynamic Model for Rice

Table

Description automatically generated As for sugarcane, as Table 4 shows, although the coefficient of interaction term is still negative, as we include our control variables, it becomes insignificant. However, we should note that, since sugarcane was mostly cultivated in dry land, the help from the irrigation was small. The results do show an insignificant coefficient of irrigation. We probably should rely more on the model with focus on dry land. As Table 5 shows, the coefficient of interaction term is significant with or without including irrigation as control. The results suggest that, on average, a 1% decrease in area of tenure dry land would decrease unit yield of around 35,000 kilograms. The coefficient is quite large since the average unit yield of sugarcane was around 50,000 kilograms. A drop of 35,000 kilograms implies a 70% decrease in yield. However, it is explainable why sugarcane would response more strongly than rice. To cultivate sugarcane well, farmers needed to invest more capital and would face higher risk. So, as land ownership transfer from the wealth landowners to the poor farmers, they might invest less due to income constraint. Table 6 shows the results of dynamic model with focus on dry land. Although the coefficients of interactions after 1953 are all negative, they vary a lot. Especially, the coefficient of the interaction term of year 1954 is insignificant. Also, either we include irrigation or not, the coefficients of interactions before 1953 are significant and positive. The results suggest that our result from Table 4 and 5 may not be robust.

Table 4: Results of Basic Model for Sugarcane

Graphical user interface, table

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Table 5: Results of Basic Model for Sugarcane (Dry Land)

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Conclusion and Limitations

The paper utilizes a difference-in-differences method with a continuous treatment to identify the effect of transfer of farmland ownership in the land-to-the-tiller program on agricultural productivity. The results suggest that the program had a negative effect on agricultural productivity. A 1% decrease in private tenure area might decrease about 500 kilograms of rice yield per hectare. A 1% decrease in area of private tenure dry land might decrease about 35,000 kilograms of sugarcane yield per hectare. Also, such results suggest a 25% of drop in rice yield and 70% of drop in sugarcane yield. The large and negative impact on agricultural productivity of the land reform is conflict with some previous studies. For instance, Duan (2015) uses a similar dataset but finds a positive effect of transfer of land ownership on rice production. Studwell’s (2013) argument that land reform could raise agricultural productivity and hence savings and then provide an initial productive surplus for industrial development might also invalid. However, it might be possible that savings were raised through wealth redistribution. The results of this paper are more aligned with the results of Adamopoulos and Restuccia (2020), who suggest that the misallocation of resource (land) might cause such drop of productivity.

However, there might be some endogenous problem in my method. The difference in decrease in private tenure area in different regions was definitely not random. Some factors that determine both decrease in private tenure area and agriculture productivity will cause estimation bias. Also, the failure of maintaining parallel trend assumptions in the case of sugarcane may also suggest that I miss some important variable. Finally, there might be measurement error on the decrease in private tenure area. Compared with a dataset from Department of Agriculture and Forestry in 1949, the total private tenant area in my dataset is 30% less.

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1. Source: Tables with name “Achievements of The 37.5 per Cent Land Rental Reduction in Taiwan” from Yearbook of the Republic of China (1955-1958) [↑](#footnote-ref-1)
2. Source: Tables with name “Achievements of The 37.5 per Cent Land Rental Reduction in Taiwan” from Yearbook of the Republic of China (1955-1958) [↑](#footnote-ref-2)
3. Source: Taiwan Agricultural Statistics 1901-1955 published by JCRR [↑](#footnote-ref-3)
4. Source: Hsieh and Lee (1966) published by JCRR [↑](#footnote-ref-4)
5. Source: Taiwan Agricultural Statistics 1901-1955 published by JCRR [↑](#footnote-ref-5)
6. Source: Taiwan Agricultural Statistics 1901-1955 published by JCRR [↑](#footnote-ref-6)