Roots of the Taiwanese Miracle? Reassessing Land Reform, 1950-1961 *

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Abstract

We study Taiwan's landmark 1950s land reform, long seen as central to its growth miracle. Phase II of reform—which redistributed formerly Japanese public lands—reduced tenancy, boosted rice yields, and increased the share of labor in agriculture. By contrast, phase III—which reduced tenancy by breaking up larger estates—did not increase agricultural productivity and pushed female labor into manufacturing. In aggregate, land reform increased GDP per worker by only 5.7% from 1956-66. These results challenge the longstanding view that land reform was a major factor behind Taiwan's economic takeoff.

JEL Codes: N55, O10, Q15
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1 Introduction

Land reform has long been viewed by social scientists as a central policy behind the East Asian economic miracle (Amsden 1988; Wade 1990; Rodrik 1995). Each of the major East Asian economies underwent land reform prior to its growth takeoff: Japan and South Korea in the late 1940s, Taiwan in the 1950s, and Mainland China in the 1970s. Among these, Taiwan's is considered "the one to beat"—based on the share of households receiving land, its land redistribution was the most ambitious of its kind in a non-communist country (Studwell 2014).

This paper studies Taiwan's 1950s landmark land reform, which proceeded in three phases. First, in 1949, rents were capped at 37.5% of output. Second, in 1951, public lands formerly held by the Japanese were redistributed to tenants. Third, starting in 1953, larger landholdings were broken up and given to tenants—a "land to the tiller" redistribution. Economists have long argued that these latter two phases of redistribution were central to Taiwan's economic takeoff (Kuo 1983; Griffin, Khan, and Ickowitz 2002; Lipton 2009): they redistributed over 71% of Taiwan's rented land to landless farmers, and in the following years, Taiwan's agricultural productivity increased dramatically, with rice yields rising by more than 40% from 1950-61. However, despite the theorized importance of the 1950s reforms to Taiwan's economic miracle, there has been no modern empirical evidence to support these longstanding claims. This paper aims to fill this gap. By digitizing historical records and exploiting exogenous variation across the latter two phases of redistribution, we provide the first causal evidence of the effects of land reform on Taiwan's economic development.

In stark contrast to the academic consensus, our main finding is that land reform made a limited contribution to Taiwanese growth. Both the phase II public land redistribution and the phase III land-to-the-tiller redistribution significantly reduced the share of tenant households, increasing the share of farmers who owned their land. However, while phase II significantly increased both rice output and yields, phase III had no effect on either. We trace these differential effects to two factors: first, phase II's redistribution of sugar company land relaxed crop choice constraints, allowing farmers to plant a second rice crop; second, unlike phase II, phase III's land-to-the-tiller redistribution lowered median farm sizes by breaking up paddy fields larger than 3 hectares, distorting allocative efficiency. However, even though phase II increased yields, it can still only explain a sixth of their 1950-61 growth, suggesting aggregate changes other than land reform (such as increased fertilizer use and the introduction of high-yield varieties) may have been more important.

Moving beyond agriculture, we find that phase II and III of reform also had different effects on structural change. On average, townships' share of primary sector workers in Taiwan fell by 17 percentage points from 1950 to 1961, while the secondary (industrial) share rose by 1 percentage point and the tertiary (services) share rose by 15 percentage points. However, phase II of redistribution increased the share of workers in the primary sector while *shrinking* the share in the secondary sector. In effect, then, by increasing agricultural productivity and likely real wages, phase II encouraged the retention of workers in agriculture. By contrast, phase III had

the reverse effect, decreasing the share of primary sector workers and increasing the share in other sectors—most notably, increasing the share of women involved in manufacturing.

Finally, we consider how much land reform mattered in the aggregate. By embedding our empirical findings into a simple theoretical framework of structural change, we find that land reform caused Taiwanese GDP per worker to increase by 5.7% from 1956 to 1966—a period when real GDP per worker grew by 101%. Altogether, this suggests that land reform was not a major factor in Taiwan's growth miracle.

This paper's findings complicate conventional, favorable views of Taiwanese land reform, which have also tended to lump the public and private land redistributions together as one unalloyed success. Among Western scholars, there is a strong historical consensus that Taiwan's land reform raised agricultural yields—most of all in rice, the main staple crop (Kuo 1983; Mao and Schive 1995; Studwell 2014). In this narrative, land reform helped boost agricultural incomes, increase economic output, and reduce rural poverty. Some scholars also credit land reform with Taiwan's unusual pattern of rural industrialization, where roughly half of manufacturing value-added came from rural areas in 1971 (Ho 1979; Wade 1990; Hamilton and Kao 2018). By contrast, we find that phase II can explain only a small fraction of the growth in rice yields from 1950-61, while phase III had little observable effect. Conversely, it was phase III that had the strongest local effects on industrialization. These results speak to a more nuanced, ambivalent literature among Taiwanese scholars that is reassessing longstanding claims about the 1950s land reform—a pillar of legitimacy for the authoritarian Nationalist regime (Z.-Y. Chen 2011; Hsu and Liao 2017; Lin 2021).

This paper contributes to a growing body of research reexamining East Asian land reforms, including Kitamura (2022), which studies Japan's reforms in the late 1940s, Kim and Lee (2024), which studies South Korea's 1950s redistribution and the effect on human capital accumulation, and Ferguson and Kim (2023), which studies China's 1970s decollectivization. More broadly, it contributes to the larger debate around land reform, which remains one of the oldest and most contentious policies in development. Prior research has raised the possibility that redistributive land reform could promote both equity *and* efficiency (Banerjee 1999), particularly through the "inverse farm size-productivity" relationship, where smaller farms are observed to be more productive than larger ones. For instance, Foster and Rosenzweig (2017) finds that small farms can be more efficient than larger ones, while Adamopoulos and Restuccia (2014, 2020) finds that reducing farm sizes reduces efficiency. This paper adds a key data point to that debate—despite longstanding views that Taiwan's shrinking of farm sizes boosted productivity, we do not find evidence that the famous land to the tiller redistribution increased rice yields. This helps reconcile Taiwan's historical experience with more recent, disappointing episodes of land reform.

The rest of the paper proceeds as follows. Section 2 outlines the historical context around land reform. Section 3 explains our data sources. Section 4 presents our empirical strategy. Section 5 presents our main results. Section 6 discusses the aggregate implication of land reform. Section 7 concludes.

2 Historical Context

2.1 Prelude to Reform

Taiwan was colonized by Japan in 1895. From the start, the colonial regime invested considerable effort into developing Taiwan's administrative and physical infrastructure. For instance, from 1898 to 1905, the colonial government conducted a cadastral survey to delineate property rights and collect taxes.[1] Starting in 1900, the colonial regime also began investing in Taiwan's sugar industry, eventually making it one of the key suppliers to Japan's domestic market. By the 1930s, Taiwan and its sister colony Korea supplied more than 90% of the sugar and 98% of the rice imported by Japan (Ho 1984).

In 1945, after Japan lost the Second World War, control of Taiwan passed to the Republic of China, a one-party state run by Chiang Kai-shek's Nationalist Party.[2] Under Nationalist rule, tensions grew between the local Taiwanese and the mainlanders. On February 28, 1947, after Nationalist troops shot a crowd of civilians, the Taiwanese rose up across the island, taking control of urban areas (Minns and Tierney 2003). The Nationalists rushed in reinforcements and violently crushed the uprising, killing thousands. Martial law was then imposed, which was not lifted for another forty years.

Meanwhile, the Nationalists were losing control of the Chinese mainland to Mao Zedong's Communists, who won vast rural support with their promises of land reform. In 1949, the mainland regime collapsed, and around a million Nationalist soldiers and refugees fled to Taiwan (Yap 2021). As the party regrouped, Nationalist leaders recognized that they had been defeated on the mainland largely because they had lost the support of China's peasantry (Myers 2009). Moreover, the February 28 incident, led by urban elites, made clear that they needed a local base of support. To secure its hold on Taiwan, the Nationalist government began an ambitious land reform program—one of the most extensive in a non-communist country.

2.2 Land Reform

When Taiwan was a Japanese colony, the standard rental agreement was based around a fixed rent paid in-kind at the end of the year, which the landlord would set based on the land's potential output.[3] Rents for paddy land were around 50%, and those for dry land around 35% (Yeh 1996, 2001, 2007).

However, by the KMT's takeover in 1945, wartime disruption had caused rural conditions to deteriorate rapidly (Booth and Deng 2017). With scarce arable land and a rapidly growing population, pressure to feed the population was immense. Landlessness rose, as did agricultural

1. Koo (2011) studies this particular institutional change, and finds that it resulted in a significant increase in land prices as well as greater investment in organic fertilizer.

2. "Nationalist Party" is the common translation of the party's Chinese name, Kuomintang, or KMT. We will use the two names interchangeably.

3. Some sources, such as Cheung (1969) and Hsiao (1975), erroneously claim that Taiwan operated under a share-cropping system, but Barrett (1984) shows that this is based on a misreading of rental agreements.

rents—in a 1948 household survey, rents averaged 56.8% of yields, reaching as high as 70% in some counties (C. Chen 1961). By global standards, even the largest Taiwanese farms were not particularly large—over 60 percent of owner-cultivators owned less than 1 *chia* (around 1 hectare)—but tenants were vulnerable to eviction, as contracts were rarely written down and often indefinite in length.[4] Wolf Ladejinsky, an American economist who had helped to design Japan's land reform, described the appalling conditions in a 1949 field visit:

> Of all the farmyards I have seen in the Far East, Southeast Asia, and in the Middle East, that of the average Taiwanese tenant is among the worst, both in appearance and in equipment. Tenants' huts, so-called barnyards, equipment, and livestock, as well as their health point to nothing but poverty (Ladejinsky and Walinsky 1977).

To address these conditions and shore up its support among Taiwan's farmers, the Nationalist government passed three major land reform laws starting in the late 1940s. These reforms were funded in large part by aid from the United States, which set up the Sino-American Joint Commission on Rural Reconstruction (JCRR) to oversee implementation and provide technical assistance.

The first phase of land reform, passed in 1949, established fixed rents based on 26 possible grades of land productivity, with a maximum rent of 37.5% of the annual yield. (This law is thus commonly called the 375 rent reduction.) The law also required that all contracts exist in writing and last for at least six years. New tenancy committees of both tenant farmers and landlords supervised the new contracts and adjudicated any disputes. By the end of 1949, 302,000 farm households had signed 393,000 new lease contracts, representing around 256,000 *chia* (248,300 hectares) of land. However, there was still a widespread recognition that rent reduction alone was not enough to address the problems of Taiwan's rural inequality (Yeh 2012).

The second phase of land reform, passed in 1951, redistributed most public lands—around 20% of all arable land on Taiwan (C. Chen 1961). Most of these lands were confiscated from private Japanese colonists expelled from Taiwan—in particular, the four major Japanese sugar corporations, which the Nationalists consolidated into the single Taiwan Sugar Company (Williams 1980). After a trial run in 1948, public land was sold in six lots from 1952 to 1958, starting with land owned by local governments, then proceeding to land owned by public enterprises like the Taiwan Sugar Company.[5] Much of this sugar company land had already been leased to tenants in a 1947 law; pressure from American advisors, including an appeal from the economist Wolf Ladejinsky to Chiang Kai-shek, eventually led the government to order the outright transfer of the Company's land as part of the broader land reform program in 1952 (Huang 1992).[6] Prices were set at 2.5 times the total annual yield, to be paid in-kind in twenty biannual installments.

4. 1 *chia*, the standard area unit in Taiwan, is 0.9699 hectares.

5. C. Chen (1961) notes that the first (small) public land sale occurred in 1948, but the remainder of the program was put on hold until 1951 to concentrate on implementing the 375 rent reduction. There was also an additional seventh public land sale in 1964, after our study period.

6. Chung (2002) analyzes the influence Ladejinsky's letter had on the way the KMT dealt with the land of Taiwan Sugar Company.

Ultimately, 139,688 households bought land as part of the program, with an average purchase size of around 0.5 hectares.

The third phase of land reform, passed in 1953, was the largest in scope. This "land-to-the-tiller" reform broke up holdings over key size cutoffs and distributed the land to the tenants. These cutoffs were determined roughly by land quality; for land of average fertility, the cutoff was 3 hectares for paddy land and 6 hectares for dry land. Landlords were compensated either with land bonds (claims on future agricultural output) or shares of state-owned industrial enterprises, both of which were likely undervalued (Liu 1992).[7] A cadastral survey in 1952, supervised by the JCRR, helped identify the owners of plots for this redistribution. Through this last stage of reform, around 143,568 *chia* of arable land was transferred to 194,823 farming households (C. Chen (1961), pg 69).[8] To prevent the re-consolidation of large holdings, recipients were banned from selling their land for 10 years, unless the land was paid off early. The government also began regular follow-ups to ensure that the redistribution would not be reversed.

Figure 1 shows the transformative change in Taiwan's land ownership distribution between 1950 and 1961. The overall distribution shifts to the right: in the median township, the share of households who fully owned their land doubled, from 32% in 1950 to 64% in 1961. All told, the latter two stages of land reform directly redistributed 215,231 hectares of land, or 24% of Taiwan's 1950 total arable land area, and the share of tenant households fell from 36.3% to 21.5%.[9] The third stage of reform, the Land-to-the-Tiller law, was roughly double the size of the second stage public land redistribution in terms of area redistributed, and around 40% larger in terms of the number of households affected.

Figure 2 maps the second and third stage redistributions. The second stage of reform was concentrated in the south, in the counties of Changhua, Chiayi, and Pingtung, while the third-stage land-to-the-tiller redistribution was concentrated more in the north. The missing areas (shaded in white) in the interior of the island are mountainous, thinly populated, and unlikely to alter our basic results. In the appendix, Figure A.1 further maps the change in tenancy share and in rice yield from 1950 to 1961.

3 Data

3.1 Sources

This paper combines several sources of archival data to measure the effects of land reform. First, to measure the effects of reform on land tenure, we digitized the JCRR's 1950 *Report of*

7. One concern is that the stock compensation may have encouraged smallholder landlords to enter industry, providing another channel for land reform's effects (Chu 2022). However, Hong (2021) shows that board membership of these public enterprises after 1954 was dominated by prewar local elites, not by landlords compensated for land redistribution.

8. One immediate consequence of the land-to-the-tiller policy, oftentimes overlooked in the literature, is the breakdown of joint land ownership. Nearly 100,000 chia of arable land transferred was confiscated from around 87,000 joint owners, according to *Land Tenure Statistics in Taiwan* (1952, 1955).

9. Data are based on Tang (1954) and C. Chen (1961).

Investigation on Ownership and Operation of Arable Land to measure the pre-reform distribution of land.[10] For the post-reform distribution, the 1961 agricultural census provides a comprehensive set of variables on land ownership, farming labor inputs, and crop yields. To be consistent with the available tenure data, our main outcomes below are long differences between 1950 and 1961, pre- and post-land reform.

For outcome variables, our main source of data is Taiwan's county guidebooks, which we have digitized for the first time. In 1950, Taiwan was divided into 21 counties and municipalities, which were further sub-divided into 361 townships. Every year, each county or municipal government compiled a guidebook that summarized socio-economic statistics at the township level, such as population, agricultural output, and employment by industry. A detailed household registration system, akin to the *hukou* on the mainland, also recorded statistics on births, deaths, and the township population share of migrants. We use data from Taiwan's Food Statbook from 1950 through 1961 for additional data on agricultural production.

One concern with this kind of historical data is the consistency of geographical units over time. The administrative divisions of postwar Taiwan mostly followed those of the 1920 Japanese colonial system, when the main island and the Penghu archipelago were divided into 342 townships. After 1945, the Nationalist government simply changed the names of Japanese divisions. Although there were some township splits during our study time period, the overall number of townships remained stable (370 in 1952-1960; 371 in the 1960s). We track name changes as well as splits and merges, treating 1956's set of divisions as authoritative.[11] We then pair our administrative data with open source Geographic Information System (GIS) data on the 1955 township borders from the Center for GIS, RCHSS, Academia Sinica.[12] As land reform largely excluded major cities, our main analysis focuses on non-urban townships, giving us a sample size of around 250 observations.[13] To measure non-agricultural outcomes, we digitize detailed demographic data from Taiwan's household registration system in 1955, as well as the 1956 and 1966 population censuses.[14] These sources contain township-level population counts by gender and place of origin, while the 1956 and 1966 censuses also contain detailed age distributions, education statistics, and occupation by sector and gender.

To test balance over colonial era statistics, we bring in Japanese data from the 1941 *Agricultural Basic Survey*, and the 1943 *Taiwan Rice Highlights* report. We also merge in township-level potential yield data from the UN FAO's Global Agricultural Ecological Zones (GAEZ) dataset, to measure regions' agricultural fertility.

10. It is worth noting that the post-war cadastral survey may be imprecise; however, it provides a baseline reflection of ownership status close to that at the end of the Japanese Era (Hou 1988).

11. We thank Kelly Olds of National Taiwan University for providing a comprehensive locality coding system that tracks the division changes from 1905 to 1966.

12. This data is publicly accessible at http://gissrv4.sinica.edu.tw/gis/twhgis/

13. We exclude townships with fewer than 1% quantile households (328 households), which excludes only one township.

14. We thank Kelly Olds again for generously sharing digitized versions of 1955 and 1966 population censuses, as well as the 1947, 1951, and 1954 establishment-level directories.

3.2 Summary Statistics

Table 1 summarizes our key variables, measured at the township level. In the average township, 8 percentage points of arable land were transferred in phase II of land reform, while 16 percentage points were transferred in phase III. The share of tenant farmer households simultaneously collapsed by 24 percentage points, while the share of full landowner households rose by 26 percentage points. At the same time, agricultural growth was rapid: from 1950 to 1961, rice output in the average township grew by 0.39 log-points (48%), almost entirely attributable to a 0.36 log-point (43%) increase in yields, rather than cultivated area. The population of the average township grew by 0.41 log-points (51%). In education, the share of the population with at least primary level schooling also grew by 12 percentage points, but the gains in middle school, high school, and higher education were relatively modest. In terms of employment, the share of those occupied in the primary sector (primarily farming, fishing, and mining) fell by 17 percentage points, a major structural change. However, most of this labor reallocated to the tertiary (services) sector, not the secondary sector (manufacturing, construction, and utilities).

4 Empirical Strategy

This paper's main focus is causally identifying the effects of the phase II and III redistributions in Taiwan.[15] A natural concern is that the amount of land redistributed in each phase is correlated with social and economic variables that shaped later growth, complicating a causal interpretation. Table A.1 shows the regressions of phase II and III transfer shares on a battery of pre-period characteristics, with the amount of land transferred in phase III in particular significantly positively related to pre-reform manufacturing and infrastructure.

To address these concerns, we use instrumental variables strategies to estimate the effects of the two phases of Taiwanese land redistribution. For each phase of land reform $p \in \{2,3\}$, we estimate the following set of equations:

$$\Delta LandTransfers_{i,p} = \beta_0 + \beta_1 Z_{i,p} + X_i'\delta + \varepsilon_i \tag{1}$$

$$\Delta y_i = \gamma_0 + \gamma_1 \Delta LandTransfers_{i,p} + X_i'\Gamma + \eta_i \tag{2}$$

where for township i, Δy_i is the long-differenced outcome, $Z_{i,p}$ is the instrument for phase p (in phase II, the 1941 share of Japanese-owned land; for phase III, the 1950 share of land above the 3-hectare cutoff), $\Delta LandTransfers_{i,p}$ is the change in land transfers between 1950 and 1961 (where the 1950 pre-reform amount is assumed to be 0), and X_i is a vector of controls.

To isolate the effect of each individual phase of land reform, in each regression we control

15. The appendix presents regression evidence for the effects of phase I of land reform, the 375 Rent Reduction, though these results may only be interpreted as strictly correlational. Yeh (2012) shows that up to 1951 (prior to phase II), because phase I simply decreased the lump sum rent instead of the marginal rental rate, it had little effect on productivity. While the phase I reform was in effect during our study period, our falsification test (Table 2) suggests that tenancy changes were not significantly related to either later phase of land reform.

for the other phase of land reform in the vector X_i—i.e., for phase II, we control for the share of land transferred in phase III, and for phase III, we control for the share of land transferred in phase II. By including long-differenced outcomes with an intercept, our specification is numerically equivalent to a model with township-level fixed effects and year effects, meaning that our coefficients hold fixed any time-invariant township characteristics and any cross-Taiwan changes between 1950 and 1961. Additional socio-economic controls will be introduced in the falsification test section. We cluster using Conley (1999) standard errors to account for potential spatial correlation, using a Bartlett kernel with a 50 kilometer cutoff. The following section explains our instruments in greater detail.

4.1 Phase II: Public Land Redistribution

Starting in 1951, the Nationalist government began redistributing public lands, most of which had been confiscated from the departing Japanese. To identify the effect of this land reform, we instrument for the share of township land that was redistributed with the share of land that was Japanese-owned in 1941.

The critical exclusion assumption is that the share of Japanese-owned land was unrelated to outcome variables except through the mechanism of greater redistribution after 1951. We argue for this primarily on historical grounds. Prior to the handover to the Republic of China, Japanese-owned lands were worked in a way similar to local Taiwanese-held lands. In particular, even though most Japanese-owned land was contracted out to large sugar companies, sugar cultivation in colonial Taiwan followed a rather unusual model of small-scale farming:

> In the early twentieth century, Western colonial powers established extensive sugar plantations in Latin America, Indonesia, and elsewhere... In colonial Taiwan, however, the Japanese acquired sugarcane largely via contractual arrangements with small family farms... In the beginning stages of colonial rule, Japanese private capital, in the face of persistent family farms, tended to avoid direct involvement in agricultural production, preferring to exploit the peasant producers through market control and the provision of credit. Nevertheless, supported by the colonial state, a modern family-farming agriculture was created in order to facilitate capital accumulation by the Japanese (Ka 1995).

Taiwan's relatively strong system of land rights, intended to win the support of local landlords for the colonial regime, made it difficult for sugar companies to amass land through coercion, as the Dutch did on Java. Instead, the Japanese left the basic structure of smallholder farming intact, contracting with these small farms for cane but maximizing profits by gaining control of the milling, refining, and marketing of sugar (Cheng, Fan, and Wu 2022). The sugar companies then used a system of advances to ensure that farmers planted sugar (Koo and Wu 1996; Williams 1980). Similarly, most rice was also grown on small family farms, where Japanese attempts at vertical integration were less successful (Grabowski 2002). These practices persisted with the

handover of Taiwan to the Nationalists, and the consolidation of the Japanese sugar corporations into the Taiwan Sugar Company. Thus, the 1951 public land redistribution was a policy shock that separated areas with more and less Japanese-owned land, but were otherwise initially operating under a similar system of small family farming.

4.2 Phase III: Land to the Tiller

The 1953 Land to the Tiller law set 3 hectares as the maximum holding size for paddy land of average quality, with any land above that cutoff eligible for redistribution. To estimate the effect of the phase II land reform, we therefore instrument for the amount of land transferred using the pre-reform share of township land in holdings just above the 3 hectare retention cutoff.

The JCRR's 1950 report contains township-level data on the size distribution of private estates, with counts of the holdings that fall into bins of 0-0.5 hectares, 0.5-1 hectares, 1-2 hectares, 2-3 hectares, 3-5 hectares, 5-7 hectares, etc. We convert these counts into land area by multiplying the number of holdings by the midpoint size of each bin: for example, 20 holdings in the 2-3 hectare bin means $20 \times 2.5 = 50$ hectares of land in 2-3 hectare estates.[16] In the appendix, Figure A.2 and Figure A.3 show the national distribution of raw counts of estates and the amount of land, respectively. In 1950, the vast majority of estates in Taiwan, 65% were managed in estates smaller than one hectare. Another 19% were between one and two hectares. As a share of land, however, roughly half of private land was held in estates larger than five hectares.

To construct our instrument, we take the amount of land just above the 3 hectare cutoff and divide it by the amount of land in the bin just below the 3 hectare cutoff to normalize it. Formally, the 3-hectare cutoff instrument is constructed as follows:

$$Z_{i,3} = \frac{\text{Area in 3-5 ha bin}_i}{\text{Area in 2-3 ha bin}_i}. \tag{3}$$

We also control for the share of land in estates less than 2 hectares and greater than 5 hectares. The identification assumption then becomes that, holding fixed the land held in 2-5 hectare estates, changes in township outcomes were unrelated to the amount of land above the 3 hectare cutoff except through the channel of greater land transfers. Loosely, this can be thought of as related to a fuzzy regression discontinuity design where, conditioning on a certain threshold around a policy cutoff, greater probability mass on one side of the cutoff is as good as randomly assigned.

4.3 Falsification Tests

The previous sections outlined historical and design-based justifications for the exogeneity of our land reform instruments. A natural concern, however, is that they are still correlated with

16. Table A.8 shows that our main regression results are robust to using the minimum and maximum of each bin to construct the instrument and the controls.

economic, demographic, and other characteristics that may violate the classical exclusion assumption. We can provide support for this assumption by estimating the relationship between each of our instruments and a battery of socio-economic variables prior to the reform:

$$y_i = \delta_0 + \delta_1 Z_{i,p} + \theta_i. \tag{4}$$

where for township i, y_i is the pre-period outcome, $Z_{i,p}$ is the instrument in phase p, and θ_i is an error term, which we cluster using a spatial Bartlett kernel with a 50 kilometer cutoff.

Table 2 presents the estimates of Equation 4. Recall that our main specification Equation 2 is estimated in long-differences with an intercept—numerically equivalent to including fixed effects and year effects. In the first rows we consider *changes* in key pre-period outcomes, akin to a test of parallel trends in a differences-in-differences specification. However, in the second set of rows, we also consider the levels of pre-period characteristics that may have caused post-treatment differences between areas that saw more and less land reform—in particular, potential land yield, access to infrastructure and existing industrial capacity.

Column 1 in Table 2 examines if areas with more Japanese land were on different trends or had different characteristics prior to reform. We find that a township's Japanese land share is not significantly related to pre-reform increases in the share of tenants, changes in the median farm size, growth in population, or changes in rice yields—suggesting that, prior to land reform, agricultural institutions and production were growing similarly in areas with more and less Japanese land. Townships' share of Japanese land is positively but not significantly related to other characteristics that could plausibly be tied to sugar production: townships with more Japanese land did not have systematically higher sugar cane yields (though the standard error is large), more factories or sugar mills, and were not closer to railways or banks.[17] One variable worth highlighting is the mainlander share of the population in 1955, the earliest available data point showing residents' origin. A reasonable concern is that these new arrivals were settled in areas where they could be granted former Japanese land; however, we do not find evidence supporting this.[18] Broadly speaking, then, these results validate the historical view that Japanese-held land was operated at a similarly small scale to Taiwanese-held land—backing the assumption that areas with more and less Japanese land were largely similar except in their exposure to the second phase of land reform.

Next, column 2 considers the relationship between pre-reform variables and our 3-hectare cutoff instrument for the third phase of land reform. Similar to with the Japanese land variable, we do not find that the 3-hectare cutoff is significantly related to pre-period changes in tenancy, household farm size, rice yields, or population. The 3-hectare cutoff instrument is also not significantly related to most of our battery of pre-reform level variables, except for the number

17. We thank the authors of Huang and Jheng (2021) for providing us with geographical bank branches data.

18. One caveat is that the official statistics started including the household registration of mainlander soldiers (as opposed to general citizens from mainland) since 1969 (Yap 2021). We use the mainlander population share from the 1970 county guidebook and again observe no significant correlation of it with the Japanese land share in 1941.

of 1947 factories—we control for number of factories in 1947 to achieve balance for the rest of variables, and find that our results are qualitatively similar whether or not the control is included. Overall, these results suggest that, in the years before land reform, townships with more land just above the 3-hectare cutoff appeared to be growing on a similar trajectory to townships with relatively less land just below the cutoff.

Informed by the falsification tests and historical knowledge, we add controls in addition to the land transfers in the other stage of reform. For phase II, we control for the phase III transfer share and the 1955 mainland population share; for phase III, we include the phase II transfer share, the share of landholdings outside the 2-5 hectare bandwidth, and the number of factories in 1947. In our main specifications, treatment status is thus balanced across pre-reform agricultural and socio-economic characteristics. We also present the OLS estimates with controls for comparison.

4.4 Instrumental Relevance

Table 3 and Table 4 show the results of the first-stage regressions in Equation 1. In both tables, we consider three specifications: column 1 shows a parsimonious model where we only control for the transfer share from the other phase; column 2 adds latitude and longitude as controls; column 3 is the main model we use for our causal analysis, where we add controls based on historical knowledge and the falsification tests in the previous section.[19]

Both instruments are highly relevant in predicting the amount of land transferred in their respective phases of land reform under our main specifications. Table 3 shows that the share of Japanese-owned land in 1941 can strongly predict the share of land transferred in phase II of land reform, with an F-statistic of 33 in the main specification. Table 4 shows that the ratio of land just above the 3 hectare cutoff to the land just below is a highly relevant predictor of the amount of land redistributed in phase III, with an F-statistic of 24. Figure 3 plots the first-stage scatters of each instrument and its respective phase of land reform, highlighting the clear positive relationships.

5 Empirical Results

5.1 Land Tenure

We begin by studying land reform's effects on tenancy, ownership, and farm sizes. It is not a given that land reform altered the actual institutions on the ground, as reform efforts in other developing countries have often been co-opted by landed elites (Albertus 2015). Testing the effect of phase II and III land transfers on land tenure is thus a critical "zeroth" stage for meaningful effects on downstream socio-economic outcomes.

19. The main specifications for both phases do not include latitude and longitude polynomials as controls. Our specification is equivalent to a panel regression with township fixed effects, which serve as a higher-dimensional control than latitude and longitude.

Table 5 estimates the effect of land reform on tenure outcomes using Equation 2. Firstly, both the phase II public land transfer and the phase III redistribution caused the share of tenant households to fall significantly from 1950 to 1961, by 1.2 and 1.6 percentage points for each percentage point increase in the share of land transferred, respectively. The share of partial landowners (households who owned some land and leased the rest) increased in response to both phases of land reform, though both effects are not statistically significant. The main effect of land reform can be seen in the change in the share of households who fully owned their land. For each percentage point increase in land transfers, phase II increased the share of full landowners by 0.9 percentage points, while phase III increased it by 1.5 percentage points. By contrast, phase II left the median operating size of farms largely unaffected, while phase III significantly shrank the median farm size, by around 0.02 hectares for every 1 percentage point increase in the share of land transferred.

These effects explain a large share of aggregate changes in Taiwan's land tenure from 1950 to 1961. The IV estimates imply that in the mean township, which saw 8% of its land transferred in phase II and 16% in phase III, phase II increased the full landowner share by 7.4 percentage points, while phase III increased it by 23.7 percentage points. This suggests that the bulk of the land ownership changes were brought about by land-to-the-tiller redistribution, not the public land transfer. (The magnitude of the OLS estimates are similarly larger for phase III than for phase II.) Moreover, phase III had a much larger effect on the size of the median farm: our IV estimates imply that in the mean township, phase III shrank the median farm by around 0.3 hectares, from a baseline size of around 0.5 hectares, while the phase II effect was minimal.

The IV estimates are generally larger than OLS, suggesting that OLS may be downward-biased. Table A.1 shows that, using univariate OLS, townships with more phase III transfers were significantly different prior to reform: they had far less agriculture, smaller farm sizes, and far greater access to urban infrastructure. By contrast, our instrumental variables do not show imbalance in these characteristics.[20]

Taken together, these results suggest that both the public land redistribution and the land to the tiller law substantially changed land tenure institutions on the ground, turning rural society in Taiwan from one of tenant farmers to smallholders. However, the two phases of land reform differed significantly in their impact on the *size* distribution of farms—a result with important implications for agricultural productivity.

20. Another possibility is that local average treatment effect (LATE) induced by the IV may simply be larger than the average treatment effect (ATE). Areas with more Japanese-held land may have seen particularly large effects when freed from sugar company constraints, while areas with more land just above the 3-hectare cutoff may have seen proportionally more redistribution, with many already-small plots redistributed further. Particularly for phase III, in townships with more land just above the cutoff (compliers to the treatment), each percentage point of land transferred would have created many more individual plots, moving outcomes like tenancy rates or median farm size proportionally more per unit of land.

5.2 Agriculture

Table 6 shows the effects of the phase II and III redistributions on agricultural outcomes. Our primary focus is rice, Taiwan's main staple crop, covering half of acreage in 1951. We find a stark difference between the phase II public land redistribution and the phase III land-to-the-tiller reform. In the left set of columns, both the OLS and IV estimates show that the public land redistribution significantly increased rice output. The OLS estimates show a 0.7% increase in rice output in response to a 1 percentage point share of land transferred, while our preferred IV estimates show around a 1.6% increase in output. The increase in total rice output can be split roughly evenly between increases in yield (land productivity) and rice acreage. By contrast, in the right columns, we do not find evidence that phase III land-to-the-tiller reform increased rice output or yields—in fact, the point estimate for output is largely negative but insignificant.

We find limited evidence that either phase of land reform affected the growth of other crops. We cannot distinguish the effect of land reform on the output, yield, and area of sweet potato (the second major staple) and soy bean (a key source of protein) from 0. We note, however, that the point estimates on sweet potato and soybean areas are positive, while the point estimate on yield for soybean is negative (though the standard errors on these estimates are wide due to missing data). In the appendix, Table A.2 shows similar null results for the effects on other specialty crops, like cabbage, Chinese (Sino) cabbage, bananas, and pineapples.

One remaining concern is that land reform's main effects may have been on sugar, not rice. Unfortunately, township-level data on sugarcane cultivation does not exist, since sugar production was reported by mill catchment areas, which do not map directly to townships. However, sugar yields in 1960 were still lower than their Japanese-era peak (around 10 tons/ha in 1932), suggesting that land reform's impact was limited. Moreover, most sugar cultivation took place on the remaining holdings of the Taiwan Sugar Company, which phase III left untouched (Hou 1988).

Yield growth mechanisms The IV effects of phase II suggest that in the mean township where 8% of land was transferred, land reform increased rice yields by 6.1%, accounting for only a sixth of 1950-61 aggregate growth. These effects are economically significant, though smaller than previous claims that land reform was the main driver of yield growth (Kuo 1983). By contrast, phase III's yield effects were minimal, conflicting with a prior literature citing large effects (Kuo 1983; Griffin, Khan, and Ickowitz 2002; Lipton 2009). Why did the phase II public land redistribution significantly increase rice yields, while the phase III land-to-the-tiller reform did not?

Our results allow us to immediately rule out several common channels put forward in the land reform literature. First, the granting of land rights to tenants is often hypothesized to increase agricultural productivity by increasing tenants' bargaining power and reducing uncertainty around investment (Banerjee 1999). However, while both phase II and III decreased tenancy and increased the share of full land ownership, we only observe positive yield effects

with phase II, suggesting that land titling alone was insufficient to raise productivity. Second, previous work in land reform has highlighted the inverse farm size-yield relationship—the stylized fact that smaller plots have higher yields across a broad range of contexts—as a potential mechanism by which breaking large plots into smaller plots could boost yields (Lipton 2009; Vollrath 2007). Taiwan's land redistribution has been cited as a key example of this phenomenon (Studwell 2014). Counter to this prediction, however, phase II had no significant effect on median farm sizes but grew yields, while phase III decreased the median farm size but did not increase yields.

Given these findings, a likely explanation is that land reform (namely, phase II) raised yields by relaxing crop choice constraints, allowing land to be used more intensively for rice cultivation. Phase II redistributed land previously contracted to the Taiwan Sugar Company, where "a system of advances... effectively deprived the farmers of freedom of choice" (Williams 1980). Privatization lifted this constraint, causing farmers to shift acreage away from sugar cane towards a second crop of rice (Hou 1988).[21] Table 6 shows phase II significantly increased rice acreage, largely driven by the second crop.[22] In neoclassical models of crop choice, removing a constraint allows for crops to be better allocated to each plot given their conditions, increasing productivity. Moreover, in rice agriculture, planting a second crop of rice typically boosts the yield of the first crop, by helping to fix additional nutrients like nitrogen to the soil (Bray 1994; Li et al. 2019; Yang et al. 2024). Correspondingly, we observe that the bulk of the phase II's positive effects comes from rising yields of the first rice crop (Table 6). By contrast, private lands redistributed under phase III did not benefit from freer crop choice, since they were not previously contracted to the Taiwan Sugar Company. Table 6 shows that phase III left the acreage of the second rice crop acreage largely unchanged. This explains the lack of a significant yield effect from phase III.

If land reform only accounted for one-sixth of overall yield growth, what caused the rest? Two likely explanations are increases in fertilizer use and the introduction of high-yield varieties. From 1950 to 1961, chemical fertilizer use rose from 0.235 tons per hectare to 0.437 tons (Chu 2017), which was largely subsidized through cheaper credit from the Joint Committee on Rural Reconstruction—and, in turn, funded by American aid (Lin 2015). The JCRR also significantly funded the development of agricultural extension services, bringing the widespread adoption of high-yield varieties like Chianong No. 242, which was introduced in 1956 and increased yields in field trials by 10-20% (Wang and Yang 1957). The absence of large effects from land reform shifts the locus of explanation of Taiwan's agricultural miracle to technical developments and increased investment, rather than land reform.

21. Sugarcane takes another year and a half to mature, three times longer than rice, so switching from sugarcane allows for a second rice crop (Koo and Wu 1996).

22. Though we cannot directly observe township-level changes in sugar area, total sugar cane area in Taiwan notably declined by 18% from 1950 and 1961, from 118,452 to 97,245 hectares.

5.3 Non-agricultural Outcomes

Though its agricultural productivity effects were somewhat limited, land reform had stronger effects on non-agricultural outcomes. This section considers both the direct (own-township) effects and the spillover effects on neighboring areas.

Direct Effects First, Table 7 examines the direct effects of land reform on non-agricultural outcomes in a given township. We do not find statistically significant evidence that land reform in either phase II or III affected population growth. Nor do we find evidence that either phase of land reform had significant effects on local educational attainment.

Critically, we find significant effects of land reform on structural transformation that differ by phase. While phase II public land redistribution increased the share of the population engaged in the primary sector (agriculture and mining), the phase III land-to-the-tiller reform reduced it. For phase II, this relative increase in primary sector employment was entirely driven by large decreases in secondary sector (manufacturing, utility, and construction) and, to a lesser extent, tertiary sector (services) employment. (It is worth emphasizing that this primary sector increase was *relative*, in an overall environment of structural change out of agriculture—while the share of primary sector workers fell by 14 percentage points in aggregate, townships with more phase II land reform, on average, saw 1.28 percentage points *less* of a fall in the primary sector share.) By contrast, phase III appears to have decreased primary sector employment, pushing workers into the secondary sector—though this coefficient is not statistically significant.[23]

We can further explore these direct effects by dividing occupation share by gender and subsector. Table 8 shows that phase II land reform increased primary sector employment mostly in farming and herding, while decreasing secondary sector employment mainly in manufacturing; these patterns are reversed for phase III land reform. Moreover, male and female workers sorted into different occupations in the distinct stages of land reform. For phase II, higher agricultural yields pulled both men and (in particular) women out of manufacturing; by contrast, phase III pushed women into manufacturing, while producing no discernible effect for men. Table A.3, which disaggregates by subsectors, shows that much of the increase was driven by employment in textiles.

Spillovers When considering non-agricultural outcomes, it is also critical to take into account spillover effects, particularly on urban townships (where there is less agricultural activity and less land reform). Thus, we estimate the effects of spillovers: the effects of increased land reform in *surrounding* townships on local outcomes. We estimate Equation B.1 and Equation B.2 in the appendix, using the share of Japanese-owned land and relative share of land just above a 3 hectare cutoff within a 50 kilometer radius, respectively, to instrument for neighboring phase II and III transfers, and controlling for the own-township transfers.

23. In Table A.4, through comparing the Industry and Commerce Census data in 1954 and 1976, we find no evidence that either phase contributes to population growth and industrialization in the long run.

Table B.3 shows these spillover results for the full sample of rural and urban townships, while Table B.4 restricts the sample to just urban townships (those classified as *zhen* or *shi* in 1955), where we might expect the effects of industrialization and migration to be the strongest.[24] We find results qualitatively similar to the direct effects of land reform; in particular, phase III decreases the share of employment in the primary sector and increases that in the secondary sector. Unlike with the direct effects, we also observe significant increases in schooling as a result of both phase II and III of reform.[25] We note, however, that while the phase III instrument is balanced across pre-treatment covariates, the phase II instrument is imbalanced, necessitating the addition of a larger vector of socio-economic controls (Table B.2). Moreover, the aggregate change in secondary sector employment in urban townships over this period was just 1 percentage point (Table B.1), suggesting that our large estimated coefficients on structural change reflect local effects, but cannot explain overall industrialization.

Mechanisms We find that phase II of land reform, which increased yields, also increased the share of labor in agriculture; conversely, phase III, which shrank median farm sizes, pushed labor away from agriculture into manufacturing. Phase II's effects are consistent with the prediction of a standard two-sector model where agents choose sectors based on relative real wages. All else equal, higher land productivity is consistent with higher relative real wages in the agricultural sector—by increasing yields, Taiwan's phase II reform pulled labor back towards agriculture. (Section 6 considers the aggregate effect of this structural transformation.)

Phase III, which had little effect on yields, requires additional explanation beyond the classical model. As discussed in the previous section, growing rice is labor-intensive, and (particularly in developing contexts in Asia) yields benefit from the labor of household members who are seen as more socio-economically marginal—women, children, and the elderly (Bray 1994). However, by breaking up Taiwan's already-small holdings, phase III shrank the operating sizes of farms below the level where they could realistically support all this additional labor. In this context, it is not surprising that phase III of land reform pushed labor—in particular, female labor—off the farm to seek work in other sectors of the economy.[26]

These results add a critical social dimension to our understanding of land reform. Factory labor has long been viewed as a critical factor in shaping Taiwanese women's growing economic and social independence throughout the mid-20th century (Kung 1994; Evans 2024), but a link with land reform has not been previously shown. In rural Taiwan, as in many patriarchal societies, men were seen as the primary earners in the household, while women were of secondary

24. Alternatively, we define urban townships to be those with population density in 1951 above the upper quartile, and the results remain unchanged.

25. Galor, Moav, and Vollrath (2009) predicts that land reform may induce increases in human capital investment. Recent studies of land reform have found mixed results in various contexts. Albertus, Espinoza, and Fort (2020) find that Peru's land reform led to a decrease in educational attainment, while Kim and Lee (2024) find that South Korea's land reform boosted human capital accumulation.

26. There may also have been labor effects along the *intensive* margin, where farmers dedicated more of their time off-farm, but we unfortunately cannot observe labor hours in our data.

status, with few property rights of their own (Gallin 1989). In this context, it is not surprising that reductions in farm size led to women being pushed out first—and hence that women's sectoral choices were far more elastic than men's to the real wage changes induced by land reform.

5.4 Robustness Checks

The main concern with our instrumental variables design is that township shares of Japanese-held land and land above the 3-hectare cutoff are correlated with other factors that could have caused the observed socioeconomic effects. For instance, one plausible channel is that areas with more Japanese-held land benefited from greater infrastructure, such as railways or existing factories. In the appendix, Table A.5 considers the effects of both phases of land reform, adding controls for the pre-treatment township variables shown in Table 2, such as pre-reform growth in tenancy and yields, and the pre-reform presence of sugar mills and railway infrastructure. The left columns for each phase show the regressions for *all* the control variables in Table 2, while the right columns show the regressions dropping the control for sugar cane yields (which limits the sample to just 150 observations). Across all specifications, the main results remain qualitatively similar: phase II decreased tenancy, significantly increased rice output, and decreased secondary sector employment, while phase III decreased tenancy and median operating farm size, and had no effect on either rice output or the sectoral employment share. This suggests that pre-reform, Japanese-era characteristics are unlikely to be driving our results.

Among the potential exclusion restriction violations, one concern worth highlighting is if agricultural extension services—including those sponsored by US aid—were correlated with land reform. These programs may have led to increases in technical inputs like fertilizer that were correlated with land reform. Unfortunately, township-level data on fertilizer application is incomplete. In Table A.6, we show (in the limited sample) that both phases of transfer did not lead to faster increases in the use of chemical fertilizer and self-supplied fertilizer, or the development of irrigation length per chia of arable land, though the sample size is low and statistical power is limited. We also have contemporaneous data on the spread of Farmers' Associations (FAs)—local organizations that implemented agricultural policy and provided farmers with access to credit, production inputs (especially chemical fertilizer), and technical knowledge (Looney 2020).[27] Table A.7 shows land reform's effect on the development of Farmers' Associations (FAs). We find limited evidence that land reform increased FAs' financial capital, but generally fail to find evidence that their membership or balance sheets were significantly related to land reform. We also find no significant relationship between land reform and FAs' income growth through its local service of distributing chemical fertilizer.

Another empirical concern is that the implementation periods of the two phases of land reform overlapped. To address this, and isolate the effects of each stage, our main specifications controlled for each township's exposure to the other phase of transfers, as the intention-to-treat

27. Along with Looney (2020), recent studies revisit the role of FAs in promoting a rural-biased policy environment prior to 1970s, and discuss the political economy of the FAs following land reform (Strauss 2020; Luo 2024).

of the two policies is orthogonal by design. However, an alternative approach is to include both instruments simultaneously. In Table A.9, we show results from this alternative specification, in which both phases of transfers are treated as endogenous and instrumented using two instrumental variables. In this just-identified system, the results are both qualitatively and quantitatively similar to those in our main model.

Finally, our main results are also robust to alternative definitions of the main treatment variable. Table A.13 presents the main regression results using land reform transfers per capita (using townships' 1951 population), rather than as a share of land. The results are qualitatively similar, with both phases showing significant decreases in tenancy, but only phase II showing large increases in rice yields and decreases in the secondary sector employment share.

6 Taiwan's Land Reform in Aggregate Perspective

6.1 Land Reform and Aggregate Labor Productivity Growth

To understand the aggregate impacts of land reform on Taiwan, we embed our estimated causal effects into a simple theoretical framework. Consider a two-sector model in which the agriculture (a) and manufacturing (m) sectors produce using Cobb-Douglas technologies: $Y_s = A_s L_s^{\alpha_s} K_s^{1-\alpha_s}$ for sector $s \in \{a, m\}$, where A_s denotes sectoral total factor productivity (TFP), L_s labor input, K_s capital input, and α_s the labor share in sector s. We assume that labor is homogeneous and that markets are perfectly competitive. Under these assumptions, land reform affects aggregate labor productivity through two main channels: (1) the *rice-yield growth* channel, which raises agricultural TFP (A_a), primarily during phase II; and (2) the *labor reallocation* channel, which operates through both phases by reducing the gap in marginal revenue products of labor across sectors.

Table 9 summarizes the contribution of each channel. First, we consider yield growth. We found in Section 5 that phase II increased the rice yield of an average township by 6% while phase III contributed a statistically insignificant effect. Under Cobb-Douglas production, the former translates directly into a 6% increase in marginal labor productivity. Since rice was Taiwan's primary staple crop and the farming employment share in 1956 was 68%, the direct aggregate labor productivity gain from yield growth was around 4%.[28] Second, we consider labor reallocation. Based on the stated assumptions, any sectoral gaps in labor revenue productivity imply misallocation. Building on the development accounting approach from McCaig and Pavcnik (2018), we can formalize the agricultural productivity gap as follows:

$$\frac{MRPL_m}{MRPL_a} = \frac{w_m}{w_a} = \frac{\alpha_m ARPL_m}{\alpha_a ARPL_a}$$

Two common measures of the productivity gap under this framework include relative wages (Vollrath 2011; Herrendorf and Schoellman 2015) and revenue or value-added per worker (Gollin,

28. Under more complex assumptions that take into account the cost of inputs, 4% is an upper bound.

Lagakos, and Waugh 2014; McCaig and Pavcnik 2018). We use the sectoral value-added per worker data from ASHSTAT historical dataset maintained by the Institute of Economic Research at Hitotsubashi University.[29] According to this data set, the overall value added per worker in manufacturing was 5.92 times that of agriculture in 1956.[30] We can calculate the change in aggregate labor productivity through labor reallocation as follows:

$$\frac{s_m^{LR}\left(ARPL_{\text{ratio}}-1\right)ARPL_a}{\left(1-s_a\right)ARPL_m+s_aARPL_a} \tag{5}$$

where s_m^{LR} is the share of labor reallocated to manufacturing from farming, and s_a the share of farming employment in 1956.[31] We calculate s_m^{LR} using the mean effect by gender implied in Table 8. Rows (4) to (8) of Table 9 show that while phase III reallocated female workers from farming to manufacturing, a reverse reallocation triggered by phase II dampened the overall structural transformation. Based on Equation 5, land reform contributed a 1.7% improvement in labor productivity through structural change between 1956 and 1966.

Combining both channels, we estimate that land reform led to a 5.7% increase in labor productivity during our study period. To put this in perspective, real GDP per worker grew by 101% over the same period (roughly 7% annualized). Thus, by 1966, land reform accounted for just 5.7% of Taiwan's aggregate labor productivity growth—at roughly one year of annualized growth, a non-negligible effect, but not a major contributor to Taiwan's rapid GDP takeoff.

6.2 Land Reform and Regional Specialization

Although the *aggregate* contribution of land reform was limited, each phase of land reform had important implications for *regional* specialization.

Figure 4 shows the differential pattern of structural transformation induced by phase II and phase III across townships. We plot the change in townships' sectoral employment shares (based on the estimates in Table 7) against their 1956 employment share. For each phase of land reform, the green line shows predicted growth in townships with treatment intensity above the median of that phase's instrument, and the orange line shows growth in townships with treatment intensity below the median. This allow us to separately assess aggregate economic change and local treatment effects (reflected by the gap between the lines).

Land reform substantially reshaped the geographic distribution of sectoral economic activity in Taiwan. At the aggregate level, all townships saw decreases in agriculture employment between 1956 and 1966—most of the labor was absorbed by the tertiary (services) sector, while

29. The dataset is freely accessible via https://gcoe.ier.hit-u.ac.jp/english/research/database/ashstat_taiwan.html.

30. Gollin, Lagakos, and Waugh (2014) and McCaig and Pavcnik (2018) explain in detail how empirical measures of productivity gaps can be biased due to distortions, measurement errors, and failure to adjust for human capital differences. In our context, although we lack sector-specific data on years of schooling to make such adjustments, this concern is likely minimal given the overall low levels of educational attainment in Taiwan prior to the 1968 education reform.

31. This mirrors Equation (5) in McCaig and Pavcnik (2018).

movement to the secondary sector (industry) remained limited. However, the relative decline of agriculture was less pronounced in areas with greater phase II transfers, and more pronounced in areas with greater phase III transfers: under phase II, more-treated townships experienced an average decline in farming employment of 14.7%, compared to a decline of 18.4% in less-treated townships. Furthermore, townships more intensely treated in phase II experienced slower industrialization than less-treated ones; the pattern is reversed for phase III transfers. Under phase III, more-treated townships saw a 1.8% increase in manufacturing employment share, while less-treated townships experienced only a 0.9% increase. Lastly, the reallocation to the tertiary sector shows no discernible difference between more- and less-treated locations.[32]

In Appendix C, we formalize these findings using a spatial model with non-homothetic demand, heterogeneous agricultural productivity shocks across townships, and a Roy model of sectoral labor supply. Intuitively, increased agricultural productivity sets in motion two countervailing forces: higher wages pull labor back into farming, but non-homothetic preferences increase the demand for manufactured over agricultural goods and induce industrialization.[33] We observe that, across all townships in Taiwan, the agricultural labor share fell, implying that the non-homothetic force dominated. However, the faster yield growth in townships more exposed to phase II led to a less pronounced outflow of labor from agriculture in those areas.

7 Conclusion

The longstanding academic consensus is that Taiwanese land reform—and, in particular, the land-to-the-tiller redistribution—was a major boon to agricultural productivity and a central driver of Taiwan's growth miracle (Kuo 1983; Griffin, Khan, and Ickowitz 2002; Lipton 2009). By digitizing archival data and employing an instrumental variables design, this paper brings new causal evidence to Taiwan's historic land reform—and complicates the traditional narrative. While phase II increased rice yields, it can only explain around a sixth of the roughly 40% increase in the 1950s—and the effect of the famous phase III land-to-the-tiller reform cannot be distinguished from 0. Incorporating the effects of structural change, we find that land reform added about 5.7% of GDP per worker from 1956 to 1966, a significant but by no means major contribution.

These limited findings join a growing qualitative literature by Taiwanese scholars that is skeptical of longstanding Kuomintang claims of land-to-the-tiller's success (Liu 1992; Z.-Y. Chen 2011). For instance, new scholarship suggests that pre-reform land tenure may have been less exploitative than was previously thought (Yeh 2001; Hsu and Liao 2017). Moreover, for the authoritarian KMT, land reform served as an important "state performance of regime values [and]

32. In the appendix, Figure A.5 considers the effects of land reform on manufacturing employment growth by gender. For both phases, the difference between treated (green) and control (orange) townships is more pronounced among female workers, suggesting higher labor supply elasticity with respect to the share of land transferred.

33. We note this implicitly assumes a closed economy. During the 1950s, while inter-township trade was unrestricted, imports of manufactured final goods were constrained due to government regulations and foreign reserve shortages.

was far from benevolent... [often amounting] to authoritarian state exploitation" (Lin 2021). In this light, the conventional wisdom on land reform is perhaps not surprising. Our limited findings may also help reconcile the effects of Taiwan's reform with the disappointing results of more recent episodes of land redistribution, where ambitious land reforms outside of East Asia have not yielded the hoped-for growth effects (see, for instance, Adamopoulos and Restuccia (2020) on the Philippines). Moreover, the differential results between phase II and III highlight that, far from a uniform policy, the *form* of land reform is central: when considering redistribution, policymakers should consider the source of the land, the shape of the existing land distribution, and the potential interactions with the non-agricultural sector.

To close, it is worth noting that this paper has focused exclusively on the economic effects of land reform—but land reform in Taiwan may also have worked through other channels. In particular, the political-economic effects may have been the most crucial. By creating a relatively egalitarian distribution of wealth, Taiwan's land reform may have encouraged the adoption of pro-growth development policies, rather than growth-distorting rent-seeking (Rodrik 1995). Most importantly, the exiled Kuomintang regime may not have survived on Taiwan without the rural power base built by land reform (Albertus 2015)—leading, perhaps, to conquest by the Communists or the emergence of an indigenous Taiwanese regime. On these striking counterfactuals we must remain silent.

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Tables and Figures

Table 1: Summary Statistics

	N	Mean	SD
Treatment variables			
Phase II: Share of land transferred	259	0.08	0.10
Phase III: Share of land transferred	258	0.16	0.12
Phase II land transfers per capita	277	0.01	0.02
Phase III land transfers per capita	281	0.02	0.02
Share of Japanese-owned land (1941)	288	0.11	0.15
Japanese-owned land, p.c. (1941)	313	0.02	0.04
Land Tenure			
Dependent variables			
Δ Share of full landowners 1950-61	252	0.26	0.20
Δ Share of partial landowners 1950-61	252	-0.02	0.14
Δ Share of tenants 1950-61	252	-0.24	0.17
Δ Median farm size 1950-61	252	0.02	0.30
Δ Log-Pop change, 1951-66	305	0.41	0.16
Δ ln Rice output 1950-61	298	0.39	0.47
Δ ln Rice yield 1950-61	293	0.36	0.18
Δ ln Rice area 1950-61	293	0.04	0.43
Δ Share primary school or above, 1951-61	298	0.12	0.07
Δ Share middle school or above, 1951-61	298	0.03	0.02
Δ Share high school or above, 1951-61	298	0.01	0.01
Δ Share higher education, 1951-61	298	0.00	0.00
Δ Occupation share: primary sector, 1956-66	311	-0.17	0.09
Δ Occupation share: secondary sector, 1956-66	311	0.01	0.04
Δ Occupation share: tertiary sector, 1956-66	311	0.15	0.09
Pre-reform variables			
Δ Share of tenants, 1941-50	252	0.03	0.10
Δ Log population, 1942-50	300	-0.03	0.51
Δ Attainable rice yield, low-to-high inputs	308	4075.23	1509.72

Table 2: Balance Table for Phase II and III Transfer Instruments, Shares

	N	Japanese land share (SE)	N	3-5 Ha share/2-3 Ha share (SE)
Δ share of tenants, 1941-50	251	0.12	251	-0.00
		(0.10)		(0.03)
Δ median hhld farm size, 1941-50	251	0.04	251	-0.03
		(0.17)		(0.09)
Δ Attainable rice yield, low-to-high inputs	284	61.43	249	-92.33
		(523.75)		(239.78)
Δ ln Rice yield, 1950-52	261	0.08	249	0.01
		(0.06)		(0.02)
Δ log population, 1942-50	271	-0.07	243	0.09
		(0.14)		(0.06)
Mainlander share of pop., 1955	282	0.04	251	0.01
		(0.03)		(0.01)
Sugar cane yield (kg/ha), 1951	174	422.19	155	-2700.14
		(9100.65)		(4993.02)
Total Manuf. firms, 1947	281	12.38	248	8.08*
		(15.55)		(3.47)
Potential rice yields (FAO-GAEZ)	287	0.48	251	-0.09
		(0.42)		(0.14)
Sugar mill in township = 1, 1947	287	0.20	251	0.12
		(0.16)		(0.07)
Log distance to nearest rail station (km)	279	-0.34	251	-0.41
		(0.58)		(0.21)
Log distance to nearest sugar rail station (km)	279	-1.45	251	0.35
		(1.26)		(0.48)
Number of bank branches (<10km)	280	-1.98	251	0.66
		(1.27)		(0.40)
Employment share in agriculture, 1951	254	0.19	227	-0.09
		(0.11)		(0.05)
Employment share in manufacturing, 1951	254	0.01	227	0.01
		(0.01)		(0.00)

This table shows the estimates of Equation 4, where the outcomes are key pre-treatment socio-economic characteristics, and the independent variables are the Japanese land share instrument (column 1) and the 3 hectare cutoff instrument (column 2). Standard errors are clustered to allow for spatial correlation using a Bartlett kernel with a 50 kilometer cutoff. $^{*} \leq 0.05, ^{**} \leq .01, ^{***} \leq .001$.

Table 3: First-stage Regressions for Phase II Transfers Shares

	(1) Baseline	(2) Lat/Lon Poly.	(3) Main
Share of Japanese-owned land (1941)	0.35***	0.33***	0.36***
	(0.06)	(0.06)	(0.06)
Phase III: Share of land transferred	-0.10*	-0.05	-0.09*
	(0.04)	(0.05)	(0.04)
Mainlander share of pop., 1955			-0.16
			(0.09)
Observations	255	255	255
R^2	0.363	0.379	0.368
F-stat	31.89	27.27	33.31

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table reports estimates for Equation 1, which captures the first-stage relationship between the share of township land transferred by 1961 in Phase II of land reform and the 1941 share of Japanese-owned land. Column (1) presents the most parsimonious specification. Column (2) adds a polynomial in latitude and longitude to control for geographic trends. Column (3) includes all controls from our main specification, guided by both the falsification test and historical context, excluding the latitude and longitude polynomial

Table 4: First-stage Regressions for Phase III Transfer Shares

	(1) Baseline	(2) Lat/Lon Poly.	(3) Main
Relative share of landholdings: 3-5 Ha to 2-3 Ha	0.13***	0.10***	0.12***
	(0.03)	(0.02)	(0.03)
Share of land outside of 2-5 Ha holdings	-0.00	0.05	-0.03
	(0.13)	(0.10)	(0.14)
Phase II: Share of land transferred	-0.32***	-0.18**	-0.32***
	(0.10)	(0.06)	(0.09)
Total Manuf. firms, 1947			0.00
			(0.00)
Observations	248	248	247
R^2	0.240	0.357	0.245
F-stat	22.10	19.11	23.90

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table reports estimates for Equation 1, which captures the first-stage relationship between the share of township land transferred by 1961 in Phase III of land reform and our 3-hectare cutoff instrument. Column (1) presents the most parsimonious specification. Column (2) adds a polynomial in latitude and longitude to control for geographic trends. Column (3) includes all controls from our main specification, guided by both the falsification test and historical context, excluding the latitude and longitude polynomial.

Table 5: Land Tenure Effects of Land Reform

	Phase II				Phase III			
	OLS (SE)	N	IV (SE)	N (F)	OLS (SE)	N	IV (SE)	N (F)
Δ Share of tenants 1950-61	-0.55***	248	-1.19***	248	-1.02***	247	-1.56***	247
	(0.09)	.	(0.21)	30.15	(0.08)	.	(0.32)	22.89
Δ Share of partial landowners	0.08	248	0.26	248	0.25*	247	0.08	247
1950-61	(0.13)	.	(0.27)	30.15	(0.11)	.	(0.36)	22.89
Δ Share of full landowners 1950-61	0.47**	248	0.93**	248	0.77***	247	1.48***	247
	(0.15)	.	(0.35)	30.15	(0.13)	.	(0.45)	22.89
Δ Median farm size 1950-61	0.04	248	-0.10	248	-0.04	247	-1.90*	247
	(0.19)	.	(0.42)	30.15	(0.17)	.	(0.93)	22.89

This table shows the effect of phase II and phase III of land reform on township-level land tenure outcomes. The first group of columns reports the simple OLS coefficient estimate (with controls for phase III transfers and mainlander population share in 1955 for phase II, and controls for phase II transfers, land area outside the 2-5 hectare bin, and total manufacturing firms in 1947 for phase III) while the second group of columns reports the instrumental variable estimate of γ_1 from Equation 2. Standard errors are below in parentheses. We also report the N of each regression and, for the IV, the first-stage F-statistic. Standard errors are spatially clustered using a Bartlett kernel with a 50km cutoff. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 6: Agricultural Effects of Land Reform

	Phase II				Phase III			
	OLS (SE)	N	IV (SE)	N (F)	OLS (SE)	N	IV (SE)	N (F)
Δ ln Rice output 1950-61	0.71**	251	1.64***	250	-0.15	247	-0.15	247
	(0.23)	.	(0.46)	29.51	(0.29)	.	(0.63)	22.89
Δ ln Rice output (1st crop), 1950-61	1.22**	244	1.06	243	0.67	240	1.65	240
	(0.43)	.	(0.85)	30.80	(0.51)	.	(0.93)	21.93
Δ ln Rice output (2nd crop), 1950-61	0.37	244	1.39	243	-2.54*	240	-0.75	240
	(0.89)	.	(1.37)	30.80	(1.04)	.	(2.64)	21.93
Δ ln Rice yield 1950-61	0.28	251	0.76**	250	-0.25**	247	-0.00	247
	(0.16)	.	(0.24)	29.51	(0.10)	.	(0.37)	22.89
Δ ln Rice yield (1st crop), 1950-61	0.32	244	1.14***	243	-0.42**	240	0.61	240
	(0.22)	.	(0.29)	30.80	(0.14)	.	(0.73)	21.93
Δ ln Rice yield (2nd crop), 1950-61	0.15	251	0.29	250	-0.24	247	-0.23	247
	(0.22)	.	(0.42)	29.51	(0.14)	.	(0.57)	22.89
Δ ln Rice area 1950-61	0.42*	251	0.88*	250	0.10	247	-0.14	247
	(0.20)	.	(0.39)	29.51	(0.27)	.	(0.55)	22.89
Δ ln Rice area (1st crop), 1950-1961	0.98*	245	0.16	244	1.03	241	1.12	241
	(0.43)	.	(0.88)	31.58	(0.54)	.	(0.76)	21.68
Δ ln Rice area (2nd crop), 1950-1961	0.62**	251	1.10**	250	0.00	247	-0.25	247
	(0.24)	.	(0.35)	29.51	(0.31)	.	(0.68)	22.89
Δ ln Sweet potato output 1950-61	0.80*	203	0.39	202	-0.74	195	0.28	195
	(0.40)	.	(0.71)	26.02	(0.41)	.	(0.70)	19.30
Δ ln Sweet potato yield 1950-61	0.20	203	0.28	202	-0.37	195	0.04	195
	(0.28)	.	(0.46)	26.02	(0.24)	.	(0.41)	19.30
Δ ln Sweet potato area 1950-61	0.61*	203	0.11	202	-0.37	195	0.25	195
	(0.27)	.	(0.60)	26.02	(0.28)	.	(0.56)	19.30
Δ ln Soybean output 1950-61	0.13	92	0.29	91	0.61	84	4.45	84
	(0.96)	.	(1.77)	19.38	(1.02)	.	(4.98)	5.66
Δ ln Soybean yield 1950-61	-0.09	91	0.56	90	0.37	83	4.47	83
	(0.94)	.	(1.45)	19.50	(0.66)	.	(3.31)	7.33
Δ ln Soybean area 1950-61	0.21	91	-0.34	90	0.33	83	-0.55	83
	(0.58)	.	(1.26)	19.50	(1.03)	.	(3.64)	7.33

This table shows the effect of phase II and phase III of land reform on key township-level agricultural outcomes. The first group of columns reports the simple OLS coefficient estimate (with controls for phase III transfers and mainlander population share in 1955 for phase II, and controls for phase II transfers, land area outside the 2-5 hectare bin, and total manufacturing firms in 1947 for phase III) while the second group of columns reports the instrumental variable estimate of γ_1 from Equation 2. Standard errors are below in parentheses. We also report the N of each regression and, for the IV, the first-stage F-statistic. Standard errors are spatially clustered using a Bartlett kernel with a 50km cutoff. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 7: Non-agricultural Effects of Land Reform

	Phase II				Phase III			
	OLS (SE)	N	IV (SE)	N (F)	OLS (SE)	N	IV (SE)	N (F)
Δ Log-Pop change, 1955-66	0.12	256	0.04	255	0.04	247	-0.12	247
	(0.09)	.	(0.11)	32.20	(0.08)	.	(0.17)	22.89
Δ Occupation share: primary sector,	0.16**	255	0.15	254	-0.10	246	-0.20	246
1956-66	(0.06)	.	(0.09)	32.05	(0.07)	.	(0.20)	23.29
Δ Occupation share: secondary sector,	-0.07**	255	-0.13**	254	0.05*	246	0.12	246
1956-66	(0.02)	.	(0.05)	32.05	(0.02)	.	(0.07)	23.29
Δ Occupation share: tertiary sector,	-0.08	255	-0.03	254	0.05	246	0.08	246
1956-66	(0.06)	.	(0.10)	32.05	(0.07)	.	(0.22)	23.29
Δ Share primary school or above,	0.04	252	0.00	251	-0.00	243	-0.20	243
1951-61	(0.04)	.	(0.09)	31.19	(0.04)	.	(0.14)	23.47
Δ Share middle school or above,	-0.01	252	-0.02	251	0.01	243	-0.01	243
1951-61	(0.01)	.	(0.03)	31.19	(0.01)	.	(0.03)	23.47
Δ Share high school or above, 1951-61	-0.00	252	-0.02	251	0.00	243	-0.01	243
	(0.01)	.	(0.02)	31.19	(0.01)	.	(0.01)	23.47
Δ Share higher education, 1951-61	-0.00	252	-0.01	251	0.00	243	-0.00	243
	(0.00)	.	(0.01)	31.19	(0.00)	.	(0.00)	23.47

This table shows the effect of phase II and phase III of land reform on key township-level non-agricultural outcomes. The first group of columns reports the simple OLS coefficient estimate (with controls for phase III transfers and mainlander population share in 1955 for phase II, and controls for phase II transfers, land area outside the 2-5 hectare bin, and total manufacturing firms in 1947 for phase III) while the second group of columns reports the instrumental variable estimate of γ_1 from Equation 2. Standard errors are below in parentheses. We also report the N of each regression and, for the IV, the first-stage F-statistic. Standard errors are spatially clustered using a Bartlett kernel with a 50km cutoff. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 8: Land Reform and Changes in Occupation Share, by Gender

	Phase II				Phase III			
	OLS (SE)	N	IV (SE)	N (F)	OLS (SE)	N	IV (SE)	N (F)
Δ Farming occupation share (male), 1956-66	0.19**	255	0.03	254	-0.10	246	-0.16	246
	(0.06)	.	(0.17)	32.05	(0.07)	.	(0.19)	23.29
Δ Farming occupation share (female), 1956-66	0.01	255	0.28	254	0.01	246	-0.14	246
	(0.22)	.	(0.22)	32.05	(0.18)	.	(0.58)	23.29
Δ Manufacturing occupation share (male), 1956-66	-0.04*	255	-0.08*	254	0.03	246	0.04	246
	(0.02)	.	(0.04)	32.05	(0.02)	.	(0.05)	23.29
Δ Manufacturing occupation share (female), 1956-66	-0.14**	255	-0.21**	254	0.05	246	0.43*	246
	(0.05)	.	(0.08)	32.05	(0.08)	.	(0.17)	23.29
Δ Service occupation share (male), 1956-66	-0.10	255	-0.03	254	0.10	246	0.10	246
	(0.06)	.	(0.11)	32.05	(0.10)	.	(0.28)	23.29
Δ Service occupation share (female), 1956-66	0.10	255	0.10	254	-0.24***	246	-0.25	246
	(0.08)	.	(0.11)	32.05	(0.07)	.	(0.16)	23.29

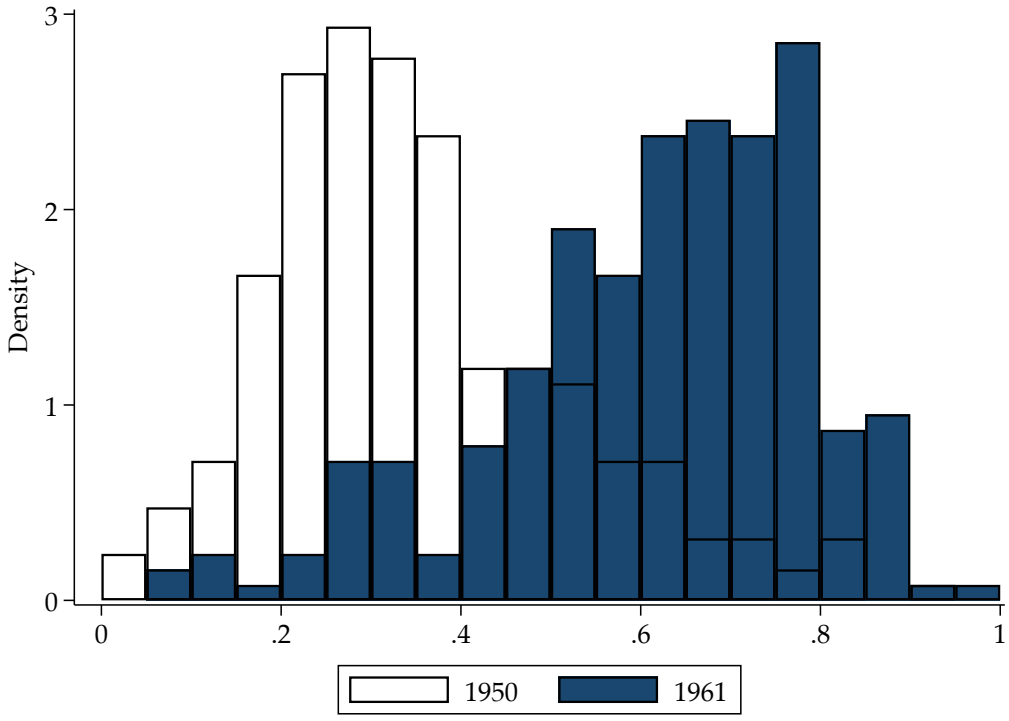
This table shows the effect of phase II and phase III of land reform on changes in sector of occupation by gender. The first group of columns reports the simple OLS coefficient estimate (with controls for phase III transfers and mainlander population share in 1955 for phase II, and controls for phase II transfers, land area outside the 2-5 hectare bin, and total manufacturing firms in 1947 for phase III) while the second group of columns reports the instrumental variable estimate of γ_1 from Equation 2. Standard errors are below in parentheses. We also report the N of each regression and, for the IV, the first-stage F-statistic. Standard errors are spatially clustered using a Bartlett kernel with a 50km cutoff. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 9: Land Reform and Aggregate Labor Productivity Growth

	Phase II	Phase III	
I. Rice yield growth			
Mean effect	0.06	0	(1)
Farming employment share, 1956	0.68		(2)
Total effect of yield growth: (1) × (2)	0.0408		(3)
II. Labor reallocation			
Mean effect, male	-0.0064	0	(4)
Employment share, male (1956)	0.79		(5)
Mean effect, female	-0.0112	0.0788	(6)
Employment share, female (1956)	0.21		(7)
Total reallocation: (4)×(5) + (6)×(7)	-0.0074	0.0165	(8)
Agriculture productivity gap ($ARPL_{ratio}$)	5.92		(9)
Agriculture employment share, 1956 (s_a)	0.68		(10)
Total effect of reallocation: based on Equation 5	0.0170		(11)
Aggregate labor productivity growth: (3) + (11)	0.0578		

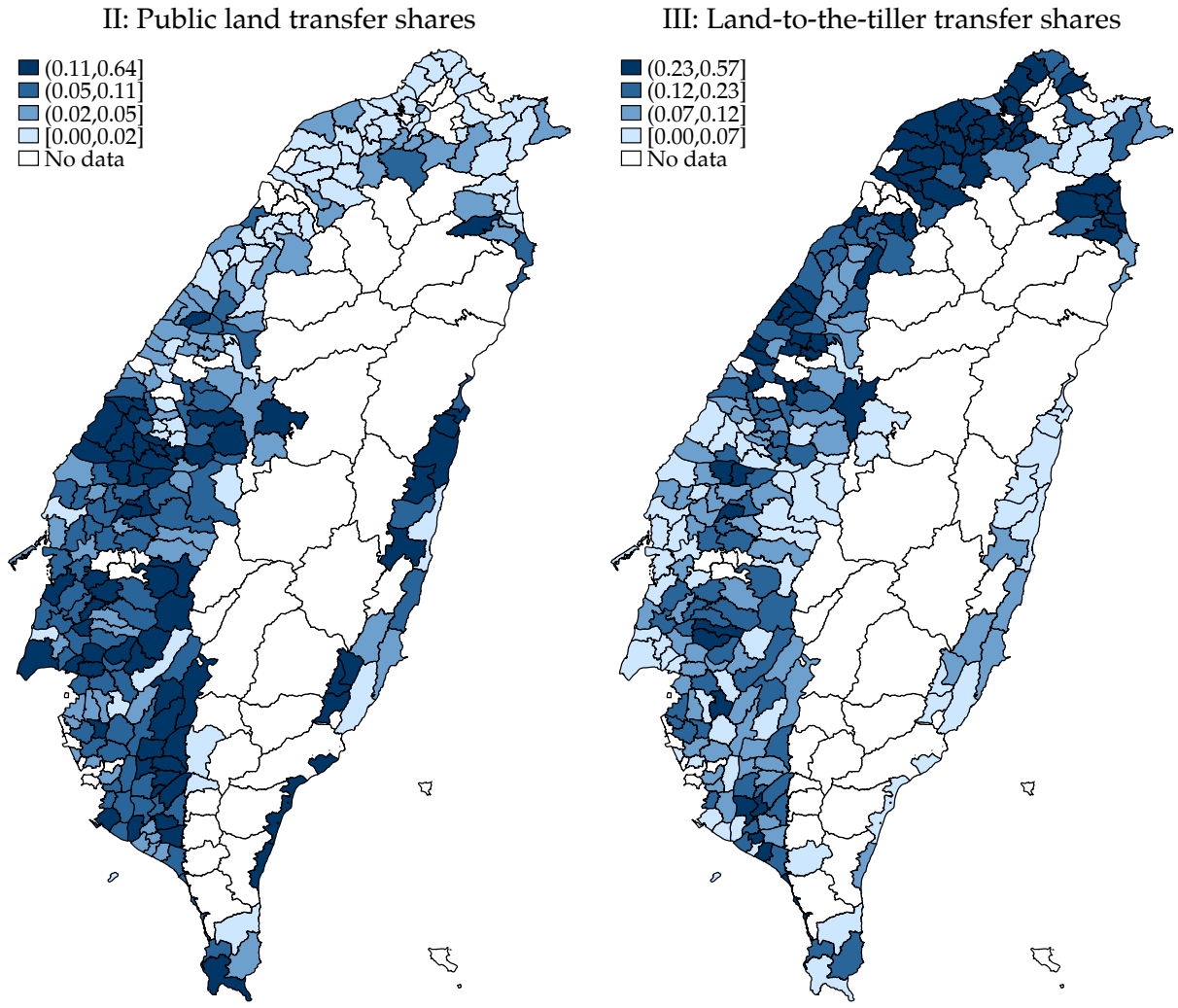
This table calculates the effect of land reform on aggregate productivity in Taiwan, using the two-sector Cobb-Douglas framework described in Section 6.

Figure 1: Share of Full-landowning Households, 1950 and 1961



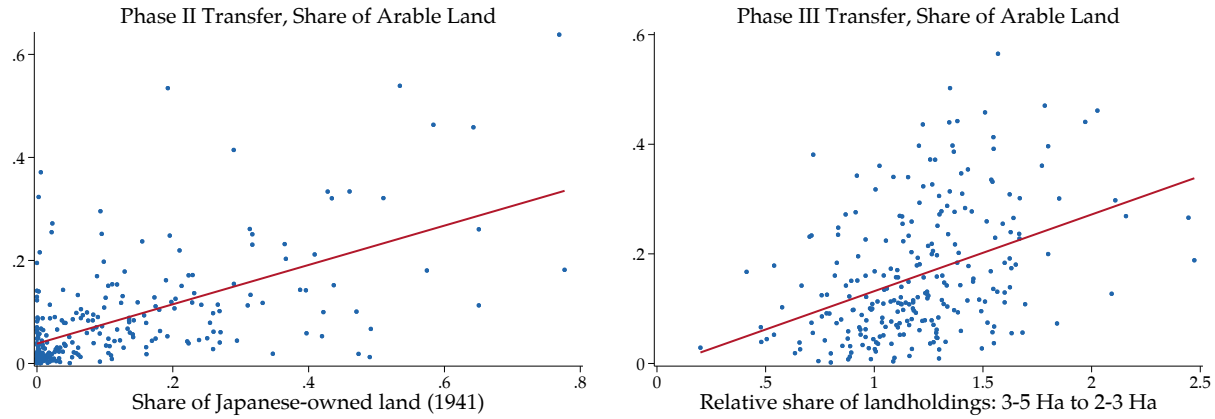
This figure shows the change in the distribution of the share of full-landowning households by township between 1950 (white) and 1961 (blue).

Figure 2: The Geography of Phase II and III Land Reforms



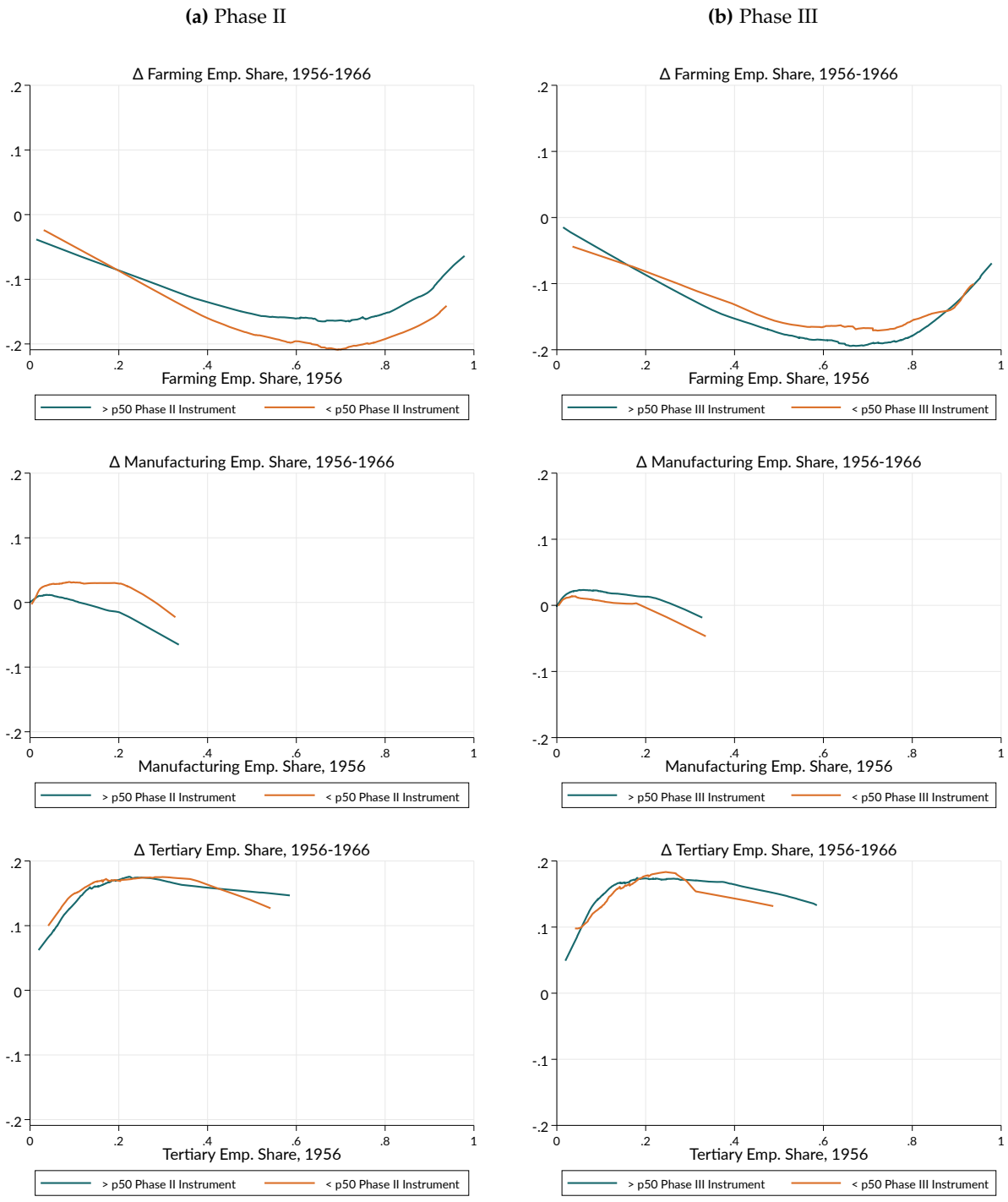
These figures show the geographic distribution of the amount of land transferred by 1961 under the Phase II public land redistribution (left panel) and the Phase III land-to-the-tiller law (right panel), as a share of total arable land in that township.

Figure 3: Scatters of First-stage Instrumental Variables Relationships



These figures show the raw first-stage correlation between land reform transfers as a share of arable land and the phase II instrument of the 1941 share of Japanese-owned land (left) and the phase III instrument of the ratio of land in 3-5 Ha to 2-3 Ha bins (right).

Figure 4: Regional Specialization, by Phases of Land Transfer



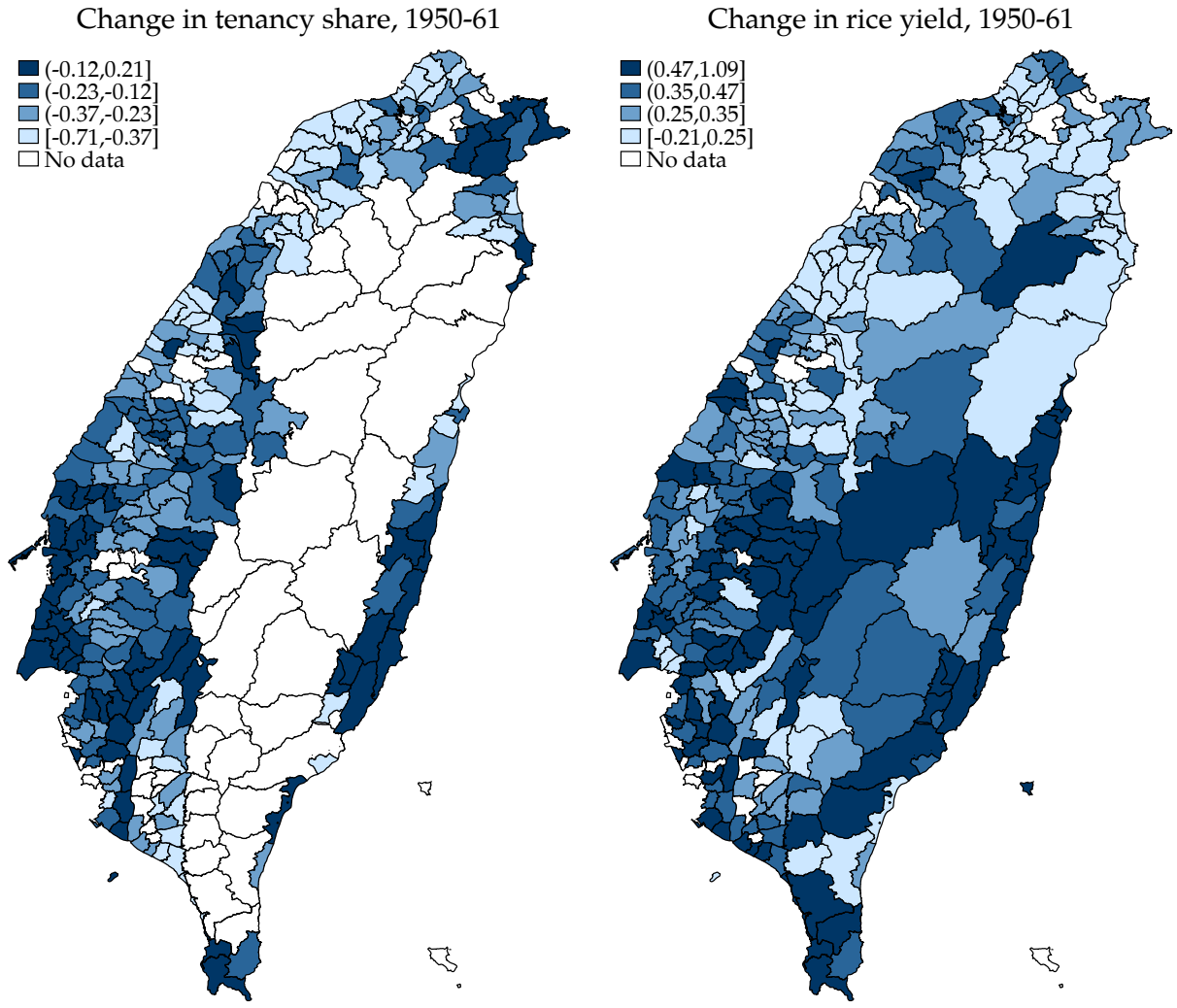
These figures, corresponding to the IV estimates in Table 7, show how changes of sectoral employment share from 1956 to 1966 vary with the exposure to the Public Land Transfer (first column) and Land to the Tiller (second column), conditional on initial sectoral employment composition in 1956. We calculate the fitted values from the first stage regression in Equation 1 and use the median as the cutoff to categorize townships into treated (green) and control (orange).

Online Appendix

Roots of the Taiwanese Miracle?
Reassessing Land Reform, 1950-1961

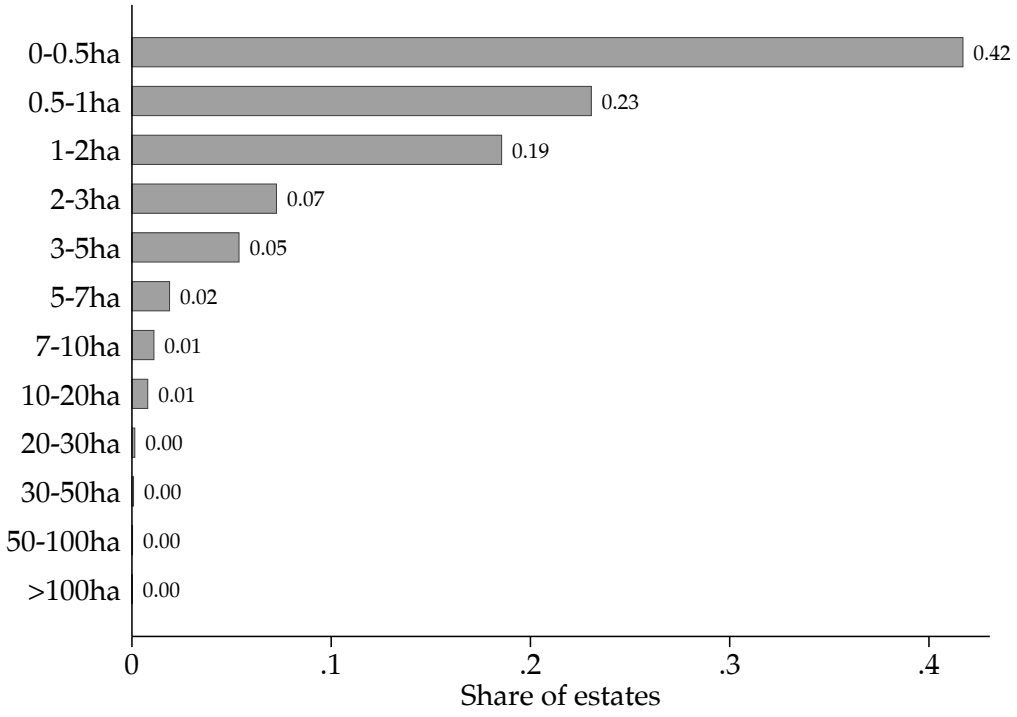
A Additional Results and Robustness Checks

Figure A.1: Changes in Key Agricultural Variables, 1950-61



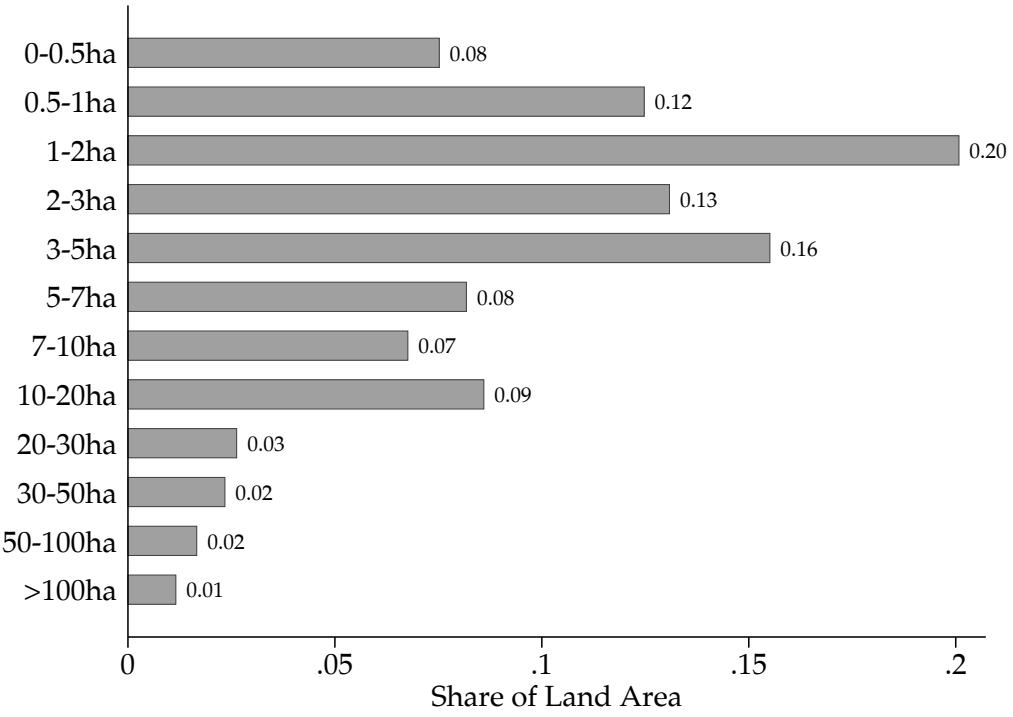
These figures show maps of the 1950-61 change in the share of households that were tenants (left panel) and the 1950-61 change in the rice yield (right panel).

Figure A.2: Private Land Holding Size Distribution, 1950



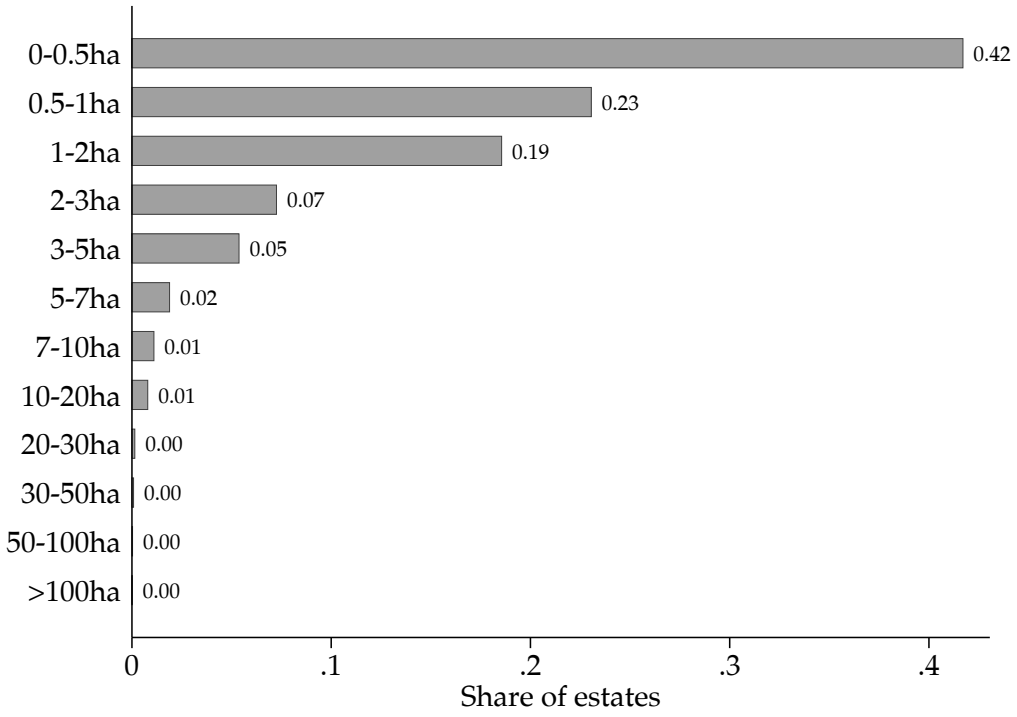
This figure shows the the distribution of private landholdings by size in Taiwan, from the Joint Committee on Rural Reconstruction's 1950 report.

Figure A.3: Private Land Holding Distribution as a Share of Total Area, 1950



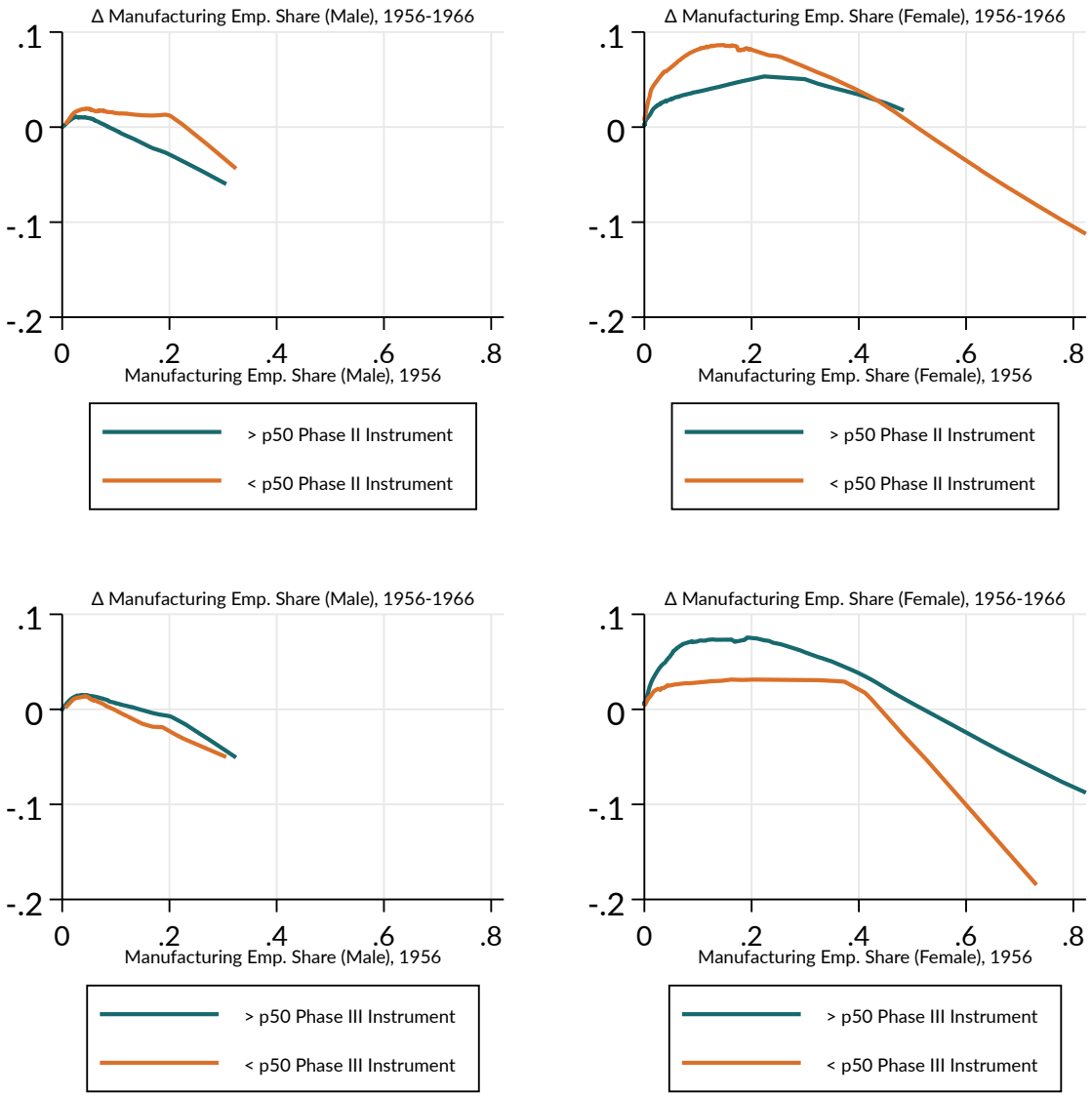
This figure shows the the distribution of private landholdings by size in Taiwan as a share of total land area, from the Joint Committee on Rural Reconstruction's 1950 report. Sizes of holdings are imputed using the midpoint of each bin (i.e., 0.25ha for the 0-0.5ha bin, 0.75ha for the 0.5-1ha bin, etc., with 150ha assumed for the last >100ha bucket).

Figure A.4: Private Land Holding Size Distribution, 1961



This figure shows the the distribution of private landholdings by size in Taiwan, from the 1961 agricultural census.

Figure A.5: Manufacturing Employment Growth for Both Phases by Gender



These figures, corresponding to the IV estimates in Table 8, show how gender-specific changes of manufacturing employment share from 1956 to 1966 vary with the exposure to the Public Land Transfer (first row) and Land to the Tiller (second row), conditional on initial manufacturing employment composition in 1956. The first column shows results for male, while the second shows those for female. We calculate the fitted values from the first stage regression in Equation 1 and use the median as the cutoff to categorize townships into treated (green) and control (orange).

Table A.1: Balance Table for Phase II and III Transfer Shares

	N	PII Transfer share (SE)	N	PIII Transfer share (SE)
Δ share of tenants, 1941-50	248	0.13	248	0.05
		(0.12)		(0.08)
Δ median hhld farm size, 1941-50	248	-0.07	248	-0.74**
		(0.24)		(0.27)
Δ Attainable rice yield, low-to-high inputs	255	939.50	255	602.86
		(658.68)		(958.97)
Δ ln Rice yield, 1950-52	251	0.02	250	0.02
		(0.10)		(0.07)
Δ log population, 1942-50	252	0.31	251	0.44**
		(0.20)		(0.15)
Mainlander share of pop., 1955	258	-0.01	257	0.06
		(0.04)		(0.04)
Sugar cane yield (kg/ha), 1951	161	5634.79	161	-19835.71
		(19259.69)		(12253.73)
Total Manuf. firms, 1947	254	-4.40	254	18.09*
		(9.56)		(8.02)
Potential rice yields (FAO-GAEZ)	258	0.72	257	-1.17*
		(0.58)		(0.49)
Sugar mill in township = 1, 1947	258	0.00	257	-0.50***
		(0.23)		(0.14)
Log distance to nearest rail station (km)	258	0.81	257	-2.12***
		(1.02)		(0.59)
Log distance to nearest sugar rail station (km)	258	-3.36	257	3.71*
		(2.14)		(1.64)
Number of bank branches (<10km)	258	-2.96	257	5.81**
		(1.63)		(2.20)
Employment share in agriculture, 1951	236	0.39*	235	-0.47***
		(0.18)		(0.14)
Employment share in manufacturing, 1951	233	-0.02	233	0.02
		(0.01)		(0.02)

This table shows the estimates of Equation 4, with the independent variables being the phase II transfer share (column 1) and phase III transfer share (column 2) instead of the instruments. Standard errors are clustered to allow for spatial correlation using a Bartlett kernel with a 50 kilometer cutoff. $^{*} \leq 0.05, ^{**} \leq .01, ^{***} \leq .001$.

Table A.2: Land Reform and Crop Choices, Detailed

	Phase II				Phase III			
	OLS (SE)	N	IV (SE)	N (F)	OLS (SE)	N	IV (SE)	N (F)
Δ ln Cabbage yield 1950-61	-0.13	85	-1.43*	85	0.98	78	2.18	78
	(0.50)	.	(0.73)	19.16	(0.59)	.	(4.17)	10.03
Δ Cabbage share 1950-61	0.01	78	0.01	78	-0.01	78	-0.20*	78
	(0.01)	.	(0.02)	15.80	(0.02)	.	(0.10)	10.03
Δ ln Sino Cabbage yield 1950-61	-0.52	88	-0.97	88	0.59	81	2.12	81
	(0.48)	.	(0.78)	14.94	(0.74)	.	(3.54)	9.59
Δ Sino Cabbage share 1950-61	-0.06*	82	-0.16	82	-0.04	82	0.62	82
	(0.03)	.	(0.09)	13.29	(0.03)	.	(0.49)	13.82
Δ ln Leaf mustard yield 1950-61	-0.79	82	-1.20	81	0.61	74	2.07	74
	(0.99)	.	(1.45)	18.15	(1.13)	.	(5.46)	7.64
Δ Leaf mustard share 1950-61	-0.01	86	-0.02	86	-0.01	86	0.00	86
	(0.00)	.	(0.01)	23.19	(0.01)	.	(0.01)	6.98
Δ ln Vegetable yield 1950-61	0.50	88	-1.22	88	-0.44	88	-0.72	88
	(0.35)	.	(1.44)	2.03	(0.32)	.	(0.49)	25.06
Δ Vegetable share 1950-61	0.06	88	-0.23	88	-0.02	88	-0.41*	88
	(0.07)	.	(0.29)	2.03	(0.07)	.	(0.17)	25.06
Δ ln Banana yield 1950-61	0.82	134	1.65	133	0.49	126	-0.62	126
	(0.48)	.	(0.94)	27.40	(0.71)	.	(1.58)	18.34
Δ Banana share 1950-61	0.05	126	0.13	126	-0.00	126	0.07	126
	(0.05)	.	(0.11)	25.04	(0.05)	.	(0.07)	18.34
Δ ln Pineapple yield 1950-61	-1.05	76	-1.62	75	-1.33	74	-1.65	74
	(0.55)	.	(1.12)	14.92	(0.99)	.	(1.76)	3.84
Δ Pineapple share 1950-61	0.16*	76	0.32*	76	0.28	76	0.57	76
	(0.07)	.	(0.13)	15.21	(0.18)	.	(0.43)	7.14

This table shows the effects of land reform on vegetable and fruit cultivation. The first group of columns reports the simple OLS coefficient estimate (with controls for phase III transfers and mainlander population share in 1955 for phase II, and controls for phase II transfers, land area outside the 2-5 hectare bin, and total manufacturing firms in 1947 for phase III) while the second group of columns reports the instrumental variable estimate of γ_1 from Equation 2. Standard errors are below in parentheses. $^{*} \leq 0.05, ^{**} \leq .01, ^{***} \leq .001$.

Table A.3: Land Reform and Changes in Occupation Share, Detailed

	Phase II				Phase III			
	OLS (SE)	N	IV (SE)	N (F)	OLS (SE)	N	IV (SE)	N (F)
Δ Mining share 1956-66	-0.02	255	-0.02	254	-0.01	246	-0.04	246
	(0.02)	.	(0.02)	32.05	(0.01)	.	(0.04)	23.29
Δ Food processing share, 1956-66	0.00	255	-0.02	254	0.01***	246	0.00	246
	(0.01)	.	(0.02)	32.05	(0.00)	.	(0.01)	23.29
Δ Textile share, 1956-66	-0.01*	255	-0.01	254	-0.00	246	0.04*	246
	(0.01)	.	(0.01)	32.05	(0.02)	.	(0.02)	23.29
Δ Construction share, 1956-66	-0.00	255	0.00	254	-0.00	246	0.01	246
	(0.01)	.	(0.01)	32.05	(0.01)	.	(0.01)	23.29
Δ Utility share, 1956-66	-0.00	255	-0.01	254	0.00	246	0.01	246
	(0.00)	.	(0.00)	32.05	(0.00)	.	(0.01)	23.29
Δ Commerce share, 1956-66	0.01*	255	-0.01	254	-0.02*	246	-0.02	246
	(0.01)	.	(0.01)	32.05	(0.01)	.	(0.03)	23.29
Δ Communication share, 1956-66	0.00	255	-0.01	254	-0.00	246	-0.01	246
	(0.00)	.	(0.01)	32.05	(0.00)	.	(0.01)	23.29

This table extends the result of Table 8 by more detailed sub-industries. The first group of columns reports the simple OLS coefficient estimate (with controls for phase III transfers and mainlander population share in 1955 for phase II, and controls for phase II transfers, land area outside the 2-5 hectare bin, and total manufacturing firms in 1947 for phase III) while the second group of columns reports the instrumental variable estimate of γ_1 from Equation 2. Standard errors are below in parentheses. $^{*} \leq 0.05, ^{**} \leq .01, ^{***} \leq .001$.

Table A.4: Land Reform's Long-Run Effects

	Phase II				Phase III			
	OLS (SE)	N	IV (SE)	N (F)	OLS (SE)	N	IV (SE)	N (F)
Δ Log-Pop change, 1951-70	0.20	234	-0.01	233	0.36	225	-0.32	225
	(0.19)	.	(0.28)	29.57	(0.23)	.	(0.39)	19.78
Δ Log-Pop change, 1951-80	0.15	233	-0.04	232	1.04	224	-0.07	224
	(0.23)	.	(0.45)	31.76	(0.53)	.	(0.98)	19.71
Δ Migrant share, 1955-70	-0.01	236	-0.08*	235	0.04	227	-0.03	227
	(0.02)	.	(0.03)	30.43	(0.03)	.	(0.05)	19.43
Δ Migrant share, 1955-80	-0.06	235	-0.09	234	0.21	226	0.13	226
	(0.03)	.	(0.07)	32.87	(0.11)	.	(0.16)	19.37
Δ Manuf. estab., 1954-76	-0.22	251	-0.40	250	1.74***	242	-1.45	242
	(0.63)	.	(0.98)	32.47	(0.46)	.	(1.72)	22.33

This table shows the effect of phase II and phase III of land reform on long-run population and industrialization outcomes. The first group of columns reports the simple OLS coefficient estimate (with controls for phase III transfers and mainlander population share in 1955 for phase II, and controls for phase II transfers, land area outside the 2-5 hectare bin, and total manufacturing firms in 1947 for phase III) while the second group of columns reports the instrumental variable estimate of γ_1 from Equation 2. Standard errors are below in parentheses. We also report the N of each regression and, for the IV, the first-stage F-statistic. Standard errors are spatially clustered using a Bartlett kernel with a 50km cutoff. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.5: Core Regression Results, Pre-Reform Controls

	Phase II				Phase III			
	IV (SE)	N	IV (SE)	N	IV (SE)	N	IV (SE)	N
Δ Share of full landowners 1950-61	1.50**	151	1.03**	219	1.84***	151	1.75***	219
	(0.57)	12.47	(0.34)	20.39	(0.48)	24.26	(0.48)	22.94
Δ Share of partial landowners 1950-61	0.12	151	0.15	219	0.03	151	-0.09	219
	(0.41)	12.47	(0.24)	20.39	(0.32)	24.26	(0.28)	22.94
Δ Share of tenants 1950-61	-1.61***	151	-1.18***	219	-1.87***	151	-1.66***	219
	(0.39)	12.47	(0.25)	20.39	(0.32)	24.26	(0.36)	22.94
Δ Median farm size 1950-61	-0.12	151	-0.23	219	-1.89	151	-2.00*	219
	(0.78)	12.47	(0.46)	20.39	(1.07)	24.26	(1.00)	22.94
Δ ln Rice output 1950-61	1.36	151	1.08*	219	-0.61	151	-0.25	219
	(0.91)	12.47	(0.53)	20.39	(0.50)	24.26	(0.48)	22.94
Δ ln Rice yield 1950-61	0.21	151	0.50	219	-0.15	151	-0.01	219
	(0.34)	12.47	(0.27)	20.39	(0.44)	24.26	(0.41)	22.94
Δ Log-Pop change, 1955-66	-0.52*	151	-0.11	219	-0.60**	151	-0.34	219
	(0.26)	12.47	(0.14)	20.39	(0.22)	24.26	(0.18)	22.94
Δ Occupation share: primary sector,	0.13	150	0.08	218	0.12	150	-0.09	218
1956-66	(0.15)	12.53	(0.10)	20.30	(0.24)	24.22	(0.23)	22.95
Δ Occupation share: secondary sector,	-0.14*	150	-0.15***	218	0.03	150	0.16**	218
1956-66	(0.06)	12.53	(0.04)	20.30	(0.06)	24.22	(0.06)	22.95
Δ Occupation share: tertiary sector,	0.01	150	0.07	218	-0.15	150	-0.08	218
1956-66	(0.13)	12.53	(0.10)	20.30	(0.25)	24.22	(0.22)	22.95
Δ Share primary school or above,	0.06	151	-0.05	219	-0.28	151	-0.14	219
1951-61	(0.12)	12.47	(0.08)	20.39	(0.15)	24.26	(0.15)	22.94
Δ Share middle school or above,	-0.04	151	-0.01	219	0.04	151	-0.00	219
1951-61	(0.04)	12.47	(0.03)	20.39	(0.03)	24.26	(0.03)	22.94
Δ Share high school or above, 1951-61	-0.02	151	-0.01	219	0.02	151	-0.01	219
	(0.02)	12.47	(0.02)	20.39	(0.02)	24.26	(0.01)	22.94
Δ Share higher education, 1951-61	-0.01	151	-0.00	219	0.02*	151	0.00	219
	(0.01)	12.47	(0.01)	20.39	(0.01)	24.26	(0.00)	22.94
Pre-reform controls	X		X		X		X	
Drops sugarcane yields			X				X	

This table shows the regression results for our core set of outcome variables including controls for the pre-reform variables from Table 2. The second specification in each group drops sugar cane yields from the regression, which increases sample size.

Table A.6: Land Reform and Agricultural Investment

	Phase II				Phase III			
	OLS (SE)	N	IV (SE)	N (F)	OLS (SE)	N	IV (SE)	N (F)
Δ Log chemical fertilizer, 1952-61	0.29	43	0.93	43	-1.17	43	-6.10	43
	(0.93)	.	(1.64)	22.21	(1.00)	.	(8.26)	4.48
Δ Log self-supplied fertilizer,	-0.13	218	-2.11	217	-0.28	210	1.29	210
1952-61	(0.96)	.	(1.83)	25.18	(0.81)	.	(3.01)	23.12
Δ Log irrigation per chia, 1951-61	-0.11	154	-0.25	154	-0.40	153	-1.63	153
	(0.42)	.	(1.94)	8.43	(0.34)	.	(0.93)	14.53

This table shows the effect of phase II and phase III of land reform on key technology investment for farming production, including chemical fertilizer use, self-supplied fertilizer use, and irrigation. The first group of columns reports the simple OLS coefficient estimate (with controls for phase III transfers and mainlander population share in 1955 for phase II, and controls for phase II transfers, land area outside the 2-5 hectare bin, and total manufacturing firms in 1947 for phase III) while the second group of columns reports the instrumental variable estimate of γ_1 from Equation 2. Standard errors are below in parentheses. We also report the N of each regression and, for the IV, the first-stage F-statistic. Standard errors are spatially clustered using a Bartlett kernel with a 50km cutoff. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.7: Land Reform and the Farmers' Associations

	Phase II				Phase III			
	OLS (SE)	N	IV (SE)	N (F)	OLS (SE)	N	IV (SE)	N (F)
Δ FA members, 1956-66	0.31	251	0.34	251	-0.09	243	-0.27	243
	(0.19)	.	(0.25)	30.29	(0.11)	.	(0.46)	21.75
Δ FA capital, 1956-66	0.65	250	1.50*	250	-0.28	242	1.20	242
	(0.34)	.	(0.65)	30.17	(0.22)	.	(2.13)	21.80
Δ FA fixed assets, 1956-66	0.08	251	1.77	251	-0.46	243	0.29	243
	(0.36)	.	(1.08)	30.29	(0.28)	.	(1.08)	21.75
Δ FA deposits, 1956-66	1.22	242	0.11	242	0.63	234	0.95	234
	(0.69)	.	(1.26)	32.72	(0.43)	.	(1.25)	23.20
Δ FA loans, 1956-66	0.78	235	-0.55	235	1.11	227	1.01	227
	(0.88)	.	(1.09)	31.99	(0.68)	.	(1.61)	19.39
Δ FA fertilizer income, 1964-69	0.55	248	0.51	248	-0.36	240	-0.81	240
	(0.40)	.	(0.70)	29.91	(0.37)	.	(0.84)	21.00

This table shows the effect of phase II and phase III of land reform on key farmers' association outcomes. The first group of columns reports the simple OLS coefficient estimate (with controls for phase III transfers and mainlander population share in 1955 for phase II, and controls for phase II transfers, land area outside the 2-5 hectare bin, and total manufacturing firms in 1947 for phase III) while the second group of columns reports the instrumental variable estimate of γ_1 from Equation 2. Standard errors are below in parentheses. We also report the N of each regression and, for the IV, the first-stage F-statistic. Standard errors are spatially clustered using a Bartlett kernel with a 50km cutoff. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.8: Main Regression Results, Using Bin Min and Max

	Phase III Min		Phase III Max	
	IV (SE)	N (F)	IV (SE)	N (F)
Δ Share of full landowners 1950-61	1.41***	247	1.44**	247
	(0.43)	19.64	(0.48)	15.27
Δ Share of partial landowners 1950-61	0.12	247	-0.00	247
	(0.35)	19.64	(0.37)	15.27
Δ Share of tenants 1950-61	-1.54***	247	-1.44***	247
	(0.31)	19.64	(0.30)	15.27
Δ Median farm size 1950-61	-2.06*	247	-1.71*	247
	(0.93)	19.64	(0.83)	15.27
Δ ln Rice output 1950-61	-0.04	247	-0.26	247
	(0.64)	19.64	(0.69)	15.27
Δ ln Rice yield 1950-61	0.05	247	0.05	247
	(0.38)	19.64	(0.42)	15.27
Δ Log-Pop change, 1955-66	-0.07	247	-0.08	247
	(0.18)	19.64	(0.22)	15.27
Δ Occupation share: primary sector,	-0.16	246	-0.17	246
1956-66	(0.20)	19.97	(0.21)	15.14
Δ Occupation share: secondary sector,	0.11	246	0.15*	246
1956-66	(0.07)	19.97	(0.07)	15.14
Δ Occupation share: tertiary sector,	0.04	246	0.02	246
1956-66	(0.22)	19.97	(0.22)	15.14
Δ Share primary school or above,	-0.21	243	-0.26	243
1951-61	(0.15)	20.10	(0.15)	15.44
Δ Share middle school or above,	-0.00	243	-0.00	243
1951-61	(0.03)	20.10	(0.03)	15.44
Δ Share high school or above, 1951-61	-0.01	243	-0.01	243
	(0.01)	20.10	(0.01)	15.44
Δ Share higher education, 1951-61	-0.00	243	-0.00	243
	(0.00)	20.10	(0.00)	15.44

This table shows the main regression results for phase III of land reform, using cutoff instruments defined with the minimum (left) and maximum (right) acreage of each bin. $^{*} \leq 0.05, ^{**} \leq .01, ^{***} \leq .001$.

Table A.9: Effects of Phase II and III Transfer Shares, Joint Estimation with Two Instruments

	Phase II (SE)	Phase III (SE)	N F
Δ Share of full landowners 1950-61	1.60***	1.75**	247
	(0.37)	(0.58)	26.12
Δ Share of partial landowners 1950-61	0.12	0.12	247
	(0.34)	(0.45)	26.12
Δ Share of tenants 1950-61	-1.72***	-1.88***	247
	(0.27)	(0.39)	26.12
Δ Median farm size 1950-61	-1.76	-2.25*	247
	(1.17)	(0.95)	26.12
Δ ln Rice output 1950-61	1.65***	0.15	247
	(0.45)	(0.75)	26.12
Δ ln Rice yield 1950-61	0.98***	0.19	247
	(0.27)	(0.28)	26.12
Δ Log-Pop change, 1955-66	-0.08***	-0.16	247
	(0.01)	(0.14)	26.12
Δ Occupation share: primary sector, 1956-66	0.05	-0.22	246
	(0.23)	(0.26)	25.52
Δ Occupation share: secondary sector, 1956-66	-0.08*	0.10*	246
	(0.04)	(0.05)	25.52
Δ Occupation share: tertiary sector, 1956-66	0.03	0.12	246
	(0.20)	(0.25)	25.52
Δ Share primary school or above, 1951-61	-0.18	-0.24	243
	(0.13)	(0.17)	27.25
Δ Share middle school or above, 1951-61	-0.03	-0.01	243
	(0.02)	(0.03)	27.25
Δ Share high school or above, 1951-61	-0.02	-0.01	243
	(0.01)	(0.02)	27.25
Δ Share higher education, 1951-61	-0.01	-0.00	243
	(0.01)	(0.00)	27.25

This table reports the effects of phase II and phase III land transfers on key township-level agricultural and socio-economic outcomes. We estimate a two-stage least squares model in which the transfer shares of both phases are treated as endogenous and instrumented simultaneously. Corresponding to Equation 2, the second stage regression here is $\Delta y_i = \gamma_0 + \gamma_1 \Delta LandTransfers_{i,2} + \gamma_2 \Delta LandTransfers_{i,3} + X_i'\Gamma + \eta_i$, and the first stage regressions are $\Delta LandTransfers_{i,p} = \beta_0 + \beta_1 Z_{i,2} + \beta_2 Z_{i,3} + X_i'\delta + \varepsilon_i$ for phase $p = 2, 3$. The first instrument, $Z_{i,2}$, is the Japanese land share in 1943, and the second one, $Z_{i,3}$, comes from the 3-hectare cutoff rule as in Equation 3. Control variables (X) include the 1955 mainlander share, the fraction of land outside the 2–5 hectare size bandwidth in 1950, and the number of firms in 1947. Standard errors are spatially clustered using a Bartlett kernel with a 50 km cutoff.* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.10: Balance Table for Phase II and III Transfers, Per Capita

	Japanese land pc		3-5 Ha share/2-3 Ha share	
	N	(SE)	N	(SE)
Δ share of tenants, 1941-50	248	0.33	251	-0.00
		(0.32)		(0.03)
Δ median hhld farm size, 1941-50	248	-0.33	251	-0.03
		(0.65)		(0.09)
Δ Attainable rice yield, low-to-high inputs	302	4927.06*	249	-92.33
		(1940.14)		(239.78)
Δ ln Rice yield, 1950-52	285	0.04	249	0.01
		(0.28)		(0.02)
Δ log population, 1942-50	299	1.88*	243	0.09
		(0.74)		(0.06)
Mainlander share of pop., 1955	307	0.07	251	0.01
		(0.10)		(0.01)
Sugar cane yield (kg/ha), 1951	175	17147.93	155	-2700.14
		(33108.09)		(4993.02)
Total Manuf. firms, 1947	286	-143.70**	248	8.08*
		(55.37)		(3.47)
Potential rice yields (FAO-GAEZ)	362	3.72*	251	-0.09
		(1.54)		(0.14)
Sugar mill in township = 1, 1947	312	0.26	251	0.12
		(0.49)		(0.07)
Log distance to nearest rail station (km)	301	-3.07	251	-0.41
		(2.10)		(0.21)
Log distance to nearest sugar rail station (km)	301	-3.65	251	0.35
		(3.75)		(0.48)
Number of bank branches (<10km)	302	-4.50	251	0.66
		(3.53)		(0.40)
Employment share in agriculture, 1951	276	0.75	227	-0.09
		(0.44)		(0.05)
Employment share in manufacturing, 1951	264	-0.02	227	0.01
		(0.04)		(0.00)

This table shows the estimates of Equation 4, with the independent variables being Japanese land per capita (column 1) and the 3 hectare cutoff instrument (column 2). Standard errors are clustered to allow for spatial correlation using a Bartlett kernel with a 50 kilometer cutoff. $^{*} \leq 0.05, ^{**} \leq .01, ^{***} \leq .001$.

Table A.11: First-stage Regressions for Phase II Transfers, Per Capita

	(1) Baseline	(2) Lat/Lon Poly.	(3) Main
Japanese-owned land, p.c. (1941)	0.37***	0.35***	0.37***
	(0.07)	(0.07)	(0.07)
Phase III land transfers per capita (Land to the Tiller)	-0.02	0.01	-0.02
	(0.03)	(0.04)	(0.04)
Mainlander share of pop., 1955			-0.05**
			(0.02)
Observations	316	316	266
R^2	0.545	0.551	0.556
F-stat	27.17	23.28	26.16

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table shows the estimates for Equation 1, the first-stage relationship between the per capita of township land transferred by 1961 in phase II of land reform and the 1941 per capita of Japanese-owned land and the ratio of land in 3-5 hectare bins to land in 2-3 hectare bins, respectively.

Table A.12: First-stage Regressions for Phase III Transfers, Per Capita

	(1) Baseline	(2) Lat/Lon Poly.	(3) Main
Relative share of landholdings: 3-5 Ha to 2-3 Ha	0.03***	0.02***	0.03***
	(0.01)	(0.00)	(0.00)
Share of land outside of 2-5 Ha holdings	-0.05	-0.04	-0.05
	(0.03)	(0.03)	(0.03)
Phase II land transfers per capita (public land)	-0.10	-0.04	-0.11*
	(0.05)	(0.04)	(0.05)
Total Manuf. firms, 1947			-0.00**
			(0.00)
Observations	246	246	245
R^2	0.253	0.308	0.276
F-stat	25.56	38.23	32.33

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This table shows the estimates for Equation 1, the first-stage relationship between the per capita of township land transferred by 1961 in phase II of land reform and the 1941 per capita of Japanese-owned land and the ratio of land in 3-5 hectare bins to land in 2-3 hectare bins, respectively.

Table A.13: Main Results for Phase II and III Transfers, Per Capita

	Phase II				Phase III			
	OLS (SE)	N	IV (SE)	N (F)	OLS (SE)	N	IV (SE)	N (F)
Δ Share of full landowners 1950-61	1.12	246	1.57	243	4.62***	245	6.61***	245
	(0.69)	.	(1.07)	24.79	(0.67)	.	(1.74)	30.96
Δ Share of partial landowners 1950-61	0.65	246	0.51	243	0.86	245	0.41	245
	(0.52)	.	(0.83)	24.79	(0.64)	.	(1.64)	30.96
Δ Share of tenants 1950-61	-1.77***	246	-2.07***	243	-5.48***	245	-7.02***	245
	(0.46)	.	(0.58)	24.79	(0.47)	.	(1.22)	30.96
Δ Median farm size 1950-61	0.67	246	-0.22	243	-0.74	245	-8.25**	245
	(0.87)	.	(1.13)	24.79	(1.34)	.	(3.14)	30.96
Δ ln Rice output 1950-61	3.00**	258	5.21**	254	0.00	245	-1.24	245
	(0.97)	.	(1.71)	24.94	(1.26)	.	(2.77)	30.96
Δ ln Rice yield 1950-61	2.10**	258	3.19***	254	-0.31	245	-0.15	245
	(0.68)	.	(0.84)	24.94	(0.54)	.	(1.62)	30.96
Δ Log-Pop change, 1955-66	0.78*	271	0.68	266	0.01	245	-0.60	245
	(0.32)	.	(0.35)	25.31	(0.38)	.	(0.83)	30.96
Δ Occupation share: primary sector,	0.51*	269	0.39	264	-1.29***	244	-1.10	244
1956-66	(0.23)	.	(0.27)	25.22	(0.25)	.	(0.86)	31.20
Δ Occupation share: secondary sector,	-0.30**	269	-0.36*	264	0.31*	244	0.57	244
1956-66	(0.11)	.	(0.16)	25.22	(0.13)	.	(0.31)	31.20
Δ Occupation share: tertiary sector,	-0.21	269	-0.03	264	0.97**	244	0.52	244
1956-66	(0.20)	.	(0.30)	25.22	(0.31)	.	(0.96)	31.20
Δ Share primary school or above,	0.02	270	-0.07	265	0.07	244	-0.91	244
1951-61	(0.22)	.	(0.26)	25.22	(0.21)	.	(0.70)	31.33
Δ Share middle school or above,	-0.05	270	-0.09	265	0.00	244	-0.02	244
1951-61	(0.05)	.	(0.08)	25.22	(0.07)	.	(0.15)	31.33
Δ Share high school or above, 1951-61	-0.01	270	-0.03	265	-0.03	244	-0.03	244
	(0.02)	.	(0.04)	25.22	(0.03)	.	(0.07)	31.33
Δ Share higher education, 1951-61	-0.01	270	-0.02	265	-0.00	244	-0.01	244
	(0.01)	.	(0.01)	25.22	(0.01)	.	(0.02)	31.33

This table shows the effect of phase II and phase III of land reform on key township-level agricultural and socio-economic outcomes, and the . Each group of columns first reports the simple OLS coefficient estimate (with controls for phase III transfers and mainlander population share in 1955 for phase II, and controls for phase II transfers, land area outside the 2-5 hectare bin, and total manufacturing firms in 1947 for phase III) and the instrumental variable estimate of γ_1 from Equation 2, with the standard error in parentheses. We also report the N of each regression and, for the IV, the first-stage F-statistic. Standard errors are spatially clustered using a Bartlett kernel with a 50km cutoff. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A.14: The 375 Rent Reduction

	OLS (SE) (1)	N
Δ share of tenants, 1941-50	-0.01	216
	(0.04)	
Δ ln Rice yield, 1950-52	0.01	214
	(0.04)	
Δ median hhld farm size, 1941-50	0.04	216
	(0.09)	
Δ Attainable rice yield, low-to-high inputs	-101.64	214
	(319.43)	
Δ log population, 1942-50	0.41***	211
	(0.11)	

This table shows the effect of phase I land reform, the 375 rent reduction program, on key township-level agricultural and socio-economic outcomes prior to the phase II and phase III land reform. Control variables include latitude, longitude and terrain ruggedness. Standard errors are spatially clustered using a Bartlett kernel with a 50km cutoff. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

B Spillover and General Equilibrium Effects of Land Reform

To understand the spillover effect of neighboring townships' land transfers, we implement the instrumental variables method in the fashion of Equation 1 and Equation 2:

$$\Delta NeighborTransfers_{i,p} = \beta_0 + \beta_1 Z_{i,p} + X_i'\delta + \varepsilon_i \tag{B.1}$$

$$\Delta y_i = \gamma_0 + \gamma_1 \Delta NeighborTransfers_{i,p} + X_i'\Gamma + \eta_i \tag{B.2}$$

where $NeighborTransfer_{i,p}$ is defined as the share of arable land being transferred due to phase p in the neighborhood outside of township i but within a 50-kilometer radius from township i's centroid.

The instrument for phase II is the share of Japanese arable land in 1941 in the same neighborhood, and that for phase III is the relative share of farm of 3-5 hectare vs. 2-3 hectare in the neighborhood, holding fixed the farm size distribution outside the 2-5 hectare bandwidth. In our baseline balance check (where we implement the falsification test in the fashion of Equation 4), for each phase, we control township i's own phase II and III transfer share, as well as the other phase's neighborhood transfer. We report the result in Table B.2. To achieve better balance between treatment and control groups, we further add township's own mainlander share in our spillover analysis for phase II. The results are reported in Table B.3 for the whole sample, and in Table B.4 for the subset of urban townships.

Table B.1: Summary Statistics of Key Socioeconomic Outcomes, Urban vs. Rural

	Urban		Rural	
	Mean (S.D.)	N	Mean (S.D.)	N
Population density, 1951	1797.54 (683.14)	82	347.18 (42.29)	222
Primary occupation share, 1956	0.53 (0.02)	80	0.80 (0.01)	230
Manufacturing occupation share, 1956	0.13 (0.01)	80	0.05 (0.00)	230
Service occupation share, 1956	0.17 (0.01)	80	0.08 (0.00)	230
Δ Log-Pop change, 1955-66	0.32 (0.01)	86	0.27 (0.01)	231
Δ Occupation share: primary sector, 1956-66	-0.16 (0.01)	80	-0.17 (0.01)	230
Δ Occupation share: secondary sector, 1956-66	0.01 (0.00)	80	0.02 (0.00)	230
Δ Occupation share: tertiary sector, 1956-66	0.15 (0.01)	80	0.15 (0.01)	230
Δ Share primary school or above, 1951-61	0.12 (0.01)	77	0.12 (0.01)	220
Δ Share middle school or above, 1951-61	0.04 (0.00)	77	0.02 (0.00)	220
Δ Share high school or above, 1951-61	0.02 (0.00)	77	0.01 (0.00)	220
Δ Share higher education, 1951-61	0.00 (0.00)	77	0.00 (0.00)	220
Δ Log-Pop change, 1951-70	0.58 (0.03)	73	0.47 (0.01)	205
Δ Migrant share, 1955-70	0.03 (0.00)	73	0.01 (0.00)	206
Δ Manuf. estab., 1954-76	0.17 (0.08)	83	0.30 (0.06)	202

Table B.2: Balance Table for Phase II and III Transfer Instruments, Share within 50 km Radius

	N	<50 km Japanese land share (SE)	N	<50 km 3-5 Ha share/ 2-3 Ha share (SE)
Δ share of tenants, 1941-50	251	0.51***	251	-0.26
		(0.14)		(0.19)
Δ median hhld farm size, 1941-50	251	0.37	251	0.56
		(0.39)		(0.43)
Δ Attainable rice yield, low-to-high inputs	301	-3373.59*	301	-3295.09
		(1329.00)		(2229.31)
Δ ln Rice yield, 1950-52	289	0.27*	289	0.34
		(0.13)		(0.19)
Δ log population, 1942-50	298	-0.63	298	-0.72
		(0.66)		(0.72)
Mainlander share of pop., 1955	305	0.20***	305	0.02
		(0.05)		(0.07)
Sugar cane yield (tons/Ha), 1951	179	-48861.33***	179	-10681.06
		(14815.66)		(26916.54)
Total Manuf. firms, 1947	287	-36.10	287	-37.63
		(37.57)		(45.44)
Potential rice yields (FAO-GAEZ)	310	-2.09	310	-1.22
		(1.61)		(1.59)
Sugar mill in township = 1, 1947	310	-0.38	310	-0.65
		(0.35)		(0.37)
Log distance to nearest rail station (km)	299	-0.27	299	0.60
		(1.13)		(1.64)
Log distance to nearest sugar rail station (km)	299	10.81***	299	4.45
		(1.29)		(3.56)
Number of bank branches (<10km)	300	-1.10	300	0.27
		(1.34)		(1.92)
Employment share in agriculture, 1951	280	-0.09	280	0.45
		(0.33)		(0.29)
Employment share in manufacturing, 1951	269	0.00	269	-0.00
		(0.02)		(0.02)

This table shows the estimates of Equation B.1, where the outcomes are key pre-treatment socioeconomic characteristics, and the independent variables are the within 50 km Japanese land share instrument (column 1) and the 3 hectare cutoff instrument (column 2). Standard errors are clustered to allow for spatial correlation using a Bartlett kernel with a 50 kilometer cutoff. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table B.3: Spillover Effects of Land Reform, within 50 km Radius

	Phase II				Phase III			
	OLS (SE)	N	IV (SE)	N (F)	OLS (SE)	N	IV (SE)	N (F)
Δ Log-Pop change, 1955-66	0.63	305	1.90	305	0.04	310	0.12	310
	(0.43)	.	(1.25)	9.59	(0.17)	.	(0.18)	50.98
Δ Occupation share: primary sector,	-0.12	303	0.55	303	-0.25**	303	-0.27***	303
1956-66	(0.28)	.	(0.72)	9.01	(0.08)	.	(0.07)	52.15
Δ Occupation share: secondary sector,	0.00	303	-0.08	303	0.12***	303	0.14*	303
1956-66	(0.12)	.	(0.27)	9.01	(0.03)	.	(0.06)	52.15
Δ Occupation share: tertiary sector,	0.11	303	-0.48	303	0.13	303	0.13	303
1956-66	(0.27)	.	(0.77)	9.01	(0.08)	.	(0.08)	52.15
Δ Share primary school or above,	0.33	296	1.86*	296	0.02	296	0.14	296
1951-61	(0.25)	.	(0.93)	9.71	(0.09)	.	(0.10)	47.85
Δ Share middle school or above,	0.06	296	0.02	296	0.08***	296	0.10***	296
1951-61	(0.08)	.	(0.15)	9.71	(0.02)	.	(0.02)	47.85
Δ Share high school or above, 1951-61	0.03	296	-0.02	296	0.03*	296	0.04**	296
	(0.04)	.	(0.08)	9.71	(0.01)	.	(0.01)	47.85
Δ Share higher education, 1951-61	0.01	296	-0.02	296	0.01*	296	0.01**	296
	(0.01)	.	(0.03)	9.71	(0.01)	.	(0.01)	47.85
Δ Log-Pop change, 1951-70	1.17	275	2.41	275	0.30	277	0.42	277
	(0.64)	.	(1.86)	11.87	(0.45)	.	(0.48)	49.33
Δ Migrant share, 1955-70	0.10	278	0.15	278	0.08	278	0.07	278
	(0.08)	.	(0.19)	11.06	(0.05)	.	(0.05)	51.94
Δ Manuf. estab., 1954-76	3.86	274	0.20	274	1.32	279	0.72	279
	(2.07)	.	(9.15)	6.68	(1.26)	.	(1.49)	47.44

This table shows the spillover effect of phase II and phase III of land reform on key township-level long-run socioeconomic outcomes. The explanatory variable for each phase is the share of land transferred within the geographic radius of 50 kilometers from the township centroid, excluding the transfer within the township. Control variables for each phase include within township transfer of both phases, and the spillover from the other phase (e.g., for phase II, we control township level phase II and phase III transfer, and the spillover from phase III transfer). For phase II, we further control for mainlander share, as suggested by Table B.2. Standard errors are clustered to allow for spatial correlation using a Bartlett kernel with a 50 kilometer cutoff. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table B.4: Spillover Effects of Land Reform for Urban Townships, within 50 km Radius

	Phase II				Phase III			
	OLS (SE)	N	IV (SE)	N (F)	OLS (SE)	N	IV (SE)	N (F)
Δ Log-Pop change, 1955-66	1.07	81	2.28	81	0.26	85	0.38	85
	(0.65)	.	(2.52)	3.36	(0.27)	.	(0.27)	29.63
Δ Occupation share: primary sector,	-0.07	79	0.32	79	-0.08	79	-0.14	79
1956-66	(0.43)	.	(1.14)	2.17	(0.07)	.	(0.10)	31.04
Δ Occupation share: secondary sector,	0.15	79	0.68	79	0.16***	79	0.19**	79
1956-66	(0.23)	.	(0.74)	2.17	(0.04)	.	(0.06)	31.04
Δ Occupation share: tertiary sector,	-0.08	79	-1.00	79	-0.07	79	-0.05	79
1956-66	(0.33)	.	(1.46)	2.17	(0.08)	.	(0.07)	31.04
Δ Share primary school or above,	0.20	77	1.19	77	0.12	77	0.19*	77
1951-61	(0.20)	.	(1.00)	3.66	(0.07)	.	(0.09)	28.13
Δ Share middle school or above,	-0.04	77	-0.11	77	0.08**	77	0.08**	77
1951-61	(0.12)	.	(0.34)	3.66	(0.03)	.	(0.03)	28.13
Δ Share high school or above, 1951-61	-0.02	77	-0.11	77	0.03	77	0.03*	77
	(0.05)	.	(0.19)	3.66	(0.02)	.	(0.02)	28.13
Δ Share higher education, 1951-61	-0.00	77	-0.06	77	0.01	77	0.01	77
	(0.01)	.	(0.06)	3.66	(0.01)	.	(0.01)	28.13
Δ Log-Pop change, 1951-70	1.75	72	3.11	72	0.82	73	0.95	73
	(1.06)	.	(3.65)	3.69	(0.58)	.	(0.63)	28.88
Δ Migrant share, 1955-70	-0.05	73	0.11	73	0.15	73	0.14	73
	(0.09)	.	(0.35)	3.25	(0.07)	.	(0.07)	27.86
Δ Manuf. estab., 1954-76	2.27	78	-16.67	78	3.59**	82	3.72**	82
	(2.88)	.	(12.95)	3.41	(1.21)	.	(1.42)	26.89

This table shows the spillover effect of phase II and phase III of land reform on key township-level long-run socioeconomic outcomes, focusing on the urban townships. The explanatory variable for each phase is the share of land transferred within the geographic radius of 50 kilometers from the township centroid, excluding the transfer within the township. Same measure is applied when we construct the instrument of these spillover terms. Control variables for each phase include within township transfer of both phases, and the spillover from the other phase (e.g., for phase II, we control township level phase II and phase III transfer, and the spillover from phase III transfer). For phase II, we further control for mainlander share, as suggested by Table B.2. Standard errors are clustered to allow for spatial correlation using a Bartlett kernel with a 50 kilometer cutoff. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

C Model

In this section, we present a model that illustrates the mechanism through which Taiwan's land reform induced regional specialization within a general equilibrium framework. While the overall structure is inspired by Fajgelbaum and Redding (2022), the model specifically highlights how phase II—by directly enhancing agricultural productivity through the liberalization of crop choice constraints—can drive labor reallocation across sectors in the spirit of Roy (1951) and Gollin, Lagakos, and Waugh (2014), depending on a township's exposure to land reform. Since our empirical findings suggest that phase III played a more limited role in altering sectoral productivity and labor reallocation, we do not model the effects of the land-to-the-tiller program.

Preference The economy consists of a set of locations $\ell \in \mathcal{L}$, corresponding to townships in Taiwan. Each location has a total arable land area L_ℓ and a continuum of land plots indexed by $j \in [0, L_\ell]$. There are two sectors: agriculture (a) and non-agriculture (n). Agricultural production occurs on these arable plots, with each plot characterized by idiosyncratic productivity for two possible crops, $g \in 1, 2$, where $g = 1$ denotes rice and $g = 2$ denotes sugarcane. The distribution of crop-specific productivities will be specified below.

In our baseline model, we consider the case where goods of both sectors are tradable within Taiwan, but not with the rest of the world (ROW). Such a setting is realistic as Taiwan's export and import were highly regulated until the early 1960s. We denote the internal trade costs between location ℓ and ℓ^* by $\{\delta_{1(\ell,\ell^*)}, \delta_{2(\ell,\ell^*)}, \delta_{n(\ell,\ell^*)}\}$, varying with traveling time or railroad access.[34]

Each location has a unit measure of workers. In this simple model, we abstract from internal migration. For each worker $i \in \mathcal{I}^\ell$, the preference is given by

$$U^i = \log\left(c_a^i - \bar{a}\right) + \nu \log c_n^i$$

where c_a^i is agricultural consumption, $\bar{a}$ the subsistence agriculture consumption level, c_n^i non-agricultural consumption, and ν the relative preference for non-agricultural consumption. Agricultural good is a Cobb-Douglas composite of rice and sugarcane: $\log c_a^i = \alpha \log c_1^i + (1 - \alpha) \log c_2^i$.

Each worker is endowed with sectoral specific productivities, $\{z_a, z_n\}$, each drawn independently from a Fréchet distribution with shape parameter γ:

$$G(z) = \exp(-z^{-\gamma})$$

The budget constraint of the worker can be written by

$$p_a^\ell c_a^i + p_n^\ell c_n^i \leq w^i$$

34. The railroad network in 1950s Taiwan can be roughly captured by Japanese railroad construction at the township level, of which we have the data.

where w^i is the labor income, which we specify below. The implied demand for sectoral goods can be written as:

$$c_a^i = \frac{y^i + \bar{a} p_a^\ell \nu}{p_a^\ell (1+\nu)}; \qquad c_n^i = \frac{\nu \left(y^i - \bar{a} p_a^\ell \right)}{1+\nu}. \tag{C.1}$$

Production Technology Both sectors are competitive, with zero profits in equilibrium. The technology for agriculture and manufacturing intermediate production is given by

$$Y_{gj}^\ell = A_{gj}^\ell N_{aj}^\ell \quad Y_n^\ell = A_n^\ell N_n^\ell,$$

where A_{gj}^ℓ is the crop specific efficiency for plot j in location ℓ, A_n^ℓ the efficiency for the non-farm sector in location ℓ, and N^ℓ is the efficient labor unit.

We assume that each land plot is owned by a landowner who makes the crop choice prior to the realization of crop-specific productivity. It is important to note that, due to the fixed-rent system in Taiwan (i.e., the landlord receives a fixed amount rather than a share of the output), tenants and landlords share the objective of maximizing total output, and are therefore expected to make the same crop choice—except in cases where the landowner is the Taiwan Sugar Company. As a result, and consistent with our empirical findings, only phase II has a significant effect on crop choice, while the effect of phase III is negligible.

After the crop choice is made, productivity for all possible cropping decisions will be drawn from a Fréchet distribution with shape parameter θ:

$$\text{Prob}\left[A_{gj}^\ell < A \right] = e^{-T_g^\ell A^{-\theta}}$$

where T_g^ℓ governs average productivity of crop g in ℓ, and θ the dispersion of productivity across plots, assumed to be the same for all g.

The Role of Land Reform We start by discussing the crop choice and the region's agricultural productivity after the land reform, as it represents the efficient benchmark. Due to the specification of the extreme value distribution, the share of land used for cultivating crop g is

$$\frac{L_g^\ell}{L^\ell} = \frac{T_g^\ell \left(p_g^\ell \right)^\theta}{\sum_{g=1}^2 T_g^\ell \left(p_g^\ell \right)^\theta} \tag{C.2}$$

The implied agricultural productivity of location ℓ in expectation is

$$E\left[A_a^\ell \right] = \Gamma\left(\frac{\theta - 1}{\theta} \right) \left[\sum_{g=1}^2 T_g^\ell \left(p_g^\ell \right)^\theta \right]^{\frac{1}{\theta}}$$

Prior to land reform, each location has L_{TSC}^ℓ measure of land plots controlled by the Taiwan Sugar Company, on which only sugarcane cultivation is permitted. Define the share of state-controlled

land as $s^{\ell}_{TSC} = L^{\ell}_{TSC}/L^{\ell}$. The pre-reform agricultural productivity is thus a weighted average of the efficient productivity and the constrained productivity:

$$E\left(A^{\ell}_{a,pre}\right) = \Gamma\left(\frac{\theta-1}{\theta}\right)\left\{\begin{array}{c}(1-s^{\ell}_{TSC})\left[\sum_{g=1}^{2} T^{\ell}_{g}\left(p^{\ell}_{g}\right)^{\theta}\right]^{\frac{1}{\theta}} \\ +s^{\ell}_{TSC}\cdot\left[T^{\ell}_{2}\left(p^{\ell}_{2}\right)^{\theta}\right]^{\frac{1}{\theta}}\end{array}\right\}$$

Sectoral Labor Allocation The worker's goal is to maximize the expected wage income w^i. As both sectors are competitive, the respective wage per efficient labor unit can be written as

$$w^{\ell}_{a} = A^{\ell}_{a}p^{\ell}_{a}; \quad w^{\ell}_{n} = A^{\ell}_{n}p^{\ell}_{n}$$

A worker will join the agriculture sector with the probability that

$$n^{\ell}_{a} \equiv \Pr\left[z_a w^{\ell}_{a} \geqslant z_n w^{\ell}_{n}\right] = \frac{1}{1+\left(\frac{w^{\ell}_{n}}{w^{\ell}_{a}}\right)^{\gamma}} \tag{C.3}$$

The efficient labor unit for each sector is thus

$$N^{\ell}_{a} = \int_{i\in\mathcal{I}_n} z^{i}_{a}di; \quad N^{\ell}_{n} = \int_{i\in\mathcal{I}_n} z^{i}_{n}di$$

where $\mathcal{I}_a$ and $\mathcal{I}_n$ are the sets of workers joining each sector.

Final goods production In each location, there is one final good firm that produces non-agricultural consumption goods through bundling across intermediate varieties across townships:

$$q^{\ell}_{n} = \left[\sum_{\ell\in L} Y_{n}^{\ell\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}}$$

Similarly, there is one firm that produces the final rice and sugarcane consumption goods across all land plots within Taiwan:

$$q^{\ell}_{g} = \left[\int_{0}^{\bar{L}} (Y^{\ell}_{gj})^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}}, \quad \bar{L} = \sum_{l\in L} L^{\ell}$$

For non-agricultural goods, the cost of sourcing from location ℓ' to ℓ is $p_n(\ell,\ell') = \left(\frac{w^{\ell'}_{n}}{A^{\ell}_{n}}\right)\delta_{n(\ell,\ell')}$. Assume, yet again, the A^{ℓ}_{n} follows a Fréchet distribution with shape parameter θ and scale parameter T^{ℓ}_{n}. The trade share from ℓ' to ℓ is thus

$$\pi_{n(\ell,\ell')} = \frac{T^{\ell}_{n}(p_{n(\ell,\ell')})^{-\theta}}{\sum T^{\ell}_{n}(p_{n(\ell,\ell')})^{-\theta}} \tag{C.4}$$

An analogous expression applies to the trade of agricultural crops across townships.

Timing Assumption First, workers choose which sector to enter based on their idiosyncratic efficiency in each sector and the expected marginal productivity of labor, which together determine expected sectoral labor income. Workers who enter agriculture are randomly assigned to land plots. Landowners then select which crop to cultivate before the realization of crop-specific plot productivity. After productivity is realized and intermediate goods are produced, final good producers in each location aggregate sectoral outputs across space into consumption goods.

Equilibrium We can thus characterize the general equilibrium.

Definition 1 *A general equilibrium consists of a set of wages in two sectors for each township, goods prices for each township, an allocation of land plots across two crops for each township, an employment share in two sectors for each township, and a balanced trade across townships such that*

- *Workers maximize expected labor income and utility given the endowed sectoral efficiencies, resulting in goods demand as in Equation C.1 and location-specific sectoral employment share as in Equation C.3*
- *The crop choice of each land plot is made to maximize the expected revenue productivity as in Equation C.2*
- *Competitive producers source intermediate goods across locations with lowest cost, taking into account the trade costs between location pairs; this results in the regional goods prices and trade share as in Equation C.4*
- *Labor and all goods markets clear in each location*

Discussion The model, drawing on insights from the trade and structural change literature, outlines the mechanism through which land reform in Taiwan contributed to regional specialization, as visualized in Figure 4 and Figure A.5. In particular, given phase II's positive yet heterogeneous effects on yield growth, the model highlights two countervailing forces: (1) the *productivity effect*, which increases the agricultural employment share through higher sectoral wages, and (2) the *nonhomothetic effect*, which reduces the agricultural employment share due to shifts in aggregate demand toward non-agricultural products.

First, phase II liberalized crop choice constraints and increased expected revenue productivity and wages in treated townships, thereby raising the agricultural employment share. The growth in expected agricultural productivity, capturing both the effects of Phase II and external technical assistance (denoted by $\bar{A}$, which is constant across all locations), can be measured as:

$$\widehat{A}^{\ell} = E[A_a^{\ell}] - E(A_{a,pre}^{\ell}) + \bar{A}$$

and the direct effect on regional agricultural employment share can be approximated by

$$p_a \cdot \widehat{A}^{\ell} \cdot \frac{\partial n_a^{\ell}}{\partial w_a^{\ell}} = (p_a \cdot \widehat{A}^{\ell}) \cdot \left(\frac{\gamma}{w_a^{\ell}}\right) \cdot \frac{\left(w_n^{\ell}/w_n^{\ell}\right)^{\gamma}}{\left[1 + \left(w_n^{\ell}/w_a^{\ell}\right)^{\gamma}\right]^2}$$

Second, overall productivity growth in the farming sector reduced the relative price of agricultural goods, $p_{a\ell\in\mathcal{L}}^{\ell}$, and increased demand for non-agricultural products, as implied by Equation C.1. Given the limited scope of international trade during our study period, this increased demand had to be absorbed domestically (Matsuyama 1992). As shown in Figure 4, the non-homothetic effect dominates the productivity effect, resulting in a net decline in the agricultural employment share.

In sum, despite the limited impact on aggregate industrialization, the causal inference presented in the main text masks the rich and heterogeneous effects of each phase of land reform on the geographic distribution of economic activity across sectors. While we lack township-level data on prices, wages, travel times, and trade flows to fully calibrate the model and conduct counterfactual analysis, the framework nonetheless helps address the "missing intercept" problem by capturing the aggregate demand channel omitted from the reduced-form estimates.