Will industrial specialization squeeze out rural smallholder production? --A 10-year tracking survey of 4,376 households from China's "One Village, One Product" program

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Highlights

- the regional promotion of the "one village, one product" (OVOP) industrial specialization policy significantly increases the share of agricultural income in the total income of the households and weakens the withdrawal of households from agricultural production;
- for the region that lacks the organization of clan alliances, the industrial specialization policy significantly increases the level of agricultural part-timing, and the effect of households stranded in agrarian production is enhanced;
- in regions with plain terrain, OVOP leads to an increased effect of households stranded in agricultural production;
- for households closer to the regional economic center, OVOP leads to an increased effect of households stranded in agricultural production.

Abstract

Enabling smallholder farms into larger operations and avoiding smallholders stranded in agricultural production is essential, for low- and middle-income countries' economic development and food security, but also avoiding farmers' hidden unemployment and

land abandonment. We propose the "endowment constraints - organizational embeddedness - transaction costs" framework to explore whether industrial specialization can alleviate smallholders stranded in agricultural production. In this paper, using a multi-period policy effect estimation method (CSDID) with 4376 households and 19,706 people in China from 2010 to 2020, the empirical evidence reveals several vital results: (a) the concentrated production areas (CPAs) policy of the "one village, one product" significantly increases the share of agricultural income in the total income of the households, and weakens the withdrawal of households from agricultural production (stagnation farmer II); (b) for the region that lacks the organization of clan alliances, effectiveness is enhanced over-generalized results. This suggests that, for developing countries, with constrain of agricultural endowments, industrial specialization can hardly change the directly production, but can significantly reduce the transaction costs and make farmers further rely on agriculture. For regions where clanship exists, it can serve as a substitute for organized markets, increasing the bargaining power of agricultural purchases and marketing, and reducing transaction costs through industrial specialization.

Keywords

Transformation, smallholder farming, agricultural specialization, regional development planning, organizational behavior, transaction costs

JEL classification

O13, D23, R58

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1 | Introduction

Virtually every one of today's developing economies is experiencing a revolutionary adjustment in both industry structural and rural society, which represents structural transformation – from agriculture to industry – and population migration – from villages to cities and from farmers to workers. Ideally, although the agriculture apartment is usually described as a low-income society, which absorbs most labor and generates most economic output, the equilibrium of capital and labor productivity between agriculture and non-farm industry and services may turn out to be the final outcome if, as we expected, and also the level of the wage gap will decline to near zero as the economy transforms (Barrett, 2017[1]; Alvarez, 2020[2]). However, in China, the situation of type II multiple livelihoods farmers[1] stranded is getting tougher after we have made many attempts and reforms in our macro policies, such as security of land property rights - Rural Land Contracting Law (RLCL), the separation of three rights on the land property right and land titling (Liu et al., 2018[3]; Zheng et al., 2020[4]; Chen, 2017[5]), collective economic shareholding reform - the Sanbian reform (Guo & Liu, 2021)[6], and land transfer improvement policies - incentives for appropriately scaled agribusiness operations and construction of high-standard farmland (Zhou and Cao, 2020[7]; Fei et al.,2021[8]).

It has been a hot academic topic regarding the transformation between industry and agriculture since Lewis divided the industrial economy into the agricultural and industrial sectors. Based on the practice of Japan's structural transformation in the 1960s and the dilemma of mismatch on human and land factors, Hayami and Ruttan (1971) define the type II multiple livelihoods farmers and put forward the problem of "type II multiple livelihoods farmers' stagnation"[9]. Why does the existence of the type II

[1] Type II multiple livelihoods farmers: Farming households that are engaged in both on-farm and off-farm employment, but whose on-farm income accounts for less than 50 per cent of their total income.

farmers become a problem? Typically, under an efficient market, households can earn more by renting out their land and labor in competitive factor markets. However, the existence of type II farmers means that it is difficult for agricultural operators to improve productivity through enlarging operation scale.

Land control and land titling have become the main starting points for research to address the mismatch of human and land factors in the transformation of structural and agricultural transformation. Firstly, land control. Adamopoulos and Restuccia (2020) take the 1988 land reform in the Philippines as an example, arguing that absolute landholding ceiling controls wrongly allocate farmers' resources and distort their occupational and technological decision-making, thus reducing agricultural productivity[10]; Le (2020) takes the crop cultivation choice control on agricultural land in China as an example, estimating that if the removal of all land use restrictions could increase real GDP per farmer by 8.03 percent [11]. In addition, land titling. Hornbeck (2010) was the first to argue for the significance of border land titling security for agricultural development[12], while Castañeda and Pfutze (2020) later argued that a clear definition of land titling reduces the risk of violent encroachment by agents and the intervention of political actors[13], and Janvry (2015) and Chen (2017) further argued that fixing land property rights through land certificates is beneficial for villagers' occupational choices between agriculture and off-farm work, and optimization and adjustment of labor and land factors[5,14]. In contrast, land titling has a limited impact on villages under traditional community governance, such as in Zambia in Huntington and Shenoy's (2021)[15] study.

The solution to the "type II multiple livelihoods farmers stagnation" is divided into two ways: firstly, rewarding large-scale operators to squeeze out small producers, and secondly, improving the farm operation efficiency through organizational reconstruction, such as cooperation and specialized commercial services. Over an extended period, urbanization in China positively impacted the increase of nominal incomes of rural migrants, and the off-farm employment of rural laborers made it possible to appropriately scale agribusiness operations (Combes et al., 2020)[16]. According to data from the 6th and 7th Population Census of the National Bureau of Statistics of China

(NBS), in 2020, the urbanization rate of China's resident population increased from 49.68 percent in 2010 to 63.89 percent, and the proportion of people who under separation of the place of domicile registration and place of actual residence increased from 19.6 percent to 35 percent. At the same time, the number of people employed in China's plantation industry plummets from 3,270.78 million to 1,184.27 million.[2] It is easy to see that in this decade, 14.21 percent of the population moved from the countryside to the cities, and 63.79 percent of former farmers left farming. However, the agricultural land allocation in China has been significantly adjusted since the 1990s, which means that misallocation may have existed between agricultural land and labor factors when China underwent a major structural transformation. With such a large scale of urban-rural mobility, sorting out the village household's livelihood structure and land allocation at the current stage of China's transition is part of the contribution of this study.

In addition, Zhao et al. (2021) verified that the impact of non-farm employment of rural labor on agricultural land use efficiency in China follows a U-shaped pattern. Further, for counties with low non-farm employment rates, allowing farmers to engage in non-agricultural activities would harm rural land use efficiency[17]. The administrative land redistribution ban -RLCL- corrects the fact that frequent land redistribution under communal ownership has led Chinese rural households to allocate too much labor to the agricultural sector, but it also weakens the adjustment of the allocation of human and land factors at the same time (Zhao, 2020)[18]. This means that in order to solve the problem of human-land factor mismatch, we need to squeeze out small farmers to enhance the scale of agricultural production and operation with non-agricultural employment, but meanwhile, we are facing the dilemma of inefficient utilization of land owing to land abandonment. In past studies, researchers have contributed many quantitative works from a meso and urbanization perspective, like the impacts of a series of policies on villagers' income and farms' evolution under different scales (Combes et al., 2020[16]; Ma et al., 2022[19]). In our paper, for dealing with the "type II multiple

[2] Office of the Leading Group of the State Council for the Seventh National Population Census. China population census yearbook 2020. https://www.stats.gov.cn/sj/pcsj/rkpc/7rp/zk/indexch.htm

livelihoods farmers dilemma" and achieving a balanced and efficient allocation of labor and land, we further pay attention to the farmer household's adaptive behavioral choices, and make sense of the mechanism of farmer household's change of land use and livelihood during structural and agrarian transformation, especially for the reflection on local agricultural production support policy like "One village One Production".

2 | Setting

Although the structural transformation and rural transformation have been somewhat uneventful, the community has also been working towards the goal of a high-income society characterized as a relatively small but highly productive agricultural sector. As is well known, agriculture is one of the most heavily subsidized sectors globally due to its weak nature. According to the Producer Support Estimates (PSE) estimated by the Organisation for Economic Co-operation and Development (OECD), China's PSE reached 2,527.6 billion dollars in 2020, compared to 1,159.6 billion dollars in 2010, representing an increase of 122.28 percent in 10 years.[3]

Among the many industrial promotion policies, the "One Village One Product" Demonstration Village and Township Project (OVOP), which was launched in 2011, has selected 12 batches of 4,177 items, covering 31 provinces and districts, 899 counties and districts in China, and is a concentrated demonstration of the effectiveness of the construction of rural speciality industries under the support of agricultural subsidies. The procedure of OVOP recognition is as follows: 1) declaration of specialized villages and towns; 2) selection of eligible specialized villages and towns by county-level agricultural and rural authorities; 3) scrutiny and recommendation by provincial-level agricultural and rural authorities; and 4) evaluation and release of selected lists of demonstration villages and towns recommended by provinces by experts organized by the Ministry of Agriculture and Rural Development. OVOP declaration focuses on dominant industries' share, standardization, organization, marketing, and sustainable development.

[3] OECD (Organ. Econ. Co-op. Dev.). Data set from OECD.Stat. https://data-explorer.oecd.org

The essence of OVOP is the branding of local specialties by the concentrated production of agricultural products in villages and towns. In China's local practice, concentrated production areas (CPAs) for agricultural products are often based on the resource endowment and characteristics of regional agriculture, where many farming households plant the same agricultural products in a village, town, or even a county and usually specialty advantageous products such as vegetables, teas, edible fungi, and Chinese herbs. With the guidance of the local government to focus on planting, these areas with advantageous resources will gradually become the CPAs for this kind of agricultural products and even set up modern agricultural zones and digital intelligent supply chain platforms for the relevant categories. The most notable thing about the creation of CPAs is the improvement of the planting area of agricultural products, the total output, the quality of agricultural products and agricultural production technology, as well as the equalization of the public costs of infrastructure construction, agrotechnology promotion, promotion of branding, trade logistics and other public costs. Further, in order to build local specialty brands, local governments often simultaneously promote the construction of production standards and branding to solve the problem of having products without brands and weak market competitiveness. First of all, CPAs usually formulate product quality standards, which are not constrained by harvesting standards, pest control standards, processing standards, or packaging standards. Then, relying on the agricultural product quality classification system, CPAs establish a traceability management system, which promotes the traceability of agricultural products from the point of production to the point of entry into wholesale and retail markets or production and processing enterprises. In addition, by recognizing geographical indication products and declaring OVOP, CPAs contribute to building regional public brands and, in some areas, even achieve a unified standard among registration, trademarks, and management.

In addition to the overall layout, OVOP tends to reshape agricultural production's organizational structure and the agricultural products supply chain. Firstly, in the agricultural production process, modern agriculture needs to decipher the problems of fragmented means of production and the low level of organization of smallholder

production, which aims to realize the re-centralization of means of production, organizational methods, and farmers' skills training—meanwhile, local financial arrangements fund leading enterprises. Then, driven by the radiation of leading enterprises, traditional production systems formed a multi-level production system in which leading enterprises built production bases linked to large farming households or professional cooperatives and small-scale farmers. Secondly, for traditional agricultural products to adapt to the modern system, the docking of production and marketing is vital to the rural industrial revolution. CPAs can achieve multi-channel expansion of the trading radius of local agricultural products: 1) CPAs establish long-term stable supply and marketing relationships through multi-level urban sales nodes from business entities to wholesale markets; 2) CPAs expand online sales channels through the network live broadcast, network celebrity, online shop, streaming media platform, and even linkage to the well-known e-commerce services enterprises, like Hema and Pinduoduo, to promote the construction of e-commerce industrial zones, incubators and entrepreneurial zones; 3) CPAs can transport production to wider consumers through group terminals such as supermarket, school and hospital. In the deepening of structural transformation and rural transformation, where agricultural products are used as raw materials for the food and light industry, which promotes the rise of related processing enterprises. CPAs often choose to increase the added value of agricultural products through business enrichment, especially in the upgraded iterations of the agricultural supply chain, like "central kitchen" and "pre-prepared food", the scale advantage of CPAs is increasingly prominent in the competition of the food industry.

3 | Conceptual framework

The relationship between non-farm employment of rural labor and rural land use in China is not unidirectional and linear (Zhao et al., 2021)[17], which means that the optimal allocation of labor and agricultural land factors cannot be achieved simply by crowding out small farmers to expand scale operations. Here, we will further explore the livelihood decision-making process of farmers in response to CPAs based on the framework of "endowment constraints - organizational embeddedness - transaction

costs."

3.1 | Endowment constraints

Firstly, it should be noted that, in contrast to established studies that usually set the context as a situation where villagers leave agricultural production in a situation where the returns from the industrial sector are much greater than those from the agricultural sector, our logical starting point is why a multi-livelihood farming household in structural transition chooses to give up agricultural production altogether. Our research objective is to explore the dynamics of change from mixed to single livelihoods for households engaged in both agricultural and non-agricultural production, i.e., part-time farmers are the object of the study. Typically, the commercialization of smallholder agriculture advances the agro-industry, and the large wage gap between agriculture and other sectors narrows as the agro-industrial revolution advances (Alvarez, 2020[2]; Ogutu et al., 2020[20]). In the process, farmers with below-average productivity tend to outsource or withdraw from agricultural production; conversely, farmers with above-average productivity tend to farm the land themselves (Deng et al., 2020)[21]. While the rural population is still primarily composed of small-scale farmers, evidence from a growing number of developing countries suggests that the number of "medium-sized" or "emerging" farmers is increasing rapidly (Burke et al., 2020)[22].

In the past, as most developing countries were in the early stages of structural transformation, the unidirectional pursuit of increasing the scale of agricultural production was the ultimate choice. Nowadays, when the process of industrialisation is slowing down, as well as the problem of farmer fragmentation in rural systems is becoming more acute. The choice between promoting smallholder production systems as a strategy for growth and poverty reduction, or choosing an institutional framework that supports further endogenous and voluntary consolidation of smallholder farms into large-scale operations, has become a challenge for low- and middle-income countries in the later stages of industrialization in order to reconcile the goals of economic development and food security (Ciaian et al., 2021)[23]. In addition, diversified employment is often perceived as little more than a risk mitigation strategy, where farmers sacrifice expected returns in exchange for income or consumption stability,

rather than a pathway to increased returns through strategic complementarity (Barrett, 2017)[24]. Households and individuals who enter non-farm self-employment for subsistence reasons are more likely to exit the sector when wages increase or more stable employment opportunities become available (Merfeld, 2020)[25].

In summary, exploring the optimal labor-agricultural land factor allocation is not just a matter of a single choice or a combination of choices of economic push and pull between the agricultural and non-agricultural sectors based on the production endowment capacity and risk preferences of farmers, but also a realistic challenge for low-income and middle-income countries in the mid- to late-stage of industrialization in terms of balancing efficiency and equity.

3.2 | Organizational embeddedness

As mentioned above, the commercialization of agricultural products has contributed to the structural transformation of the rural economy, and the nature of the OVOP project is an organizational embedding whereby farmers share the public expenditures in various aspects, including, but not limited to, the purchase of agricultural materials, technological research and development, marketing, and so on. This organizational order can shift traditional agricultural production from basket selling to a modern supply chain system.

1) Organisational embeddedness flattens scale constraints.

By expanding scale operations, large farms are not only reducing costs in specific production processes, which can also be cut by small agriculture through social services, but more importantly, expenditures on farm input purchases, technology development and marketing. Firstly, it is difficult for farmers to discern the quality of inputs in the agricultural market and the impact of input quality on profitability, whereas OVOP support policies can often increase bargaining power through organizational reconstruction (Ola & Menapace, 2020)[26]. At the same time, the adoption of new technologies is associated with upfront fixed costs and scale effects (Foster & Rosenzweig, 2010)[27], and OVOP support policies help farmers to introduce sustainable agricultural intensification (SAI) and other sustainable agricultural intensification (SAI)

practices through organizational embedding, to Increasing land productivity and reducing natural resource degradation and transforming traditional to modern agriculture (Nyarindo et al., 2023)[28].

2) Commercial-scale operations in the downstream sector of the industry chain are forcing the modernization of the agricultural supply system

In developing countries, contract farming has expanded rapidly with the emergence of high-value supply chains such as large supermarket chains and consumer giants in the food industry. The emergence of supply chains has weakened the role of wholesale markets and traders in favor of direct marketing, greater vertical coordination, and the enforcement of private standards through vertical integration and contracts. In this context, influential downstream buyers may have considerable bargaining power over smallholders, forcing them to set up efficient production systems and demanding standardized and high-quality outputs. Moreover, it becomes a significant challenge how smallholder farmers working alone can be embedded in modern supply chain systems, and how the traditional agricultural sector can be further integrated into economic sectors in the supply chain in competitive markets (Barrett, 2010)[29]. The OVOP project, which is committed to extending the chain by tapping industries from agriculture based on the advantages of the region's overall scale of production, has come into being in the current context of advancing the transformation of industrial and business systems in the context of the current push for changes in industrial and business systems. More efficient and standardized agricultural production will create more opportunities for downstream businesses (e.g., food processing), and the transformation of smallholder agriculture and the growth of the downstream sector of the agricultural system will be mutually reinforcing. Undoubtedly, the OVOP project, through its organizational embeddedness, achieves an essential bridge between commodity-based agriculture and the livelihoods of modern industries and service sectors in urban centers.

3.3 | Transaction costs

The modernization of agricultural value chains, often through a system of agreements, arrangements, and contracts linking farmers to food consumers through one or more

intermediaries, is both a consequence and a cause of economic development (Barrett et al., 2012)[30]. The OVOP support policy has fostered the growth of the intermediaries and the agricultural social services sector, which improves smallholder farmers' production and business conditions. The project enabled smallholders to overcome market and production barriers, resulting in higher yields and incomes (Dubbert, 2023)[31].

However, several key features that consistently emerge from empirical studies of OVOP support policies, such as geographic location, transportation and heterogeneity in the scale of arable land operations, and the expected role of the pre-existing clan governance system as a contractual agent, have implications for the adaptive behavior of farmers amid the structural transformation of the rural economy in response to industrial support policies. The differential choice behavior here will be further explored, drawing on transaction costs, rational actor, and principal-agent theories.

4 | Data

4.1 | Household level data: China Family Panel Studies

My principal empirical analysis uses a panel of China households from 2010 to 2020, China Family Panel Studies (CFPS), a nationally representative and influencing survey administered by the Institute of Social Science Survey, Peking University (ISSS). The timing of the CFPS is ideal for this research — as mentioned previously, 14.21 percent of the population moved from the countryside to the cities, and 63.79 percent of former farmers left farming during this decade. The ISSS conducted national household surveys every two years during the decade, and it is timely to document the major structural transformations in the allocation of agricultural land and labor from a micro perspective.

The CFPS is exceptionally well-suited for studying agricultural and livelihood choices at the household level — it contains detailed information on households' landholdings, operation scale, agricultural inputs, crop sales, revenues and profits, and information on off-farm employment. In addition, the village-level CFPS questionnaire includes demographic variables as well as information on clanship, integrated economic data, infrastructure, and distance to various amenities.

Notably, the restricted CFPS data contains village-level identifiers that allow me to match the household panel to geospatial data, data set of OVOP or CPAs, China county statistical yearbook (CCSY). The CCSY is an informative yearbook that comprehensively reflects the socio-economic development of China's counties. Since 2000, the CCSY has provided information on the basic situation, comprehensive economy, agriculture, and other aspects of more than 2,000 county units in China each year, which include mountainous, hilly, plains, ethnic areas, land border counties, pastoral areas, semi-pastoral areas, the nine major agricultural areas, major cotton producing counties, and counties that are key to poverty alleviation work. After these connections, my matched sample consists of 4376 households, concerning 18995 villagers from 437 villages and 117 prefectures from 24 provinces. It should be noted that, in order to achieve the scientific use of the data, we identified and matched the experimental group of "one product, one village" as "one county, one product" only if the associated area of the same product category spanned different towns and villages within the county. Finally, there were 458 households in the experimental group and 3,918 in the control group.

TABLE 1 Scale of agricultural land management of surveyed farm households, 2010-2020.

Year	Farming Observations	(0,1]	(1,2]	(2,3]	(3,4]	(4,5]	(5,10]	(10,20]	(20,50]	(50,]
2010	3,390	248	497	389	414	256	814	505	226	41
2012	3,313	175	373	262	344	242	643	421	160	693
2014	2,809	161	318	218	287	177	551	344	149	604
2016	2,712	155	292	218	249	160	521	342	124	651
2018	2,271	144	262	195	232	107	459	273	104	495
2020	2,010	98	223	177	228	118	401	262	102	401

Note: The data is compiled based on the CFPS, and the sample was selected under two conditions: (i) households participated in the six-phase tracking survey, and (ii) there were "pesticide and fertilizer" cost inputs in the 2010 survey.

4.2 | Geospatial data

We chose geospatial data in designing the control and heterogeneity variables.

a) Gini FE

County Light Gini Coefficient (CLGC), which reflects inter-regional economic vitality differences in which the village is located. In our research, the explanatory variables are the share of agricultural income in total household income and the livelihood choice of the farm household - whether or not to become a stranded household, i.e., not working in agriculture but still residing in the countryside. The CLGC is used here as a critical control variable, which was used to smooth out changes in livelihood choices across counties due to internal economic development gaps. As for the measurement of the CLGC, the DMSP data and the VIIRS data are overly reliant on nighttime light and do not represent economic activity in low-density rural areas well (Gibson et al., 2021)[32]. Consequently, the CLGC in this paper refers to Liu et al. (2023)[33], who uses the global spatialization of population data from the Oak Ridge National Laboratory in the USA as the underlying data. This section comprehensively uses census data, administrative division information, land cover data, and related high-resolution remote sensing imagery such as elevation, slope, and coastline (Dobson et al., 2000)[34].

b) Topography

Indicator of the average slope of the county, which is used to reflect the impact of land on the livelihood choices of farmers due to differences in baseline topography in the county in which the village is located. The data was raster extracted based on geographic layers, and the underlying data is NASA ASTER Global Digital Elevation Model version V003.

c) Vegetation

Indicator of the county's cultivated land area, which is used to reflect the essential capacity of continuous production and operation in the county where the village is located. The data is extracted from a raster geographic layer, and the underlying data is the annual China Land Cover Dataset (CLCD). Based on the 335,709 Landsat images on Google Earth Engine, this dataset is interpreted through human-computer interaction

to identify the layers as farmland, forest, grassland, water, built-up area, and unused land (Yang & Huang, 2021)[35]. Also, the indicators used in this paper are mainly extracted from the area of arable land.

5 | Empirical strategy

5.1 | Behavioral field experiments

Randomized controlled trials (RCTs), which often require a subjective choice of sites to conduct behavioral experiments, suffer from the pitfalls of methodological boosterism, including ethical dilemmas, uncontrolled treatments that lead to 'false homogeneity,' and distortion of the research agenda (Barrett & Carter, 2010)[36]. Our study is based on observing changes in farmers' adaptive behavioral choices, i.e., recording farming and livelihood behavior choices before and after the OVOP industrial promotion policy at different process points of CFAs. In the empirical strategy of our research, the project of OVOP was made for all townships in China, but the gain of OVOP's authentication relied on both regional endowments and opportunity. With this kind of tracking, respondents' behavioral choices will be subject to the less subjective experimental intervention. Thus the respondents' adaptive behaviors for filling their basic needs in response to random CFAs' policy interventions are somewhat similar to behavioral field experiments (BFE). Similarly, the key part of our study is observing the adaptive behavior of respondents under the influence of OVOP and the changes in well-being. This accomplishes most RCTs' goals while rendering tolerable the assumption of non-conformability on which credible identification depends.

It is worth noting that the study classifies villagers into five categories, namely "Multiple livelihoods farmer", "Stagnation farmerI ", "Farming-only farmer", "Rural-leaving villagers" and "Stagnation farmerII ", based on the indicators of "engaging in agricultural production", "working outside the village", "transferring land" and "making profits from agriculture". For the data in the orange squares in Figure 1, the left side of the arrow shows the proportion of villagers in this category in 2010, and the right side shows the proportion of villagers in this category in 2020 and 2018, respectively.

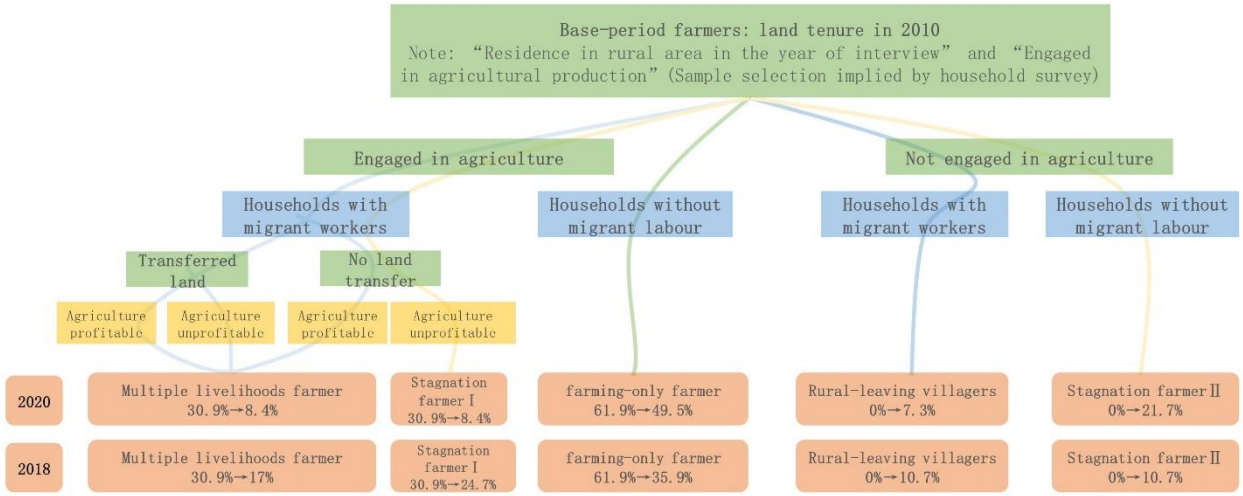
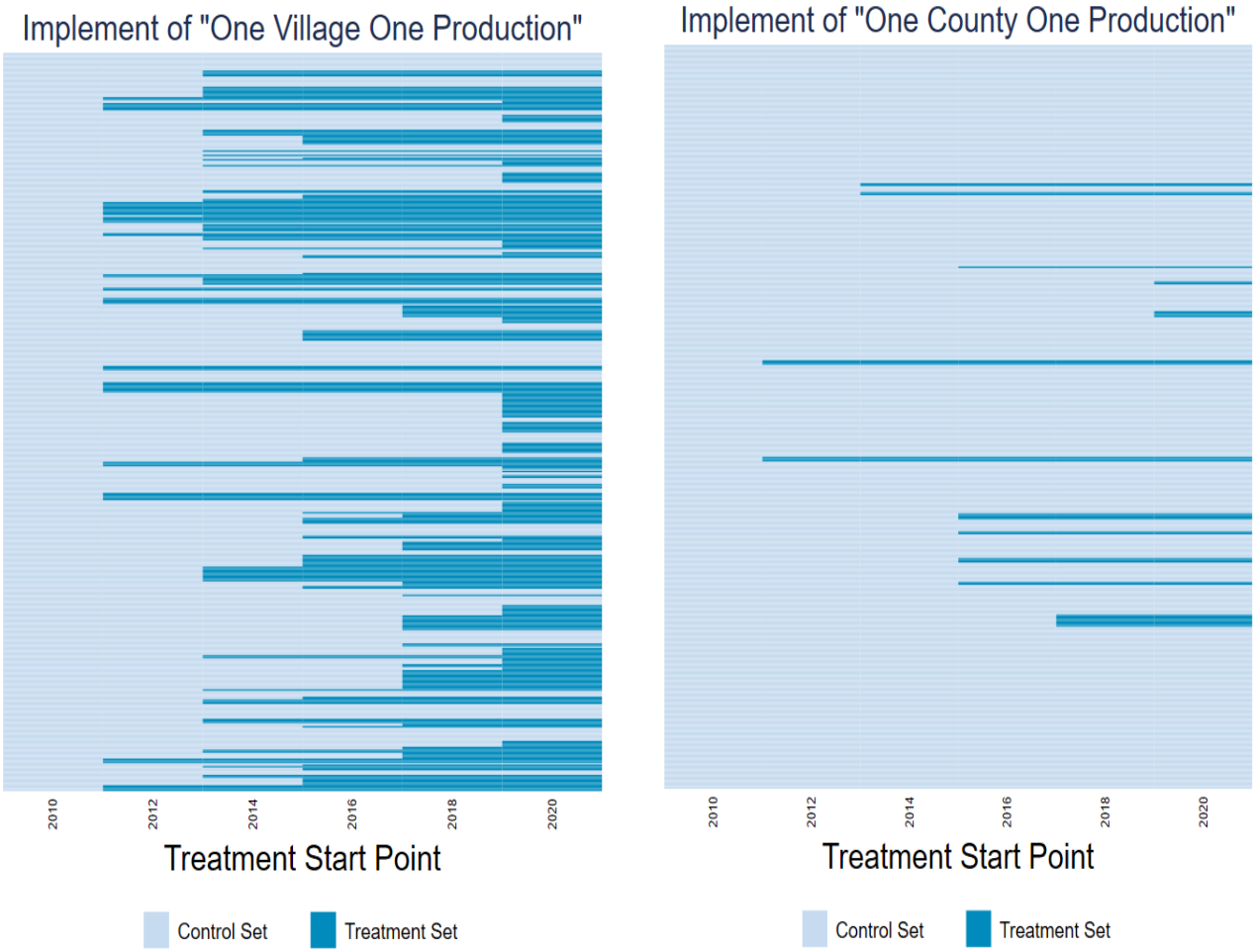


Figure 1. Categorization and variations of multiple villagers

5.2 | Defining treatment and control groups



It is true that, as mentioned earlier, as of February 2024, a total of 4,177 items have been selected in 12 batches of OVOP. Since the CFPS survey is limited to 162 counties, 94

counties in the survey have been certified as OVOP, of which 13 of them have achieved OVOP certification across townships, which we can also call OCOP. e.g. water bamboo in Anxi County, Anhui Province, snow pear in Guanyang County, Guangxi Province, navel orange in Xinfeng County, Jiangxi Province, etc. Consistent with the traditional staggered did approach, we identified as an experimental group when the county was certified by OVOP in the same year and beyond. The others are the control group.

5.3 | The multi-period policy effect estimation method

The traditional double-difference (DID) method is usually used in a 2x2 model, where the experimental subjects are divided into treatment and control groups, and the treatment times are divided into pre-treatment and post-treatment. However, many empirical applications of DID deviate from the typical DID model as many studies have more than two treatment time points. In this paper, we use Callaway and Sant's (2021) cutting-edge research approach to policy effect estimation, the multi-period policy effect estimation method (CSDID). In estimating between-group average treatment effects with multi-period policy implementation, this method allows for the estimation and inference of interpretable causal parameters, arbitrary treatment effect heterogeneity, and dynamics. It thus avoids the problem of inaccurate estimation of multi-period policy effects by standard double-differenced fixed effects regression.

In CSDID, it is first necessary to calculate the group-time-point average treatment effect ATT(g,t), which is calculated as shown in equation (1).

$$ATT(g,t) = E\left[Y_t(g) - Y_t(0) | G_g = 1\right] \tag{1}$$

where g is the point in time when an individual was first treated, G is the set of individuals who first received the treatment at point g, G_g denotes the group G that first received the treatment at point g, $Y_t(g)$ is the outcome at time point t for the group that first received the treatment at point g, and $Y_t(0)$ is the potential outcome

for this group that was untreated at time point t.

The total treatment effect, as well as the heterogeneity of treatment effects, is of more interest than measuring individual treatment effects. CSDID provides aggregation methods to meet these needs. As shown in equation (2).

$$ATT_{TYP} = \frac{\Sigma_{TYP}\omega_{g,t}ATT(g,t)}{\Sigma_{TYP}\omega_{g,t}}, \tag{2}$$

$$Simple:\ t \geq g;\ Group:\ t \geq g \& g = h;\ Calendar:\ t \geq g \& t = s;\ Event:\ t - g = e$$

where $\omega_{g,t}$ is based on the number of treatment subjects used in a given ATT(g,t);

"Simple" is the calculation of the total policy effect of the experimental subjects; "Group" is the calculation of the policy effect by the time of the treatment determination; "Calendar" is the calculation of the policy effect for each year; and "Event" is the "event study", which reports the average policy effect based on the number of years that the OVOP or OCOP has been in place. Event is an "event study" that reports average policy effects based on the year in which the OCOP was implemented.

6 | Results

6.1 | Validating the parallel trends assumption

The difference-in-differences specification relies on the assumption that in the absence of OVOP, the livelihood behavior choices of farmers supported by the CPAs policy in earlier years will have a parallel trend to those of farmers supported in later years. I test this hypothesis through two separate exercises.

First, I conduct a parallel trend test using CFPS data. As shown in Figure 2, the results of the parallel trend test indicate that before the policy was implemented, the policy effects were not significant and did not show a clear trend in most of the periods, while after the policy was implemented, the policy effects were all significant. This indicates that the parallel trend hypothesis holds for both the experimental and control groups, thus satisfying the prerequisites for using the double-difference model.

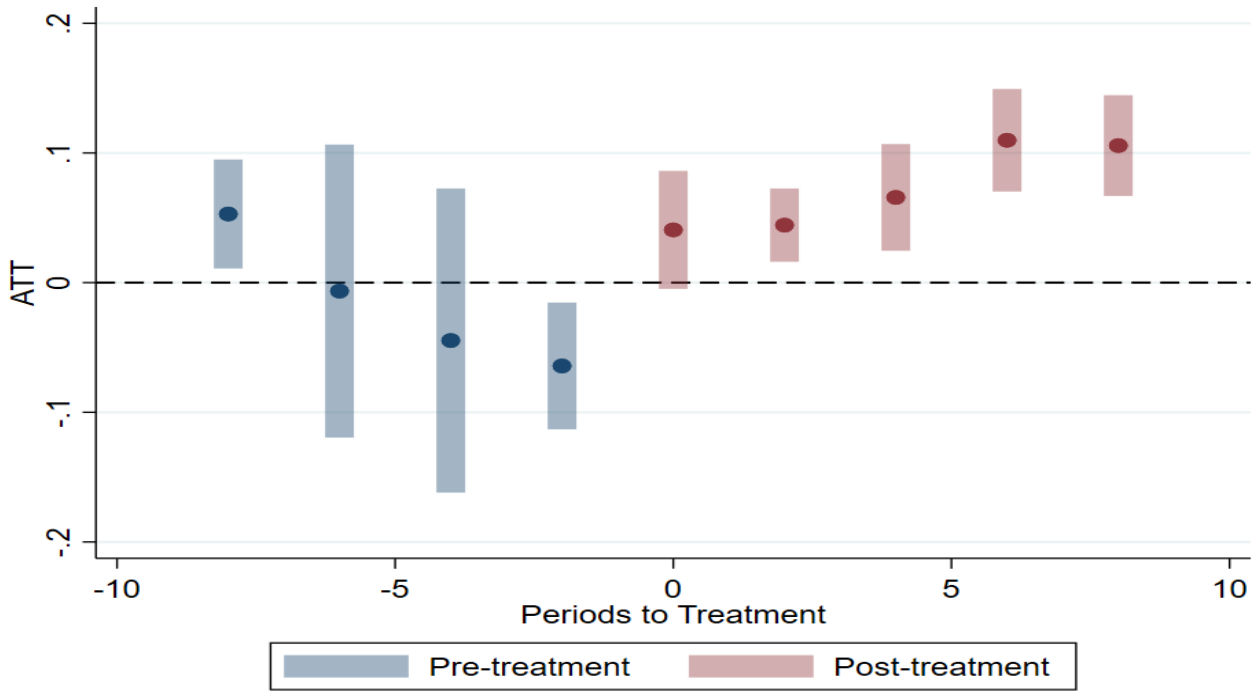


Fig. 2. Parallel Trend Test using the method from Callaway and Sant'Anna (2021), Notes: This figure illustrates the event studied using improved DID estimations. Bars around point estimates represent 95% confidence intervals.

In addition, I dig deeper into the underlying CFPS data (2010 and 2010) to examine the sample endowment characteristics of the experimental and control groups. Given that OVOP was launched in 2011 and a new cohort is selected each year. After being subjected to the CPAs policy, I identify each sample as a treatment group. The data in Figure 2 present the treatment status plotting the annual means of columns (1) and (4) for the sample of farmers who were affected by the CPAs policy, and columns (2) and (5) for the sample of farmers who have not been affected by the CPAs policy. It is worth emphasizing that no difference in the endowment of the treatment villages relative to the control villages is found. This is sufficient to support the idea that the behavioral choices of farm households in the sample period stem more from differences in support policies than from differences in county endowment changes.

Table 2. Characteristics of OCOP rural households at baseline.

	2010			2020		
	Treatment	Control	p-value	Treatment	Control	p-value
Agricultural revenue	4,420	4,734	-0.066	2,559	3,715	-0.311
	(9,079)	(7,130)		(12,025)	(23,877)	
Proportion of total income derived from agriculture	0.313	0	-0.022	0.031	0	-0.255
	(0.354)	(0.341)		(0.085)	(0.103)	
Size of household	4.439	4.329	0.025	4.465	4.147	0.077
	(1.687)	(1.680)		(2.091)	(2.017)	
Salary income	14,440	14,076	0.026	41,905	40,280	0.040
	(20,465)	(18,125)		(49,797)	(45,748)	
Non-agricultural business income	601	286	1.105	11,757	9,198	0.278
	(9,447)	(5,405)		(52,845)	(35,512)	
transfer income	436	523	-0.167	9,883	9,206	0.073
	(2,439)	(2,830)		(39,857)	(71,898)	
Other income	985	852	0.156	1,248	1,995	-0.374
	(3,699)	(3,193)		(5,034)	(10,499)	
Consumer expenditures	18,641	17,590	0.060	44,998	44,583	0.009
	(28,572)	(20,746)		(49,264)	(56,025)	

Notes: Table presents baseline means by treatment status, with standard deviations reported in parentheses. Columns (1) and (4) are restricted to program-inflenced households (N(treatment) 458), and Columns (2)–(5) are restricted to program-free households (N(control) 3,918) . Columns (3) and (6) display p-values from a comparison of means across treatment and control sample, obtained from a simple univariate regression with state fixed effects. Outcomes are measured in the 2010 and 2020 CFPS survey.

6.2 | Impact on Share of Agricultural Income

First, I consider the share of agricultural income in total household income as a reflection of household livelihood changes during social structural transformation or, more precisely, under the concentrated production areas (CPAs) like the “One Village, One Production” support policy. Table 3 estimates the impact of the shift in income sources of farming households under the impact of the CPAs support policy. The livelihood status of the household is measured by the proportion of the household's total income that comes from agriculture.

In this paper, a model, as shown in equation (6), is developed to test the dynamic characteristics of the impact of OCOP policy on the livelihood structure of farm households.

$$Y_{i,t} = \alpha_1^{g,t} + \alpha_2^{g,t} G_g + \alpha_3^{g,t} I\{T=t\} + \beta^{g,t}(G_g * I\{T=t\}) + \sum^{k} \gamma_k Control_{k,i,t} + \varepsilon^{g,t} \quad (3)$$

where i denotes the observed city, t denotes the observation time, $\alpha_1^{g,t}$ denotes a constant term, $\alpha_2^{g,t}$ denotes an individual fixed effect, $\alpha_3^{g,t}$ denotes a time fixed effect, $G_g \in \{0,1\}$ denotes the first time a county is certified as an OCOP demonstration county, $I\{T=t\} \in \{0,1\}$ is a schematic function, $\beta^{g,t}$ is the effect of the policy that we are interested in ATT(g,t), $G_g * I\{T=t\}$ denotes a multi-period OCOP policy,

$Control_{k,i,t}$ is the set of control variables, and $\varepsilon^{g,t}$ denotes an error term.

This paper uses CSDID to reflect the adaptive behavioral tests of farmers' livelihood structures in response to CPAs, as shown in Table 3. As a control, Table 3 also reports the average policy effect coefficients obtained using DID. From the static tests, all the policy effect results from the CSDID method are significantly positive at the 1 percent level, while all the policy effect results from the DID method are significantly positive at the 1 percent level. It is easy to see that the TWFE estimates are biased here, with "negative weights" due to the imbalance in the proportion of DID estimates comparing the trend of outcomes between policies over time.

Table 4
Special stagging farming households: shocks from Specialized Agriculture Support Policy

	DID method from Callaway and Sant'Anna (2021)				
	(1)	(2)	(3)	(4)	(6)
	farmerh_b	farmerh_b	farmerh_b	farmerh_b	farmerh_b
csdid	-0.011	-0.048***	-0.0335*	-0.0229*	-0.0187*
	(0.307)	(0.002)	(0.062)	(0.049)	(0.039)
Industry FE		Yes			
Geni FE			Yes		
Major agricultural county				Yes	
Cropland-Level Controls					Yes
Observations	26,256	26,256	26,256	26,256	26,256

Notes: [1] Group (a) shows the results of the regression without control variables, and group (b) adds the indicators "County Light Gini Coefficient" and "regional industrialization development level" as control variables. [2] TWFE and “Calendar Time Effects” reflect regress results from the traditional DID method. [3] “Simple Weighted Average”, “Group-Specific Effects,” and “Event Study” reflect regress results from the multi-period policy effect estimation method in Callaway and Sant's way.[4] The p-value from a F-test of the joint significance of the two coefficients is reported at the bottom of each panel. Standard errors, clustered at the village level, are reported in parentheses. *ρ < 0.10 , **ρ < 0.05 , ***ρ < 0.01.

From the dynamic tests, the results of the policy effects in the Time-Specific Effects are different for each year, suggesting temporal heterogeneity. The "event study" reports the average policy effect based on the number of periods in which the OCOP support policy was in place, where e denotes the number of periods in which the county was treated by the policy. The policy effect increases each year as the number of treatment periods increases, suggesting that the effect of the OVOP support policy on increasing the share of farm income continues to grow. In summary, both the static and dynamic

tests indicate that Hypothesis 1 is valid.

6.3 | Impact on Special Stagging Farming Households

Huang and Peng (2007) argue that China is at the crossroads of three historical changes: large-scale non-farm employment, slowing natural population growth and structural transformation of agricultural production[37]. However, with the end of the demographic dividend era at this stage of China's development, urbanization is lagging behind industrialization, and the co-existence of farmers' hidden unemployment and land abandonment needs attention. In Figure 1, we define Special stagging farming households, “stagnation farmer II”, those who survive in the countryside but do not engage in agriculture, and the proportion of these households has increased to 20.7 per cent in 10 years. Not surprisingly, the existence of this category of particular stagging farming households is the result of the combined effects of diversification of rural livelihoods and large-scale agricultural operations under land transfer.

Table 3

Special stagging farming households: shocks from Specialized Agriculture Support Policy

	DID method from Callaway and Sant'Anna (2021)				
	(1)	(2)	(3)	(4)	(6)
	farmerh_b	farmerh_b	farmerh_b	farmerh_b	farmerh_b
csdid	-0.011	-0.048***	-0.0335*	-0.0229*	-0.0187*
	(0.307)	(0.002)	(0.062)	(0.049)	(0.039)
Industry FE		Yes			
Geni FE			Yes		
Major agricultural county				Yes	
Cropland-Level Controls					Yes
Observations	26,256	26,256	26,256	26,256	26,256

Note: [1] Using "Stagging Farmer II " instead of "Share of Agricultural Income" as a proxy for the accepted variable, columns (2)-(4) control for "industrialization level", "county light Gini coefficient", "Major grain producing areas", respectively. ", and "level of arable land size", respectively. [2] The p-value from a F-test of the joint significance of the two coefficients is reported at the bottom of each panel. Standard errors, clustered at the village level, are reported in parentheses. *ρ < 0.10 , **ρ < 0.05 , ***ρ < 0.01.

In the next section, we will focus on this particular one - stagnation farmer II - and the impact of CPAs' industrial support policies on the generation of this type of farmer. In this section, we will add the dichotomous variable, which takes the value of 1 if the

farmer evolves to be a "stagnation farmer II" in response to the CPAs industrial support policy. Referring to equation (3), this dummy variable will be used as a replacement explanatory variable, and columns (2)-(4) in Table 4 indicate the regression results under different scenarios of control variables, respectively. Through the CSDID method, CPAs industrial support policies inhibit farmers from evolving into "stagnation farmer II". This suggests that effective industrial promotion policies can slow farmers' exit from agricultural production through transaction cost savings and organizational reconstruction.

6.4 | Further discussion/Heterogeneous impacts

Given that the allocation of farm labor factors is associated with evidence of profitability (Harou et al., 2022)[38], the achievement of farm profitability is directly related to the geographic terrain and size of the cultivated land in which it is located. In addition, improved road connectivity leads to livelihood transformation in agriculture, where improved transport infrastructure influences agricultural production decisions in remote villages (Shamdasani, 2021[39]; Harou et al., 2022[38]). I tested for heterogeneity in treatment effects by geographic topography, accessibility, and cultivated land size, respectively.

As an essential institutional component of the rural industrial revolution, the support policy for particular industries can have a facilitating effect on the choice of farm households to tend to allocate more labor factors to agricultural production. However, without potential profit expectations, agricultural support policy implementation also makes it challenging to achieve the expected results. Therefore, this paper selects the county average slope indicator and the traveling time from the village to the nearest marketplace as measures reflecting the geographical terrain and accessibility situation, respectively. The sample is designated as low-level areas based on the median indicator, which are areas with flatter terrain and areas with more convenient transport conditions, respectively. Through the CSDID method, the policy estimation results derived from the samples after conditional selection are shown in columns (2) and (4) of Table 5, which indicate that the treatment effect of the CPAs

support policy is -0.0928 for the flatter terrain areas and -0.0889 for the areas with more convenient transport conditions, which is an increase in the validity of 24.4 percent and 19.17 percent, respectively, compared with the overall sample. This suggests that even specialized industrial support policies require certain agricultural production endowment conditions as support for industrial development.

Table 5
The Heterogeneous Effects of Endowments: topography, transport, vegetation

	Topography: Low Level			Transport: Low Level			Vegetation: High Level		
	Before farmerh_b (1)	After farmerh_b (2)	Difference farmerh_b (3)	Before farmerh_b (1)	After farmerh_b (4)	Difference farmerh_b (5)	Before farmerh_b (1)	After farmerh_b (6)	Difference farmerh_b (7)
csdid	-0.0746***	-0.0928***	24.40%	-0.0746***	-0.0889***	19.17%	-0.0746***	-0.0340***	-54.42%
	(0.001)	(0.003)		(0.001)	(0.000)		(0.001)	(0.007)	
Industry FE	Yes	Yes		Yes	Yes		Yes	Yes	
Geni FE	Yes	Yes		Yes	Yes		Yes	Yes	
Observations	26,256	26,256		26,256	26,256		26,256	26,256	

Note: The p-value from a F-test of the joint significance of the two coefficients is reported at the bottom of each panel. Standard errors, clustered at the village level, are reported in parentheses. *ρ < 0.10 , **ρ < 0.05 , ***ρ < 0.01.

In addition, removing the two indicators of topography and transport, the size of cultivated land instead has a dampening effect on policy effectiveness. Similarly, based on the median of the indicators to designate the sample as a region with a high level of arable land size, the policy estimation results derived from the conditionally selected sample through the CSDID method are shown in column (6) of Table 5, which indicates that the treatment effect of CPAs supporting the policy is -0.0340 in the region with ample arable land size, which is an inverse effect of 54.42 percent compared to the overall sample. This also reconfirms the U-shaped relationship between land operation scale and labor allocation, and we try to guess here that an increase in land operation scale also implies a more substantial substitution of labor advantage by agricultural machinery and a more substantial differentiation effect among farmers. As a result, a small number of villagers become large-scale operators, while more villagers choose to withdraw from agricultural production.

7 | Potential channels

In this section, I explore two potential channels for interpreting my results:

(1) Clan organisation;

(2) Employment path dependence.

First, when I restrict my analysis to a sample of villages where villages retain a clan shrine, I find that the CPAs support policy dampens the evolution of farmers into "stagnation farmer II". Given that the set of control variables sequentially controls for the relevant endowment variables, the dampening effect can be attributed to organizational efficacy under the clan order. In the theoretical section, we state that the CPAs' support policy reduces the cost of purchasing farm inputs and the transaction cost of selling farm products through organizational reengineering, increasing the profit share and inducing farmers to stay in agriculture. However, in regions with a substantial clan order, the existence of an existing organizational order in the original community weakens the ability of CPAs to save transaction costs.

Table 5

Special stagging farming households: Organisational substitution from Clanship/Zongzu & Livelihood

	Sample of the village with Zupu				Sample of Pure Farming Households			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	farmerh_b	farmerh_b	farmerh_b	farmerh_b	farmerh_b	farmerh_b	farmerh_b	farmerh_b
csdid	-0.0725***	-0.0535*	-0.0404*	-0.0286***	-0.0701***	-0.0581*	-0.0528*	-0.0478***
	(0.007)	(0.063)	(0.011)	(0.004)	(0.001)	(0.017)	(0.000)	(0.000)
Industry FE	Yes				Yes			
Geni FE		Yes				Yes		
Major agricultural county			Yes				Yes	
Cropland-Level Controls				Yes				Yes
Observations	26,256	26,256	26,256	26,256	26,256	26,256	26,256	26,256

Note: The ρ-value from a F-test of the joint significance of the two coefficients is reported at the bottom of each panel. Standard errors, clustered at the village level, are reported in parentheses. *ρ < 0.10 , **ρ < 0.05 , ***ρ < 0.01.

Secondly, when the analysis focuses on households whose livelihoods were highly dependent on agriculture in 2010, we find that CPAs support policies had the same dampening effect on the evolution of farmers into "stagnation farmer II". There are two plausible explanations for this: 1) the original farm-dependent farmers have more experience and ability in agricultural production, and therefore, regardless of the policy support environment, these farmers tend to have higher than average business

performance, and are even more likely to become large-scale farmers through land transfers; 2) these farmers are more likely to be dependent on agricultural production for a long period of time and are more likely to be livelihood-dependent, which means that it is difficult for them to transition to non-farm employment, or that they are more likely to be livelihood-dependent. Non-farm employment, or that such farmers can often earn higher returns from agricultural production.

8 | Conclusion

This paper provides causal evidence for the effects of improvements of industrial support policies on farmers' livelihood decisions in concentrated production areas (CPAs) promoting "one village, one product". In the current context of slowing industrialization, hidden unemployment, and idle land, industrial support policies compensate for the scale constraints of smallholders through organizational embeddedness, allowing smallholders to link small production with modern agricultural supply chains. Specifically, the regional promotion of the "one village, one product" (OVOP) industrial specialization policy significantly increases the share of agricultural income in the total income of the households and weakens the withdrawal of households from agricultural production.

At the same time, we also find that the traditional clan order also plays a role similar to that of an intermediary agent in the agricultural supply chain, in the sense that it reduces the cost of production and operation for smallholders. Specifically, for the region that lacks the organization of clan alliances, the industrial specialization policy significantly increases the level of agricultural part-timing, and the effect of households stranded in agricultural production is enhanced.

Furthermore, we find that OVOP leads to an increased effect on households stranded in agricultural production in regions with plain terrain. For households closer to the regional economic center, OVOP increases the effect on households stranded in agricultural production. Furthermore, we find that OVOP leads to an increased effect on households stranded in agricultural production in regions with plain terrain. For households closer to the regional economic center, OVOP increases the effect on

households stranded in agricultural production. It can be seen that developing countries do not need to be anxious about the dilemma between efficiency and equity, i.e., whether to achieve OVOP by crowding out small-scale farmers for the sake of efficiency or to promote industrial promotion policies in the countryside for the sake of equity. We believe that the realization of large-scale operations is a long-term process. Although the promotion of rural industrial support policies has, to some extent, led some farmers to choose to allocate their labor to both agriculture and non-agriculture, this may seem to affect the efficient allocation of labor and agricultural land, but it is in a long-term transition process. Although this paper does not provide data on changes in farm households' production scale and the farmers' differentiation under the influence of industrial support policies, the limited findings can inform ongoing policy debates.

[1] BARRETT C B, CHRISTIAENSEN L, SHEAHAN M, 等. On the Structural Transformation of Rural Africa[J]. Journal of African Economies, 2017, 26(suppl_1): i11–i35.

[2] ALVAREZ J A. The Agricultural Wage Gap: Evidence from Brazilian Micro-data[J]. American Economic Journal: Macroeconomics, 2020, 12(1): 153–173.

[3] 刘守英, 高圣平, 王瑞民. 农地三权分置下的土地权利体系重构[J]. 北京大学学报(哲学社会科学版), 2017, 54(5): 134–145.

[4] ZHENG B, GU Y, ZHU H. Land tenure arrangements and rural-to-urban migration: evidence from implementation of China’s rural land contracting law[J]. Journal of Chinese Governance, Routledge, 2020, 5(3): 322–344.

[5] CHEN C. Untitled Land, Occupational Choice, and Agricultural Productivity[J]. AMERICAN ECONOMIC JOURNAL-MACROECONOMICS, Nashville: Amer Economic Assoc, 2017, 9(4): 91–121.

[6] GUO Y, LIU Y. Poverty alleviation through land assetization and its implications for rural revitalization in China[J]. Land Use Policy, 2021, 105: 105418.

[7] ZHOU J, CAO X. What is the policy improvement of China’s land consolidation? Evidence from completed land consolidation projects in Shaanxi Province[J]. Land Use Policy, 2020, 99: 104847.

[8] FEI R, LIN Z, CHUNGA J. How land transfer affects agricultural land use efficiency: Evidence from China’s agricultural sector[J]. Land Use Policy, 2021, 103: 105300.

[9] HAYAMI Y, RUTTAN V W. Agricultural development: an international perspective.[M]. Baltimore, Md/London: The Johns Hopkins Press, 1971.
[10] ADAMOPOULOS T, RESTUCCIA D. Land Reform and Productivity: A Quantitative Analysis with Micro Data[J]. AMERICAN ECONOMIC JOURNAL-MACROECONOMICS, Nashville: Amer Economic Assoc, 2020, 12(3): 1–39.
[11] LE K. Land use restrictions, misallocation in agriculture, and aggregate productivity in Vietnam[J]. Journal of Development Economics, 2020, 145: 102465.
[12] HORNBECK R. Barbed Wire: Property Rights and Agricultural Development*[J]. The Quarterly Journal of Economics, 2010, 125(2): 767–810.
[13] CASTAÑEDA DOWER P, PFUTZE T. Land titles and violent conflict in rural Mexico[J]. Journal of Development Economics, 2020, 144: 102431.
[14] DE JANVRY A, EMERICK K, GONZALEZ-NAVARRO M, 等. Delinking Land Rights from Land Use: Certification and Migration in Mexico†[J]. American Economic Review, American Economic Association, 2015, 105(10): 3125–3149.
[15] HUNTINGTON H, SHENOY A. Does insecure land tenure deter investment? Evidence from a randomized controlled trial[J]. Journal of Development Economics, 2021, 150: 102632.
[16] COMBES P-P, DEMURGER S, LI S, 等. Unequal migration and urbanisation gains in China[J]. Journal of Development Economics, Amsterdam: Elsevier, 2020, 142: 102328.
[17] ZHAO Q, BAO H X H, ZHANG Z. Off-farm employment and agricultural land use efficiency in China[J]. Land Use Policy, 2021, 101: 105097.
[18] ZHAO X. Land and labor allocation under communal tenure: Theory and evidence from China[J]. Journal of Development Economics, 2020, 147: 102526.
[19] MA M, LIN J, SEXTON R J. The Transition from Small to Large Farms in Developing Economies: A Welfare Analysis[J]. American Journal of Agricultural Economics, 2022, 104(1): 111–133.
[20] OGUTU S O, GÖDECKE T, QAIM M. Agricultural Commercialisation and Nutrition in Smallholder Farm Households[J]. Journal of Agricultural Economics, 2020, 71(2): 534–555.
[21] DENG X, XU D, ZENG M, 等. Does outsourcing affect agricultural productivity of farmer households? Evidence from China[J]. China Agricultural Economic Review, Emerald Publishing Limited, 2020, 12(4): 673–688.

[22] BURKE W J, JAYNE T S, SITKO N J. Do Medium-scale Farms Improve Market Access Conditions for Zambian Smallholders?[J]. Journal of Agricultural Economics, 2020, 71(2): 517–533.

[23] CIAIAN P, BALDONI E, KANCS d'Artis, 等. The Capitalization of Agricultural Subsidies into Land Prices[G]//RAUSSER G C, ZILBERMAN D.Annual Review of Resource Economics, Vol 13. Palo Alto: Annual Reviews, 2021, 13: 17–38.

[24] BARRETT C B, CHRISTIAN P, SHIFERAW B A. The structural transformation of African agriculture and rural spaces: introduction to a special section†[J]. Agricultural Economics, 2017, 48(S1): 5–10.

[25] MERFELD J D. Moving Up or Just Surviving? Nonfarm Self-Employment in India[J]. American Journal of Agricultural Economics, 2020, 102(1): 32–53.

[26] OLA O, MENAPACE L. Revisiting constraints to smallholder participation in high-value markets: A best-worst scaling approach[J]. Agricultural Economics, 2020, 51(4): 595–608.

[27] VALLIANT J C D, RUHF K Z, GIBSON K D, et al. Fostering farm transfers from farm owners to unrelated, new farmers: A qualitative assessment of farm link services[J]. Land Use Policy, 2019, 86: 438–447.

[28] NYARINDO W N, MUGERA A, HAILU A, et al. Do combined sustainable agricultural intensification practices improve smallholder farmers welfare? Evidence from eastern and western Kenya[J]. Agricultural Economics, 2023, n/a(n/a).

[29] BARRETT C B, CARTER M R, TIMMER C P. A Century-Long Perspective on Agricultural Development[J]. American Journal of Agricultural Economics, 2010, 92(2): 447–468.

[30] BARRETT C B, BACHKE M E, BELLEMARE M F, 等. Smallholder Participation in Contract Farming: Comparative Evidence from Five Countries[J]. World Development, 2012, 40(4): 715–730.

[31] DUBBERT C, ABDULAI A, MOHAMMED S. Contract farming and the adoption of sustainable farm practices: Empirical evidence from cashew farmers in Ghana[J]. Applied Economic Perspectives and Policy, 2023, 45(1): 487–509.

[32] GIBSON J, OLIVIA S, BOE-GIBSON G, 等. Which night lights data should we use in economics, and where?[J]. Journal of Development Economics, 2021, 149: 102602.

[33] LIU Y, CUI L, XIONG Y, 等. Does the development of the Internet improve the allocative

efficiency of production factors? Evidence from surveys of Chinese manufacturing firms[J]. STRUCTURAL CHANGE AND ECONOMIC DYNAMICS, Amsterdam: Elsevier, 2023, 66: 161–174.

[34] DOBSON J, BRIGHT E, COLEMAN P, 等. LandScan: A Global Population Database for Estimating Populations at Risk[J]. Photogrammetric Engineering and Remote Sensing, 2000, 66: 849–857.

[35] YANG J, HUANG X. The 30 m annual land cover dataset and its dynamics in China from 1990 to 2019[J]. Earth System Science Data, Copernicus Publications Göttingen, Germany, 2021, 13(8): 3907–3925.

[36] BARRETT C B, CARTER M R. The Power and Pitfalls of Experiments in Development Economics: Some Non-random Reflections[J]. Applied Economic Perspectives and Policy, 2010, 32(4): 515–548.

[37] 黄宗智, 彭玉生. 三大历史性变迁的交汇与中国小规模农业的前景[J]. 中国社会科学, 2007, (4): 74-88+205-206.

[38] HAROU A P, MADAJEWICZ M, MICHELSON H, 等. The joint effects of information and financing constraints on technology adoption: Evidence from a field experiment in rural Tanzania[J]. Journal of Development Economics, 2022, 155: 102707.

[39] SHAMDASANI Y. Rural road infrastructure & agricultural production: Evidence from India[J]. Journal of Development Economics, 2021, 152: 102686.