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Socioeconomic Effects of Land Use Change for Industrialization: Evidence-Informed Learnings from Sri City India

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Abstract: This study examines the socioeconomic impacts of large-scale land conversion from agriculture to industry on affected households, focusing on Sri City, an industrial hub in South India established under the SEZ Act 2005. Data from 250 households in and around Sri City were collected on socioeconomic indicators aligned with the Sustainable Development Goals using a structured survey method. Quasi-experimental methods, specifically nearest neighbor matching based on the Mahalanobis distance model, were employed for analysis. The findings indicate that affected households experience benefits, but these are not unequivocal. The study underscores the importance of project-specific factors, land acquisition strategies, and approaches to business leadership in shaping the socially sustainable outcomes of land conversion, from agriculture to industry.

Keywords: land relocation; Sri City; India; industrial development; GVCs; land lost farmers; socioeconomic sustainability; quasi experimental designs

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1. The Context

Growth-enhancing structural change, involving the relocation of economic resources from low-productivity agriculture to high-productivity industrial and services sectors, is intrinsically linked with the sustainable development agenda. As labor, land, and other resources shift from low-productivity agriculture to the non-agricultural sector, particularly industry, overall productivity increases and incomes expand. This shift propels the economy into a virtuous circle, where the growth of productive employment, capacities, and earnings mutually reinforce each other, accelerating growth, reducing poverty, promoting urban development, and improving human well-being [1,2].

In their pursuit of achieving structural change, policymakers in developing countries have continually sought new innovative tools to accelerate industrial development. In the contemporary world, the tool that has transformed the way industrialization can take place in these countries is 'insertion into and moving up the global value chains (GVCs)'. However, global competition is so intense that without deliberate policies to foster a favorable investment climate, addressing high transaction costs, inadequate provision of public goods, and low productivity which are pervasive in these countries, they may not be able to avail the opportunities to integrate themselves within these networks. To offset some aspects of an adverse investment climate, policy makers increasingly rely on economic zones, in general, and special economic zones (SEZs), in particular. While these zones primarily aim to overcome high production and transaction costs resulting from the lack of infrastructure and inefficient public service delivery, their role in exploiting agglomeration benefits is critical in enhancing efficiency and productivity. They serve as the springboards for entering into GVCs. However, one of the outcomes of the proliferation of these zones is the accelerated conversion of large chunks of agricultural land into industrial and urban spaces, which can have serious socioeconomic effects on households that depend on land

for their livelihoods and other local communities (https://cprindia.org/understanding-the-impacts-of-land-use-change/ (last accessed on 20 July 2024)).

Harvey [3,4] coined the term 'accumulation by dispossession' to describe the land use change policy for industrial use in the contemporary neoliberal regime. According to him, governments under austerity programs tend to mobilize private investment by offering fiscal and legislative incentives (favorable legal regulations) for setting up economic zones. This type of policy is "redistributive" of existing wealth rather than "generative" of new wealth. It does not lead to agrarian transitions; rather, it is land grab for capitalist development without economic development, dis-accumulating agrarian assets and marginalizing rural labor. The adverse effects are exacerbated by the dire state of transparency in land acquisition, together with weak and deficient governance, lack of safeguards, unlawful expropriation, and minimal application of agreed-upon compensation measures [5–10]. It is argued that even if rightful compensation is assured, the affected households are not equipped to transform their agricultural livelihood into a non-agricultural one [11,12]. The jobs created in these economic zones for locally affected people tend to be low-paying due to their low level of skills and qualifications, while the more sophisticated and highly paid jobs are often filled by outsiders, benefiting a narrow set of class interests and accentuating social and economic inequalities [9].

There is a large body of literature assessing the socioeconomic effects of land conversion for industrial use. However, the existing studies focus either on the effects of large-scale land acquisition on land-lost farmers [9,13–25] or explore the effects of large industrial parks/estates/SEZs on regional economies/local communities [26–33]. The present study analyses the aggregate and distributional effects of land use conversion from agriculture to industry on both land-lost farmers and households in surrounding areas. Further, unlike most existing studies that focus primarily on income levels, this study comprehensively assesses the socioeconomic sustainability of land relocation using quantitative tools, with special reference to a large industrial project in India—the 'Sri City business city'. Socioeconomic sustainability is a multidimensional concept and is captured in this study by a comprehensive set of indicators drawn from the Sustainable Development Goals (SDGs). The study is based on the premise that the impact of land acquisition is unavoidably differentiated; namely, there are 'winners and losers', and how people gain or lose out depends much on their capabilities, the type of deal and project, the investors, the speed of the process, and other macro- and micro-structural conditions [34–36]. Ours is one of few studies that has adopted a counterfactual approach to measure the distributional effects of the land use conversion for industrial zones on those directly affected by the project. The novelty of the present study also lies in the use of multidimensional indicators of socioeconomic sustainability.

India is structurally underdeveloped, with 46% of total land and 45.6% of the workforce still in agriculture, which contributes only 15–16% to GDP. A mere 9% of the total land is under non-agricultural use. The enactment of the SEZ Act 2005 was the first major effort by the government to channelize private investment in industrial and urban development and induce structural change in the allocation of resources. As part of the incentive package, the government offered attractive tax incentives to private developers for setting up SEZs, with a promise to acquire land on their behalf using 'eminent domain', which allowed governments to take private property for public use without the owner's consent. This led to public uproar and sparked farmers' protests across the country, which sometimes turned violent [37,38]. SEZs became synonymous with land grab for real estate development by the private sector. A large stream of literature appeared, aligned with Harvey's concept of 'accumulation by dispossession' [9,18,37,39–46], describing the SEZ policy as a form of coercive redistribution that served class interests [41]. In addition to land grab, the criticism touched upon several other aspects—from macro-economic issues related to their impact on government revenue, employment, trade, and foreign exchange earnings to social issues including food security, labor rights, regional inequities, and environmental protection. The government dissipated the resistance to SEZs by first withdrawing from the process

of land acquisition and then gradually diluting all direct tax incentives. This led to the cancelation, delay, and downsizing of existing projects and a decline in the number of new applications [47]. The area under notified SEZs declined steeply from 496 km^2 as of September 2012 to 397 km^2 by 12 January 2023. As of 2022–2023, 270 operational SEZs have generated 2.9 million jobs and contributed almost 20% of total annual goods and service exports. Yet, their national-level effects are not so visible, with a large chunk of the population still stuck in agriculture and employment growth accounting for a minuscule contribution to growth [33].

In that backdrop, the present study uses a case study approach to show how project idiosyncrasies can affect the outcomes of these projects at the regional level. The case in point is the 'Sri City business city' set up as a hybrid SEZ under the SEZ Act 2005 in Andhra Pradesh State of India. We collected data from 250 households spread across 33 villages in and around Sri City through a fully structured survey and used the nearest neighbor matching method based on the Mahalanobis distance model for the counterfactual analysis.

The rest of the study is divided into four sections. Section 2 describes the idiosyncrasies of the project and formulates the hypothesis. It also defines the concept and indicators of socioeconomic sustainability. Section 3 then describes the data, variable construction, and methodology for the analysis. Section 4 presents the empirical results. Finally, Section 5 concludes the analysis.

2. Sri City and Socioeconomic Sustainability

Sri City, set up by a private developer under the SEZ Act 2005, is spread over 7500 acres. The project is located in one of the most backward districts of Andhra Pradesh. The two sub-district administrative divisions where the business city is located within the district were predominately made up of subsistence farming of paddy on rain-fed land. People were dependent on agriculture with poor rainfall records, lack of options in life, and widespread poverty. Over 73% of the landholdings, according to government data, were less than 1 acre. Only 3% of the holdings were above 4 acres, but 75% of the area under them was barren. Even though 51% of people were literate, most of them had completed just primary education. In this backdrop, land acquisition for the project proceeded relatively smoothly, devoid of any major hurdles and protests, despite the grim picture of land wars that had ensued following the enactment of the SEZ Act 2005 in most other parts of the country [48]. Even though land was acquired by the state on behalf of the private developer using eminent domain, several good practices were ensured by the latter in this process. The developer, a young, first-generation, professionally qualified entrepreneur, has strong local roots. According to the literature, emotionally connected business leaders have a positive future outlook, empathy for local population, and passion about their work [49]. Thus, land was mostly acquired 'on consent', supported by prior notification. For compensation, prices well above the market rate were offered by the developer (up to 5 times). Additional compensation was paid for trees and other structures such as wells and tubewells. Generally, it is observed that the relocation of land-lost farmers leads to a series of changes, including their social and economic conditions, psychological conditions, and cultural norms, which might have a negative impact on their well-being [21]. In the case of Sri City, however, habitation areas of the villages were not acquired. The decision to preserve the habitat (even today, 14 villages are inside Sri City) prevented forced migration and the relocation of land-lost farmers. Finally, and most importantly, each village family was assured one job without any recommendation. A village coordinator was appointed to look after the overall progress of relief and rehabilitation. A 'Human Resource Academy' was set up in 2006, much in advance of commercial activities, to train the people in plumbing, masonry, electrical work, driving, software, tailoring and embroidery, security, and housekeeping, etc. Assured jobs after training in the academy became an attractive proposition for the local people. Social entrepreneurship created a positive sum between the developers and the inhabitants in the Sri City area. The engagement of the state in land acquisition was also reported to have helped in building trust between the developer and locals and

facilitated the process. As a result, the land acquisition targets were achieved within a period of one and a half years. Additionally, despite uncertainties in government policies and unfavorable public opinion regarding SEZs, the project became operational and put to generative purpose within just two years of the initiation of the land acquisition process. During the financial crisis of 2008, which severely affected the inflows of investment and job creation, people felt insecure and restless and organized protest marches to demand the promised jobs. But these agitations soon died down as Sri City started picking up in 2014, and since then, it has been on a high growth trajectory.

Its focus on manufacturing in general and light engineering and electronics industries in particular is critical in creating job opportunities for a wide spectrum of local workers, from low- to high-skilled ones. With over 210 companies from various countries, Sri City became instrumental in attracting other large industrial projects in the automobile and telecommunication sectors in the region. The project is immensely benefited by several location-specific factors, such as the (i) easy availability of land, (ii) high-class infrastructure, (iii) unrestricted supply of power and water, (iv) proximity to ports, airports, and highways, (v) cheap unskilled labor in the vicinity, and (vi) proximity to the metropolitan city of 'Chennai', with assured supply of adequate skilled and technical manpower and an established manufacturing eco-system to source components and supplies from.

Based on the above observations, we hypothesize that land conversion for the project has had socially and economically sustainable outcomes. Socioeconomic sustainability is a very broad concept which encompasses numerous indicators [50]. We draw on the Sustainable Development Goals to identify four sets of indicators for the analysis: (i) material and financial well-being (SDG #1: No Poverty); (ii) quality of life (SDG #1: Access to basic services; SDG #6 Water and Sanitation); (iii) source of income (SDG #8: Decent employment); and (iv) access to education (SDG #4) and health and mental well-being (SDG #3). The analysis is conducted to assess both aggregate and distributional effects of land conversion for industrialization, using all these indicators. While doing so, it also explores whether relocation of land to industry is equality-enhancing (SDG #10).

3. Data, Methodology and Variable Construction

3.1. Database

A primary survey was conducted between 19 September and 17 October 2021 to collect data for this research. A list of 42 villages within a radius of approximately 25 km of Sri City was prepared. Some of these villages were in the neighboring state of Tamil Nadu as well. We decided to cover all 42 villages but finally could gather information from 33 of them within the given time frame. In addition to villages, the town of Sulur Peta, which is around 23 km from Sri City, was also covered in the survey.

Using a fully structured questionnaire, we conducted face to face interviews to compile the survey data from 250 households, which we divided among villages according to their population. The sample of households in each village was based on the availability and consent of the households to talk. Care was taken to cover the various strata of the population. To conduct the survey, we engaged 7 Field Surveyors with at least a bachelor's degree. They were given classroom and field-based training. The surveyors were locals having familiarity with the local culture and language. The surveyors' performance was monitored through daily reporting by them.

The questionnaire covers a wide range of questions capturing household characteristics, migratory status of households, income, sources of income, occupational status, savings, borrowings, education and health status, and expenditures. Both the baseline and current period information were acquired by including relevant questions in the same survey. For this, the questionnaire comprised 'before and after' types of questions related to income, sources of income, satisfaction, financial status, and standard of living. Respondents were asked to recall baseline information. To cross check their responses, the key questions about their income, sources of income, and standard of living were asked at least twice in different styles seeking different levels of information.

3.2. Methodology

Two different non-parametric methodologies were utilized for the analysis. Initially, the basic t-test was employed to assess whether transformative changes in human well-being occurred in the region at the aggregate level compared to the baseline year 2007. A pre-specified set of indicators was employed for this analysis.

Subsequently, distributional effects were assessed by analyzing changes in the well-being of those directly affected by the project in comparison to those who were not (referred to as the comparison group), using quasi-experimental designs. This required the identification of those directly affected by the project (treated groups) and the comparison groups. Three distinct treated groups were identified: (i) land-lost farmers, (ii) individuals living within 5 km radius of the business city, and (iii) those within 10 km. For each treated group, a comparison (matched) group was identified, consisting of households as similar as possible to the treatment group in terms of personal traits but not subjected to the treatment.

There are several techniques available in the literature to identify the comparison group by reducing sample selection bias. This study utilizes the nearest neighbor matching method (NNM) based on the Mahalanobis distance model. The model minimizes the Mahalanobis distance between the treated and comparison groups based on multiple covariates, as measured by $M(X_t - X_c) = \sqrt{(X_t - X_c)\, S\hat{}(-1)(X_t - X_c)}$, where X_t and X_c are the mean vectors of treated and comparison groups, and S is the pooled sample covariance matrix of X. The recent literature suggests that the Mahalanobis distance model is more efficient, with a lower level of bias, model dependence, and imbalance compared to other popular methods, namely propensity score matching methods [51,52].

Once the comparison group was identified, the effect of treatment on outcomes was estimated by comparing outcomes between the two groups in the matched sample. The average treatment effect on the treated (ATT) is reported here, which is referred to as the counterfactual effect. The ATT is calculated as $[Yi - Y0 \mid Di = 1]$, where Di denotes the treatment status of household i and Y is the average outcome for the treated and comparison groups. Table 1 presents the description of treatment groups and the covariates that are used to match the non-treated groups with treated groups to construct the comparison groups.

Table 1. Description of the variables.

Treatment variables	Land-lost farmers	Land-lost farmers = 1 if sold partial or full land to Sri City =0, otherwise.
	HHs living within 5 km of Sri City	Distance_5 = 1 if the distance of their village from Sri City is less than 5 kms, =0 otherwise
	HHs living within 10 km of Sri City	Distance_10 = 1 if a HH is located within 10 km of distance from Sri City; =0 if the household is located at more than 10 kms of distance.
Covariates	Household characteristics used for matching	Dummy for caste = 1 if scheduled castes (designated by Article 341 of the Constitution) and other backward castes (Article 15(4)), =0 otherwise Number of household members Head's age Head is a male = 1; =0 otherwise Head's education years Maximum education (years) Average household age The share of working age (14–64) members If working in/for Sri City = 1; =0 otherwise If beneficiary of a welfare scheme = 1; =0 otherwise If currently owning land = 1; =0 otherwise

The outcome variables covering the indicators of socioeconomic sustainability are organized into four categories: (i) material and financial well-being (captured by household income, total and per capita, bank accounts, savings and borrowings); (ii) quality of life (access to basic services, good living conditions and asset holdings); (iii) sources of income (agriculture, regular job or self-employment); (iv) access to education (expenditure on

education and attainment of high school education), and health and mental well-being (incidence of chronic disease, income satisfaction). The definition of these variables is provided in the results tables to avoid duplicity. It should be noted that due to the lack of data on income expenditure on education, we rely on the information regarding the sufficiency of income for children's education.

4. Results

4.1. Aggregate Effects

Table 2 presents the mean of each outcome variable in the baseline and current periods in Columns 1 and 2, respectively. A t-test statistic is presented in Column 3 corresponding to each outcome variable to assess if there is a statistically significant difference between the mean values in the two periods. It is observed that the t-statistic turns out to be significant for all outcome variables, indicating transformative changes in socioeconomic indicators that have taken place in the region since the establishment of Sri City. Not only has the level of income increased significantly over time but its composition has also changed, with a significantly higher share of income accounted for by regular jobs. This provides evidence of structural change occurring in this previously agrarian area, transitioning towards an industrial economy, which is considered to enhance growth and reduce poverty [1,2].

Table 2. *T*-test results with means and coefficient of variation for pre- and post-Sri city period.

Outcome Variables	Base Line Year Average (1)	Current Year Average (2)	t-Statistic of Mean Difference (3)
Annual household income (Rupee @2021 prices)	156,077.9 (90)	236,887.4 (75)	6.9 ***
Household income per capita (Rupee @2021 prices)	39,925.8 (102)	65,610.1 (72)	8.8 ***
Agriculture as the major income source = 1; 0 otherwise	0.50 (100)	0.27 (164)	−8.4 ***
Job as the major income source = 1; 0 otherwise	0.27 (166)	0.76 (56)	14.0 ***
Business as the major income source = 1; 0 otherwise	0.216 (200)	0.404 (142)	6.2 ***
Share of agriculture in total income	77.9 (142)	20.9 (259)	−13.6 ***
Share of job in total income	17.45 (155)	61.96 (65)	9.8 ***
Share of business in total income	16.4 (167)	21.1 (129)	2.18 **
If owned a house = 1; =0 otherwise	0.28 (159)	0.57 (87)	9.2 ***
If living in huts = 1; =0 otherwise	0.42 (119)	0.02 (701)	−12.6 ***
No. of types of rooms in house	1.93 (90)	3.44 (31)	14.7 ***
Access to water and electricity	1.27 (75)	1.87 (28)	10.0 ***
Number of vehicles	0.32 (160)	0.92 (54)	16.1 ***
Weighted average of the no. of electronic gadgets	0.17 (101)	0.42 (47)	19.2 ***
No. of bank accounts	1.61 (65)	3.15 (46)	14.0 ***
If reported savings = 1; =0 otherwise	0.10 (301)	0.37 (130)	8.0 ***
If reported borrowing = 1; =0 otherwise	0.35 (184)	1.00 (86)	10.4 ***
If satisfied with income = 1; =0 otherwise	0.39 (125)	0.69 (67)	9.00 ***
If income is sufficient for education of children = 1; =0 otherwise	0.26 (167)	0.33 (143)	1.8 *

Note: Cols. 1 and 2 show mean (coefficient of variation in %); *** significant at 1%, ** at 5%, and * at 10% levels.

There has also been a significant increase in self-employment, likely due to increased economic activity in the region. Improvement in financial well-being is evident with an increased number of bank accounts and savings. However, there is a caveat: borrowings have also increased significantly over time. This could partly be due to improvements in standards of living in terms of housing type, access to utilities, and asset holdings. Overall, there is higher income satisfaction, indicating improved mental well-being. The perception regarding income sufficiency for children's education has also shown improvement, albeit

weakly at 10% unlike other variables that turn out to be significant, mostly at 1%, implying that family expenditures on education have grown over time.

Finally, it must be noted that the coefficient of variation has declined sharply for all variables used in the analysis. Our results demonstrate that variability in the socioeconomic position of households declined post Sri City. Specifically, we provide evidence of improved equality over time as land was relocated from agriculture to a successful industrial project. The increase in dispersion in the distribution of three variables—'agriculture as a major source of income', 'share of agriculture in total income,' and 'living in huts'—further supports the result that the project has had overall welfare-enhancing and inequality-reducing effects in the region.

4.2. Distributional Effects

The average treatment effects on affected households based on NNM are presented in Tables 3–6. Table 3 covers material well-being, while Tables 4–6 focus on other aspects. Each table presents three sets of counterfactual results for three different treatment groups: land-lost farmers, households (HHs) within 5 km of distance, and HHs within 10 kms of distance. These are further broken down into base year (2007), current year (2021), and the difference between the base and current years termed as difference-in-difference (DID). The results are discussed below.

Table 3. Impact of Sri City on material well-being of treated groups: Average treatment effects on treated groups based on the NNM.

Treatment Group	Well-Being Indicator	Pre-Sri City Base Year (1)	Current (2)	Difference in Difference (3)
Annual household income Rs [@] 2021 prices	Land-lost farmers	−1,21,214 *** (−3.62) [241]	−26,919.5 (−0.65) [241]	94,294.5 * (1.93) * [241]
	Distance_5	−77,363 *** (−3.28) [242]	−18,845 (−0.70) [242]	58,518 ** (2.18) [242]
	Distance_10	−99,447.75 *** (−3.99) [242]	−54,578.98 (−1.92) * [242]	44,868.77 (1.48) [242]
Household income per capita (Rs [@] 2021 prices)	Land-lost farmers	−35,876 *** (−4.15) [242]	−462.3 (−0.05) [241]	35,244.5 *** (3.15) [241]
	Distance_5	−22,580 *** (−3.44) [241]	−2943 (−0.41) [242]	19,618 *** (2.85) [241]
	Distance_10	−26,437.23 *** (−3.99) [241]	−9445.149 (−1.42) [242]	16,934.43 ** (2.45) [241]
No. of bank accounts	Land-lost farmers	−0.22 (−0.92) [240]	0.152 (0.39) [242]	0.203 (0.48) [240]
	Distance_5	−0.149 (−0.94) [240]	−0.130 (−0.66) [242]	0.165 (0.74) [240]
	Distance_10	−0.16 (−1.03) [240]	−0.162 (−0.76) [242]	0.007 (0.03) [240]
If saving money	Land-lost farmers	0.17 (1.15) [243]	0.203 * (1.72) [242]	0.02 (0.11) [243]
	Distance_5	0.032 (0.68) [242]	−0.057 (−0.81) [242]	−0.089 (−1.21) [242]
	Distance_10	0.032 (0.82) [242]	0.045(0.63) [242]	−0.028 (−0.36) [229]
If borrowing money	Land-lost farmers	0.27 * (1.69) * [240]	0.389 ** (2.06) [242]	0.101 (0.52) [240]
	Distance_5	−0.213 ** (−2.08) [240]	0.276 ** (1.99) [242]	0.459 *** (3.08) [240]
	Distance_10	−0.052 (−0.53) [240]	0.33 ** (2.43) [242]	0.366 ** (2.41) [240]

Notes: [@] Rs. Indian Rupee. The Exchange value in 2021: 0.01352 USD per rupee. Parentheses show t-statistics and brackets are number of observations; *** significant at 1%, ** at 5%, and * at 10% levels.

Table 4. Source of income.

Well-Being Indicator		Pre-Sri City Base Year (1)	Current (2)	Difference in Difference (3)
If agriculture was the major income source = 1; 0 otherwise	Land-lost farmers	0.61 *** (8.1) [242]	−0.05 (0.71) [242]	−0.644 *** (7.25) [241]
	Distance_5	0.179 *** (2.69) [242]	−0.090 (−1.59) [242]	−0.249 *** (−4.58) [241]
	Distance_10	0.16 ** (2.37) [242]	−0.10 (−1.72) * [242]	−0.25 *** (−4.51) [241]
If job was the major income source = 1; 0 otherwise	Land-lost farmers	−0.322 ***(−3.9) [242]	0.068 (0.85) [242]	0.39 *** (3.43) [242]
	Distance_5	−0.171 ** (−2.28) [242]	0.049 (0.72) [242]	0.219 *** (2.62) [242]
	Distance_10	−0.23 *** (−3.22) [242]	−0.078 (−1.20) [242]	0.16 * (1.73) [242]
If self-employment was the major income source = 1; 0 otherwise	Land-lost farmers	−0.085 (−1.3) [241]	0.034 (0.29) [240]	0.068 (0.8) [240]
	Distance_5	0.045 (0.68) [242]	0.013 (0.15) [242]	−0.04 (−0.61) [242]
	Distance_10	−0.081 (−1.16) [242]	−0.081 (−0.92) [242]	0.0 (0) [242]
Share of agriculture in total income	Land-lost farmers	47.0 *** (5.46) [219]	−3.59 (−1.19) [219]	−51.48 *** (6.38) [219]
	Distance_5	18.99 *** (2.87) [219]	−1.69 (−0.71) [242]	−20.21 *** (−3.46) [219]
	Distance_10	19.0 ***1 (2.85) [219]	0.19 (0.08) [242]	−17.09 (−2.84) *** [219]
Share of job in total income	Land-lost farmers	−17.34 **(−2.26) [222]	6.27 (0.81) [222]	20.31 * (1.71) [222]
	Distance_5	−7.94 (−1.08) [222]	6.12 (1.02) [242]	15.1 * (1.87) [222]
	Distance_10	−16.99 ** (−2.42) [222]	−2.59 (−0.44) [242]	15.04 * (1.78) [222]
Share of self-employment in total income	Land-lost farmers	−5.29 (−0.98) [218]	14.6 *** (2.59) [242]	18.39 *** (2.91) [218]
	Distance_5	−0.296 (−0.05) [218]	−1.86 (−0.34) [242]	−0.852 (−0.16) [218]
	Distance_10	9.55 (1.73) [218]	0.73 (0.13) [242]	−2.51 (−0.48) [218]

Note: Parentheses show t-statistics and brackets are number of observations; *** significant at 1%, ** at 5%, and * at 10% levels.

Table 5. Quality of life.

Well-Being Indicator		Pre-Sri City Base Year (1)	Current (2)	Difference in Difference (3)
If owned a house = 1; =0 otherwise	Land-lost farmers	−0.24 (−2.94) *** [242]	0.203 (2.08) ** [242]	0.54 (5.64) *** [242]
	Distance_5	−0.033 (−0.46) [242]	0.07 (0.85) [242]	0.11 (1.64) * [242]
	Distance_10	−0.091 (−0.019) [242]	−0.019 (−0.25) [242]	0.084 (1.18) [242]
If living in huts = 1; =0 otherwise	Land-lost farmers	0.39 (3.63) *** [242]	0.017 (0.47) [242]	−0.36 (−3.65) *** [239]
	Distance_5	0.024 (0.32) [242]	−0.032 (−1.56) [242]	−0.057 (−0.78) [241]
	Distance_10	0.019 (0.25) [242]	−0.013 (−0.55) [242]	−0.052 (−0.71) [241]
No. of types of rooms in house	Land-lost farmers	−1.39 (−5.21) *** [242]	−0.263 (−0.82) [239]	1.122 (3.5) *** [239]
	Distance_5	0.001 (0) [242]	0.182(1.08) [239]	0.339 (1.45) [239]
	Distance_10	−0.019 (−0.08) [242]	−0.020 (−0.11) [239]	0.14 (0.63) [239]

Table 5. *Cont.*

Well-Being Indicator		Pre-Sri City Base Year (1)	Current (2)	Difference in Difference (3)
Access to water and electricity	Land-lost farmers	−1.14 (−7.15) *** [242]	0.135 (0.84) [242]	1.12 (6.43) *** [242]
	Distance_5	−0.106 (−0.89) [[242]	0.049 (0.58) [242]	0.163 (1.27) [242]
	Distance_10	−0.136 (−1.16) [242]	0.052 (0.59) [242]	0.201 (1.63) [242]
Number of vehicles	Land-lost farmers	−0.31 *** (−3.05) [242]	0.135 (0.78) [242]	0.19 (1.11) [242]
	Distance_5	−0.081 (−0.94) [211]	0.041 (0.52) [211]	0.106 (1.08) [241]
	Distance_10	−0.071 (−0.94) [242]	0.078 (1.02) [242]	0.11 (1.28) [242]
Possession of the no. of electronic gadgets	Land-lost farmers	−0.068 *** (−2.97) [242]	−0.011 (−0.32) [242]	0.082 ** (2.0) [242]
	Distance_5	0.009 (0.39) [242]	−0.030 (−1.13) [242]	−0.009 (−0.03) [242]
	Distance_10	0.006 (0.26) [242]	−0.039 (−1.30) [242]	−0.004 (−0.12) [242]

Note: Parentheses show t-statistics and brackets are number of observations; *** significant at 1%, ** at 5%, and * at 10% levels.

Table 6. Education and health.

Method	Indicators		Pre-Sri City Base Year (1)	Current (2)	Difference in Difference (3)
NNM	If income was sufficient for education of children (If yes = 1; 0 otherwise)	Land-lost farmers	−0.15 (−1.25) [242]	0.017 (0.17) [242]	0.17 (1.15) [242]
		Distance_5	0.033 (0.42) [242]	−0.081(−1.14) [242]	−0.114 (−1.21) [242]
		Distance_10	−0.006 (−0.009) [242]	−0.130 * (−1.81) [242]	−0.123 (−1.25) [242]
Paired *t* test	Mean of high school pass: (Difference between the age group 14_28 and age group above 28 years)	Land-lost farmers	-	1.18 (1.24) [36]	-
		Distance_5	-	2.12 ** (2.40) [79]	-
		Distance_10	-	2.04 ** (2.01) [108]	-
	Mean of degree holders: (Difference between the age group 14_28 and age group above 28 years)	Land-lost farmers	-	1.72 * (1.67) [60]	-
		Distance_5	-	2.33 ** (2.30) [122]	-
		Distance_10	-	2.84 *** (2.67) [161]	-
NNM	Whether any member has chronic disease in the HH: Current scenario (treatment vs. comparison groups)	Land-lost farmers	-	0.305 *** (2.93) [242]	-
		Distance_5	-	0.041 (0.74) [242]	-
		Distance_10	-	0.106 ** (2.02) [242]	-
NNM	Satisfaction with income (If yes = 1; 0 otherwise)	Land-lost farmers	−0.85 (−0.76) [242]	0.067 (0.066) [242]	0.152 (1.12) [242]
		Distance_5	−0.065 (−0.82) [242]	−0.154 * (−2.22) [242]	−0.089 (−1.09) [109]
		Distance_10	−0.110 (−1.41) [242]	−0.156 * (−2.21) [242]	−0.045 (−0.53) [242]

Note: Parentheses show t-statistics and brackets are number of observations; *** significant at 1%, ** at 5%, and * at 10% levels.

4.3. Material Well-Being

The results presented in Table 3 demonstrate a robust positive impact of land conversion on the incomes of land-lost farmers compared to the comparison group. These farmers had significantly lower incomes than the comparison group in the baseline period. However, over time, their incomes increased, with the difference in incomes between the two groups shrinking and becoming insignificant by 2021. On average, the difference in annual household incomes between the two groups has steeply decreased by Rs. 94,294.5 (USD 1274.5 @ Rs.1 = 0.01352 USD), while the difference in income per capita has reduced by over Rs. 35,000 (USD 476.4), as shown in Column 3. These results can be attributed to job generation and the promise of jobs for each land-lost household. During formal interviews, companies revealed how labor availability changed over time, shifting from being abundant to scarce in recent years, with high labor turnover becoming a major challenge they are facing.

In the realm of research, most studies assessing the impact of land acquisition focus on incomes in their analysis, yielding diverse results [28,31,53–58]. Nguyen et al. [14] demonstrate that losing agricultural land negatively influences household farm income in the short run, but as employment in non-agricultural sectors increases, incomes also improve. Additionally, Aggarwal and Kokko [31] find that adverse effects diminish over time. Studies by Han et al. [59], Zhang et al. [60], and Xie [61] reveal that the effects of land acquisition on material well-being vary with farmers' education. Our results show that not only land-lost farmers but the households living within 5 kms also benefit in material terms. Even though the improvement in incomes is somewhat less impressive than for those who lost land, it turns out to be significant. However, as we move farther from Sri City, the benefits further dissipate. Indeed, the households living up to 10 kms of distance found their incomes improved but the improvement was significantly large only for income per capita and not household income. The results are in line with the findings in the existing literature that the benefits of such a project dissipate with distance (for instance, [30,32]).

It must also be noted that gains are more robust for income per capita than the total household incomes. This may be attributed to a smaller family size in the current period. Land acquisition and large compensation split up most large families due to more options in life available to them. Out of sixty-two households, fifty land-lost households reported living in a joint family system in the base year. Of them, 35 families broke up and new nuclear families came up in their place. The average family size reduced from nine to four over time. Despite improved incomes, the number of bank accounts reported by households and the probability of savings, which are good indicators of financial well-being, have not shown statistically significant improvement over time for any treatment group (Column 3: Table 3).

On the other hand, the probability of borrowings has increased across all treatment groups (Column 2: Table 3). In the baseline period, the probability of borrowing was significantly higher than the comparison groups only for land-lost farmers (Column1: Table 3). However, post-Sri City, its probability turns out to be significantly higher for all treatment groups (Column 3). More than two-thirds of the respondents reported borrowing money over the past five years. Health is the number one reason, followed by social ceremonies and education.

4.4. Sources of Income

Relocating labor from low-productivity agriculture to the higher-productivity manufacturing sector is increasingly viewed as a critical condition to generate decent employment (see [33] for literature review). Our results (Table 4) provide overwhelming evidence of structural transformation in the composition of income sources of households away from agriculture towards regular jobs in the region, post-Sri City (Table 4).

The probability of agriculture being the major source of income for all three treatment groups has declined significantly. For instance, land-lost farmers were 61% more likely to have agriculture as the main source of income than the comparison group in the baseline

period (Column1: Table 4). However, in the current period, the difference turns out to be insignificant (Column 2), depicting a decline in the probability of agriculture as the major source for 64% for them (Column 3). On the other hand, the probability of regular jobs as the major income source increased significantly by 40%, while that of self-employment increased insignificantly by 7%.

These results are upheld for the remaining two treatment groups as well. However, once again, the average treatment effect of difference in difference (Col 3: Table 4) diminishes as the distance from Sri City increases. This suggests that the impact of Sri City on income source composition is more pronounced for households closer to the industrial hub.

Evidence of structural transformation is further supported by changes in income shares. The share of jobs in the incomes of treatment groups increased significantly, while that of agriculture declined. This indicates that land-lost farmers have been absorbed into jobs without migrating from their local habitat. The results for households living within 5 and 10 km remain more or less the same (albeit with low average treatment effects of difference in difference) but the results for self-employment are ambiguous.

A major challenge in India is how to transition a significant portion of the population stuck in agriculture into the manufacturing sector. The Sri City project demonstrates that a successful manufacturing project can be instrumental in this transition. These findings are supported by evidence from China and Vietnam as well [12,54,61].

4.5. Quality of Life

The results presented in Table 5 demonstrate significant changes in the living standards of land-lost farmers compared to the comparison group over the two periods. In the base year, the average treatment effect on almost all variables depicting the standard of living turns out to be negative for land-lost farmers compared with the comparison group (Column 1). For 'living in huts,' however, the effect is significantly positive, indicating that these farmers were 39% more likely to stay in huts.

In 2021, the average treatment effect of all indicators turned insignificant, suggesting that the gap between the two groups became insignificant (Column 2), and the improvement (difference-in-difference) in nearly all of them has been significant compared with the comparison group since the base period (Column 3). There are studies that provide evidence that land-lost farmers' dwellings and living standards improved over time [62,63]).

For the two other treatment groups as well, there have been improvements in the standard of living, even though the difference is not significant in most cases. This indicates that the project has had an inequality-reducing effect in the region in terms of the standard of living, although the effects are not significantly large. Our results align with Abagna et al. [64], who find that the positive effect on the quality of life persists within 10 km of special economic zones (SEZs) in selected African countries.

4.6. Education and Health

We lacked baseline information on achievements in education and health. Therefore, for education, we evaluated the sufficiency of income for children's education in both the baseline and current years by asking households about their income adequacy for their children's education. Table 6 presents the results, indicating an increase in the probability of satisfaction with income sufficiency for education among land-lost farmers (Column 3). This is despite a significant rise in their incomes from a very low baseline. For households residing within 5 and 10 km, this satisfaction has in fact declined despite an income increase. This suggests a potential rise in educational expenditures in the region. As households witness improvements in their economic circumstances, they might prioritize investing more in their children's education, leading to reduced satisfaction levels regarding their ability to meet educational expenses. To bolster this hypothesis, we conducted further analysis by dividing the sample into two age groups, '14 to 28' and '28 and above,' and employed t-tests to compare pre- and post-Sri City levels of their education. Across all treatment groups, educational achievements were notably higher in the 14–28 age group,

predominantly comprising individuals who came of age during the post-Sri City era. This inclination could be attributed to more favorable educational opportunities arising from an enhanced quality of life [20,31,55].

Regarding health, we evaluated the probability of having chronic diseases in the current period using the NNM based on the Mahalanobis distance model. Our observation is that the probability of chronic diseases is highest among land-lost farmers, despite improvements in other socio-economic indicators. Previous studies by Qian [65] and Wang et al. [66] have shown that land expropriation can adversely affect farmers' health, primarily due to psychological stress. While only 18% of households in our study attributed chronic diseases to stress and overworking, it is essential to delve deeper into the specific factors contributing to the higher prevalence of chronic diseases among land-lost farmers. We tried to understand whether they have any income-related psychological stress. Our findings indicate that despite improvements in material well-being and the general standard of living, happiness and satisfaction levels remain indeterminate. While land-lost farmers report a positive change, albeit not significant, the other two treatment groups have become significantly unhappier. This shows that we cannot rule out stress as one of the outcomes associated with increasing material well-being due to enhanced aspirations and the higher cost of living in the region.

Several studies have focused on the happiness and satisfaction of land-lost farmers, yielding mixed findings. Some report widespread dissatisfaction [22,58,60,67], while others find satisfaction to have increased [62,68–72]). Liu et al. [73] highlight that compensation remains a major cause of dissatisfaction despite increased incomes, while Wang et al. [66] conclude that the increase in household income cannot offset the negative effect of land acquisition on happiness. These divergent findings underscore the complexity of assessing subjective well-being and the need for comprehensive analyses that consider various socio-economic factors.

5. Conclusions and Policy Implications

In conclusion, this study provides a comprehensive assessment of the socioeconomic sustainability of the Sri City business city project and its associated land use change from agriculture to industrial development and urbanization. Drawing on survey-based data collected from 250 households in and around Sri City, we adopt a multidimensional approach to define socioeconomic well-being.

Our findings, based on an aggregate before and after analysis, indicate a significant transformation over time in the region across various indicators of socioeconomic well-being. Further, controlled comparisons between well-being scenarios with and without Sri City for three treatment groups—land-lost farmers, households living within 5 kms of the project, and households living within 10 kms, for assessing distributional effects—reveal that while the lives and livelihoods of those living within proximity to the project have improved, land-lost farmers have benefitted the most across various dimensions of socioeconomic sustainability. Our analysis also reveals that the benefits of the Sri City project are smaller for households living up to 10 km from the project compared to those living within 5 km. This finding suggests that proximity to the project plays a crucial role in determining the extent of benefits accrued to households and underscores the importance of targeted interventions and inclusive planning strategies aimed at maximizing the positive effects of the project. However, it is noteworthy that despite improvements in socioeconomic well-being, satisfaction and happiness levels have not significantly improved for any treatment group, and borrowings have also increased significantly. This could be attributed to the accompanying rise in material and capability-enhancing aspirations associated with development.

Further, we argue that these results may not be generalized. However, they provide evidence that land use change for large-scale industrialization can have positive outcomes on the well-being of local communities, particularly land-lost farmers if it is supported by careful planning, inclusive policies, and sustainable practices. Our analysis underscores the

notion that a good land acquisition model for land use conversion extends beyond mere compensation and rehabilitation efforts. It should aim at providing affected households with choices and a positive future outlook. This hinges on the success of the industrial project, which in turn calls for careful project location selection, effective land acquisition practices, visionary leadership, strong commitment, and strategic management to harness opportunities and confront challenges effectively. By prioritizing inclusive development and sustainability, industrial projects like Sri City have the potential to drive socioeconomic progress and improve the well-being of local communities.

Finally, our analysis underscores the importance of manufacturing projects in generating relatively more equal effects by absorbing both skilled and unskilled labor compared to service-based counterparts. We present an analysis that stands in contrast with earlier studies, such as Levien's [9] examination of the Rajpura IT-SEZ case, which illustrated how land use policy changes could lead to dispossession without accompanying development and highlights the need for a strategic shift towards manufacturing SEZs. The lack luster approach of the government of India towards SEZs has hit manufacturing zones particularly badly, with the actual employment in them being 85 per cent short of the target as of January 2019. Our study demonstrates that successful manufacturing projects, like Sri City, have the potential to generate relatively more equal effects by absorbing both skilled and unskilled labor compared to service-based projects, which mainly cater to skilled workers. It is imperative to prioritize such industrial projects that can have a significant impact on fostering a more inclusive and sustainable economic environment.

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