Land-Market Adjustment During Economic Transition: A Case Study for Vietnam

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Abstract: While liberalizing key factor markets is a crucial step in the transition from a socialist control-economy to a market economy, resistance from entrenched interests and concerns about risk and rising inequality can stall the process. The paper studies how market and non-market forces interacted to influence agricultural land allocation in the wake of Vietnam's reforms aiming to establish a free market in land-use rights following de-collectivization. Our econometric tests using a farm-household panel data set spanning the reforms suggest that land allocation responded efficiently, but that the response was tempered by the local political economy, which operated to assure greater equity than would have been possible otherwise.

Key words: Land reform, decentralization, equity-efficiency trade-off, Vietnam

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1. Introduction

Vietnam's agrarian transition in the 1990s has closely followed a now classic policy scenario for economies in transition. First one privatizes the main productive assets — in this case agricultural land-use rights — then one legalizes their free exchange. In the first step, the de-collectivization of agriculture meant that the land that had been farmed collectively was to be allocated by administrative means within each commune. Naturally this left inefficiencies in land allocation, with some households having more land than they are likely to have had in a competitive market allocation, while some had less.

The second step was reforming land laws so as to create the framework for a free market in agricultural land-use rights. While land remained the property of the state, Vietnam reformed land laws in 1993 to introduce official land titles and permit land transactions for the first time. Having removed legal obstacles to buying and selling land-use rights, one might expect rapid transition to a more efficient market economy in which land was re-allocated to eliminate the initial inefficiencies in the administrative assignment.

However, there are reasons to question that expectation. Other markets were still poorly developed, and in ways that could seriously inhibit realizing the efficiency gains from freeing up transactions in land. The credit market failures common in other underdeveloped rural economies were arguably even more prevalent in Vietnam at this time. Additionally, given risk-market failures and limitations on the set of available redistributive instruments, land allocation is likely to have continued to play an important role in distribution and insurance. Whether or not this role favored greater equity is unclear; while socialism may have left in-grained preferences for distributive justice, the new possibilities for capture by budding local elites — well connected to the local state authorities — would not presumably have gone unnoticed.

This paper studies the changes in agricultural land allocation in Vietnam during the period of policy and economic change that followed de-collectivization. We do not attempt to evaluate the impact of the 1993 Land Law *per se*, but rather to assess whether (as a result of the legal reforms and other policy and economic changes) the realized allocation of annual agricultural land-use rights responded to the inefficiencies of the initial administrative allocation. We also test whether other factors played a role, such as the desire for distributive justice in local decision making or the desire of local administrators to favor certain groups locally.

The following section describes key features of the setting. Section 3 describes our approach to testing whether the post-reform land re-allocation responded to the household-specific efficiency losses from the pre-reform administrative allocation. Our data are described in section 4. We then present and interpret our results in section 5. Section 6 concludes.

2. Land allocation in Vietnam's agrarian transition

In the late 1980s, Vietnam abandoned socialist agriculture, whereby rural workers had been organized into "brigades" that jointly farmed the commune's land. The central government gave local authorities the power to allocate the agricultural land that had been farmed collectively to individual households. De-collectivization was followed in 1993 by a new land law that introduced official land titles and permitted land transactions for the first time since communist rule began. Land remained the property of the state, but usage rights were extended (typically from 15 to 20 years for annual crop-land) and could (for the first time) be legally transferred and exchanged, mortgaged and inherited (Cuc and Sikor, 1998).

The central government's explicit aim in introducing this new land law was to promote greater efficiency in production by creating a market in land-use rights (see, for example, de Mauny and Hong, 1998). (This was one element of a set of reforms to increase agricultural

output; other reforms include relaxing trade restrictions, which improved farmers' terms of trade; see Benjamin and Brandt, 2002.) The expectation was that, after these legal changes, land would be re-allocated to assure higher agricultural output, taking account of such factors as farmers' abilities, supervision costs of hiring labor and the micro-geographic organization of land plots.

We will see whether that expectation is borne out by econometric tests using survey data on the post-reform evolution of land allocation. But first we need to describe some key features of the setting and the continuing debates about the agrarian transition in Vietnam; these observations will be crucial to both the specification and interpretation of our econometric tests.

2.1 Non-market influences on land allocation

Despite the center's aim of fostering a market in land-use rights, local authorities retained a degree of power over land after the reforms. Local cadres oversee titling, land-use restrictions and land appropriation for infrastructure projects. Sikor and Truong (2000) describe well how the reforms were mediated by village institutions in Son La, a northern uplands province:

> "Local cadres were located at the intersection of the state and villages. A large majority of them came from local villages and maintained close ties with their kin and fellow villages. The close ties between local cadres and villages influenced the activities of the local state. Local cadres attempted to accommodate villagers' interests, sometimes even when they contradicted national policy." (Sikor and Truong, 2000, p.33).

In these circumstances, it would be wrong to view the land-market reform as undermining the power of the local state over land allocation. Indeed, staff of one NGO argued that the reforms enhanced the power of the state over land usage (Smith and Binh, 1994). Although both the 1988 and 1993 land laws extended land use rights for "stable and long-term use" there are reports that some local authorities continue to re-allocate land periodically by administrative means, such as in response to demographic changes and new family formations.

The power of the local state is likely to have limited the feasible efficiency gains from the reforms. Writing a few years after the 1993 Land Law, Smith (1997) reports that in one northern

province (Ha Tinh) the major commercial bank lending for agricultural purposes had not yet accepted a single land-usage certificate as collateral for a loan.[2] The resistance of local officials to have the land sold to an outsider was one of the reasons given by the bank; another was that the bank was unsure it would ever find a buyer for the land should it foreclose on the loan.

Just how much the local state has inhibited the development of a land market is unclear. It appears that land transactions can by-pass state control. There have been reports of land transactions without titles (Smith, 1997; de Mauny and Vu, 1998). Possibly a quasi-market has emerged despite the continuing intrusions of the local state.

2.2 Distributional outcomes of the agrarian transition

There have been concerns about rising inequality in Vietnam's agrarian transition. A report by ActionAid staff exemplifies these concerns; while presenting no supportive evidence, the report predicted that the reforms would lead to:

> "..a greater concentration of land ownership, a greater disparity in wealth throughout the rural community and a possible increase in the phenomenon of landlessness and full-time agricultural wage labour." (Smith and Binh, 1994, p.17.)

There have been reports of rising landlessness, notably in the South (de Mauny and Hung, 1998; Lam, 2001b). However, there is little sign of sharply rising income or consumption inequality.[3]

Some of the efforts made to avoid rising inequality may well have had perverse effects. There are reports that, in response to central Communist Party concerns about rising landlessness in the late 1990s, some local officials in the South tried to stop poor families selling their land (de Mauny and Vu, 1998). The consequent devaluation of their main non-labor asset would

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[2] This should not be generalized; indeed, the same field study reported cases of land certificates being accepted as collateral in another province.

[3] Analyses of household survey data for 1992/93 and 1997/98 indicate a significant drop in income inequality in the South (from a Gini of 0.46 to 0.42), though there was a slight increase in the North (from 0.37 to 0.39) and a slight increase in consumption inequality in both North and South (Benjamin and Brandt, 2002, Glewwe et al., 2001), though the statistical significance of these changes is a moot point.

presumably make the poor worse off. It is likely that transfers still happened despite such policies, though the transactions would become informal, and possibly on less favorable terms for those forced to sell their land because of adverse shocks.

2.3 Summary

These observations suggest that it would be naïve to think that simply legislating the pre-requisites for a competitive land market in this setting would make it happen. The reality is more complex and uncertain, given the institutional/historical context. In principle, the continuing (and possibly enhanced) power of local cadres could undermine the expected efficiency gains from the center's reforms. The distributional outcomes are equally unclear; the local state had the power to either magnify any adverse distributional impacts of the reforms, or dampen them. The outcome is likely to depend in large part on the outcomes of a power struggle at local level, which can be taken to determine the (explicit or implicit) distributional goals of the local land allocation process. Capture of this allocation process by local elites could lead to even worse distributional outcomes.[4] On the other hand, a desire to protect the poor could soften the impact. These same features of the Vietnamese rural economy that could inhibit the efficiency gains from introducing land titles and other trappings of the market economy lead one to question any presumption that efficiency gains from the land law would necessarily come with a cost to equity. Local institutions would have been capable of both stalling the market and protecting the poor from any polarizing forces it generated.

In the rest of this paper we will study the efficiency and equity outcomes of this process of post-reform land re-allocation, given its institutional and historical context.

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[4] This has been a concern in recent analyses of the case for community-based welfare programs more generally (Bardhan and Mookherjee, 2000; Galasso and Ravallion, 2001).

3. Modeling land allocation

The main hypothesis to be tested is that, during the agrarian transition, land re-allocation helped offset prior inefficiencies in the non-market allocation. To test this, we need to explicitly characterize the extent of inefficiency in the initial administrative allocation at the farm-household level. Then we will see how well this measure predicts the subsequent re-allocations of land, and what role was played by other factors, such as distributive justice.

3.1 The efficiency losses from the initial administrative allocation

An initial administrative allocation of land was made as part of de-collectivization, giving an amount L_i^A of land to household *i* for *i*=1,..,*n*. The administrative allocation need not be efficient in the specific sense of maximizing aggregate output or consumption.

To characterize the efficient allocation, suppose that holding L_i of land yields an output of $F(L_i, X_i)$ for household *i* where X_i is a vector of exogenous household characteristics. We assume that the function F is increasing and strictly concave in L_i. The household also has (positive or negative) non-farm income, $Y(X_i)$. The household consumes its current income:[5]

$$C_i = C(L_i, X_i) = F(L_i, X_i) + Y(X_i) \tag{1}$$

The allocation that maximizes the commune's aggregate current consumption is:

$$(L_1^*,..,L_n^*) = \arg\max[\sum_{i=1}^{n} C(L_i, X_i) \Big| \sum_{i=1}^{n} L_i = n\bar{L}] \tag{2}$$

The solution equates $F_L(L_i^*, X_i)$ with the multiplier λ on aggregate land in (2), giving:

$$L_i^* = L(X_i, \lambda) \ (i=1,..,n) \tag{3}$$

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[5] We ignore saving/dissaving and borrowing/lending; incorporating these features would complicate the model in unimportant ways for our purposes.

We call this the "consumption-efficient allocation." This is also the competitive equilibrium assuming that utility depends solely on consumption. In the market allocation, each household's consumption will be $F(L_i, X_i) + Y(X_i) - \lambda L_i$ where λ is the market price of land. Demands then equate $F_L(L_i, X_i) = \lambda$ over all *i*, which is the allocation that maximizes aggregate consumption.

In our empirical implementation, we assume that (1) takes the specific form:

$$\ln C_i = a + b \ln L_i + cX_i + \nu_i \tag{4}$$

where *a*, *b* and *c* are parameters and ν_i is a white noise error process. Given estimates of the parameters and error term and data on *X*, we then calculate the consumption efficient allocation to each household. For 0<*b*<1 the solution is $L_i^* = \exp\{[\ln(b/\lambda) + X_i c + \nu_i]/(1-b)\}$.

The efficiency loss from the administrative allocation is measured by

$$\tau_i = \tau(L_i^*, L_i^A) = \phi(L_i^*) - \phi(L_i^A) \tag{5}$$

for some strictly increasing function ϕ; we adopt this functional form for to assure that $\tau(L, L) = 0$. We can embrace a reasonably wide range of possible empirical measures by restricting attention to the class of functions: $\phi(L) = (L^\eta - 1)/\eta$ where $\eta \in [0,1]$. The two extreme cases are (i) <u>proportionate differences</u>, in which $\eta = 0$, implying that $\tau_i = \ln(L_i^*/L_i^A)$ (noting that $\lim_{\eta \to 0}(L^\eta - 1)/\eta = \ln L$); and (ii) <u>absolute differences</u> ($\eta = 1$) whereby $\tau_i = L_i^* - L_i^A$.

3.2 Modeling post-reform land re-allocation

We only observe a single time interval in the process of land re-allocation after legalizing market transactions and we do not, of course, assume that the process has reached its long-run solution by the end of the period of observation. However, we do assume that the dynamic process will eventually converge to a unique long-run equilibrium, which depends on the

competitive market allocation of land to that household but can also be influenced by the household's weight in local decision making about the allocation of use rights.

The new allocation at a date after the reform is $(L_1^R, L_2^R, ..., L_n^R)$. Let $\rho_i = \rho(L_i^R, L_i^A)$ denote a measure of the extent of land re-allocation. We clearly want $\rho(L_i^R, L_i^A)$ to be strictly increasing in L_i^R and decreasing in L_i^A with $\rho(L, L) = 0$. We also want to assure that if $\rho(L_i^R, L_i^A) = \tau(L_i^*, L_i^A)$ then $L_i^R = L_i^*$; if land re-allocation for household *i* exactly matches the initial efficiency loss then the household must have reached the market solution. These conditions require that ρ and τ have the same functional form i.e., $\rho_i = \phi(L_i^R) - \phi(L_i^A)$.

To see how land allocation responded to initial inefficiencies we study the non-parametric regression:

$$\rho_i = f_i(\tau_i) + \varepsilon_i \tag{6}$$

where $f_i(\tau_i) \equiv E_\varepsilon[\rho_i | \tau_i]$. In the extreme case with $f_i(0) = 0$ and $f_i'(\tau_i) = 1$, there are no systematic non-market constraints on land re-allocation, so $L_i^R = L_i^*$ in expectation. Adjustment to the market solution is then complete within the period of observation. More generally one can allow $0 \le f_i'(\tau_i) \le 1$ in which case we have a (nonlinear) partial adjustment model by which land holdings adjust to any discrepancies between the administrative allocation and the market solution, though the process need not be complete in the period of observation. With repeated observations, L_i^* will be reached whatever the initial start value of the process (in this case, the administrative allocation at de-collectivization). The slope, $f_i'(\tau_i)$, is the "partial adjustment coefficient" for household *i* giving the speed at which initial inefficiencies are eliminated.

However, equation (6) does not capture the non-market factors that may matter to land re-allocation (section 2) We continue to assumption that the process converges to a unique equilibrium, but we do not assume that L_i^* is that equilibrium. Both efficiency and distributional considerations influence the outcome, which we denote as L_i^{R*}. The value of $\tau(L_i^*, L_i^{R*})$ then gives a measure of the role of non-market forces in land allocation; the higher the weight that a given household has in local decision making about land, the lower the value of $\tau(L_i^*, L_i^{R*})$.

We assume that L_i^{R*} is a function of household consumption, interpreted as a metric of household welfare. Thus we will study the non-parametric regression in (6) stratified by consumption per person. We will also test the impact on land allocation of a wider range of other household characteristics, for which we switch to a more convenient parametric form:

$$-\tau(L_i^*, L_i^{R*}) = \frac{\alpha}{\beta} + \frac{\gamma}{\beta}\ln C_i + \frac{\pi}{\beta}X_i + \frac{\varepsilon_i}{\beta} \qquad (7)$$

where α, β, γ and π are parameters to be estimated (the reason for normalizing by β will soon be clear). Equation (7) implicitly defines the long-run equilibrium L_i^{R*} as a function of L_i^*, C_i and X_i. To embed (7) in a dynamic adjustment process consistent with reaching L_i^{R*} we assume the following parametric regression of ρ_i on τ_i:

$$\rho_i = \alpha + \beta\tau_i + \gamma\ln C_i + \pi X_i + \delta\Delta X_i + \varepsilon_i \qquad (8)$$

in which we allow for shocks to household characteristics (ΔX_i). (It is readily verified that equation (6) is obtained as the long-run solution to (8) when $L^R = L^A = L_i^{R*}$ and $\Delta X_i = 0$.) We can also allow the partial regression coefficient of ρ_i on τ_i to vary between individuals according to their characteristics, by testing for appropriate interaction terms to equation (8).

Two remarks are in order about our specification in (8). First, the controls serve multiple roles. One role is to reduce bias in the partial adjustment coefficient β. In the light of what we already know about the allocation of land at de-collectivization, there are reasons to doubt that those characteristics are orthogonal to the initial efficiency loss. For example, the existence of an equity-efficiency trade-off in the initial administrative allocation will mean that the efficiency loss is positively correlated with welfare. Assuming that equity considerations also influenced the land re-allocation, consistent estimation of the partial adjustment coefficient requires controls for initial welfare indicators and other non-market factors. The controls may also help pick up errors in our measures of either welfare or the efficiency loss from the administrative allocation. For example, children's schooling may influence expectations of future welfare at given current consumption. Or demographic shocks may pick up changes in the efficient allocation.

Secondly, we do not include L_i^A as a determinant of land re-allocation independently of τ_i, C_i and X_i. This conditional independence property stems from our assumptions that (i) the underlying dynamic process has a unique long-run equilibrium for a given household (and so reaches the same solution whatever the starting position one happens to observe for that process), and (ii) the long-run equilibrium defined by equation (7) does not depend on L_i^A independently of C_i and X_i. Given that L_i^* is a function of X_i, the conditional independence of L_i^A is untestable (except with arbitrary exclusion restrictions or functional form assumptions). Notice, however, that conditional independence of L_i^A does not preclude the possibility that the initial administrative allocation influences the long-run solution through its effect on the welfare measure, C_i, or that X_i captures the same factors that determined L_i^A initially.

4. Data

We use the household panel data from the 1992/93 and 1997/98 Vietnam Living Standard Surveys (VLSS). The first survey preceded the change in the land laws in 1993. These are nationally representative, high quality surveys with comprehensive and carefully collected data on a wide range of household characteristics including consumption expenditures, production and land holdings (World Bank 1995 and 2000). The surveys contain a balanced panel of 4308 households. We limit our sample to the 2559 rural farming households in the panel who had allocated annual agricultural land in 1993. The 1992/93 VLSS is self weighted so that expansion factors are not needed. Both surveys spanned 12 months.

Perennial, forest and water surface land have also been allocated to households. However, we focus on allocated annual agricultural land because of its importance in production and total area, and because its allocation began earlier and has progressed more rapidly than for other land types.[6] (Annual agricultural land is for annual crops such as rice or groundnuts.)

Annual agricultural land can be irrigated or non-irrigated. To facilitate the analysis we convert all allocated annual agricultural land into an allocated irrigated land equivalent amount for each household. Non-irrigated land amounts are weighted by the ratio of the coefficients on non-irrigated to that of irrigated land estimated from region-specific regressions of farm profits on allocated irrigated and non-irrigated annual land and all other land cultivated by households, household characteristics and commune dummies. The weights are estimated using the 1992/93 VLSS and used to create the allocated irrigated land equivalents in both 1992/93 and 1997/98.[7]

A household's cultivated land can differ from its allocated land. Rural households typically have their own private residential land with its garden area. We consider this type of

[6] We will hereafter refer to allocated annual agricultural land simply as allocated land.

land as being a well-known and longstanding asset associated with each household and hence we control for it in our analysis. The rental market is thin. Rented-in land represented 6.2% of annual crop land in 1993 and 5.7% in 1998. A more active rental market has clearly not emerged since the reforms. Our impression is that rentals tend to be temporary arrangements, such as when a family worker is sick or temporarily absent. There is also a small amount of "auction land" that is effectively rented from the commune. (This accounted for 2.1% of all cultivated land in 1993, and 1.9% in 1998.) We do not control for land obtained though rental arrangements, given the possible endogeneity concerns.

The land situation has been an evolving during the 1990s — reflecting changing official attitudes towards the market economy and the role of land, and consequent policy and legal reforms. This is apparent in the surveys. Land categories and definitions changed between the 1992/93 and 1997/98 VLSS. Our aim here is to study changes in the allocated annual land amounts over time. Fortunately, this is straightforward. In 1993, our allocated land variable comprises the questionnaire categories 'allocated' and 'long-term-use' annual land. (Both categories refer to land allocated to households for long-term use. They differ only in that the allocation terms are slightly different with the first arrangement more common in the North and the second more so in the South.) By 1998, this distinction is no longer enforced. The 1997/98 VLSS refers to allocated land as either long-term-use or 'contract' land. The latter is also allocated to households for long-term and stable use, but its land-use title is held by a state managed farm or enterprise rather than the household. This category of land was subsumed in either allocated or long-term use land in the 1992/93 survey. We consider this to be part of the allocated land category in 1998. Finally, in contrast to the 1992/93 VLSS where allocated annual

[7] See Ravallion and van de Walle (2001) on construction of the allocated land equivalent.

land amounts include any area that was rented out, the latter is recorded separately in 1998 and so must be added in to determine the household's total allocated annual land amount.

We use consumption in 1992/93 as our indicator of pre-reform welfare. This includes the value of consumption from own production, imputed housing expenditures and the use value of consumer durables (World Bank 1995). It also takes account of temporal price variation across the survey year as well as spatial price differentials and is expressed in real 1993 Dongs. Vietnam is characterized by marked geographical variation, some of which reflects different historical evolutions. The country is commonly divided into seven regions that are relatively homogeneous. We estimate our regressions nationally as well as by region, though only for the five regions—namely, the Northern Uplands, the Red River, North Coast, Central Coast and Mekong Delta—for which there is sufficient data for estimation. In addition, the augmented model includes a full set of commune dummy variables to capture latent regional heterogeneity.

In our augmented model below we control for exogenous household level variables that describe the household's initial 1993 situation. These include log household size, the dependency ratio (defined as one minus the ratio of labor age members to all members), the years of education of the head and of other household adults; the head's age and dummy variables for his/her religion (1 if the head practices the Christian or Buddhist religion, 0 otherwise), ethnicity (1 if the head belongs to an ethnic group other than the majority Kinh or relatively wealthy Chinese minority), gender and whether born locally; dummies for whether the household contains one or more handicapped adult members, members who work for the government or for a state owned enterprise, and whether the household receives government social fund transfers. The latter tend to be targeted to individuals who suffered in the wars and to the families of war heroes and martyrs. Such households are often treated preferentially in

Vietnam and this might also exert some influence on land allocations. We also control for the household's private land (discussed above), whether it cultivates swidden land or not, and the share of its irrigated and non-irrigated land that is considered of good quality.

In addition, we include variables that capture exogenous changes in the household's characteristics—namely the change in the number of disabled adult members, the change in the number of able bodied working age members, the number of new members aged between 8 and 99 in 1998, and whether an adult or elderly member died between the two surveys.

Table 1 provides summary statistics for the national sample, split according to whether allocated annual crop land was retained over the period; 198 households (7.7% of the sample) who had allocated land in 1992/93 are found to have none in 1997/98.[8] We also present the data separately for the Mekong Delta and for the national sample omitting the Mekong Delta.

It can be seen that those who lost their allocated land were not poorer on average, and that they did not see lower consumption gains. There is little sign that becoming landless in terms of allocated annual land was generally a sign of impoverishment. Nor is there any sign that those whose consumption fell were more likely to have lost their allocated land; the proportion who disposed of their land was not significantly different between quintiles defined according to the change in consumption. We also tested this for the sub-set of 88 households who became landless in that they disposed of all cultivated land (whether allocated or not); the results were similar. Of course there may well have been cases in which landlessness was associated with impoverishment, but it clearly does not stand up as a generalization.

[8] This is not the same as becoming landless. Of the 198 households who did not have any allocated land in 1997/98, only 88 had no cultivated land whatsoever other than their private residential land.

5. Results

Recall that in measuring land re-allocation and the initial efficiency loss we assume that $\phi(L) = (L^{\eta} - 1)/\eta$ where $\eta \in [0,1]$. To choose a value of η we regressed ρ_i on τ_i across the entire data set for alternative values of η at 0.1 intervals over the [0,1] interval. The best fit (measured by the t-ratio on the partial adjustment coefficient) was obtained at $\eta = 0$, which gave a partial adjustment coefficient for proportionate differences of 0.328 with a t-ratio of 18.54. The coefficient for absolute differences ($\eta = 1$) was 0.170 with a t-ratio of 7.56 and between the two, the t-ratio declined monotonically. So we chose the proportionate (log difference) specification in all further work. However, this specification has the drawback that we lose some observations with zero land allocation in 1997/98 (since we cannot take the log of zero); this applies to slightly less than 8% of the sample.[9] We will study this sub-sample with zero allocated land in the second survey more closely, and test for sample selection bias, later in this section. For the present discussion we confine attention to the proportionate case.

5.1 Non-parametric regressions

Figure 1(i) plots the proportionate changes (log differences) in land allocation against our measure of the initial loss relative to the efficient allocation, measured by $\ln(L_i^* / L_i^A)$, for the national sample. The empirical relationship in Figure 1(i) is strong and suggests a tendency for land re-allocation to respond positively to the initial inefficiency in the administrative allocation. As already noted, the linear regression coefficient is 0.33, indicating that one third of the initial disparity between the administrative allocation and the market allocation was eliminated over

[9] We also tried defining the proportionate difference as the percentage change rather than log difference, thus allowing us to keep these observations; the results were similar, though (again) the log difference specification gave a better fit.

this five year period. Figure 1 also gives the nonparametric regression function (using Cleveland's, 1979, local regression method). The slope is positive but less than unity throughout, though it is clear that $f(0) \neq 0$, reflecting an overall expansion in allocated annual land area over this period.

The relationship between annual land re-allocation and the extent of the initial inefficiency comes out more sharply when we stratify by initial consumption. Figures 1(ii) to (vi) give the plots corresponding to Figure 1(i) by quintile of consumption in 1992/93, ranked by consumption per person. Table 2 gives the corresponding conditional means. The tendency to adjust over time toward the efficient allocation is evident for all quintiles of initial consumption. We also see a marked tendency in Table 2 for the gains in allocated annual landholding to fall as consumption rises. This effect appears to be somewhat stronger among those who lost most from the initial administrative allocation, relative to the efficient solution. In other words, the gradient in land increments between those who gained from the efficient allocation and those who lost appears to be steeper for the poor, suggesting a negative interaction effect between initial consumption and initial efficiency loss (Figures 1(ii) to (vi) and Table 2).

These patterns motivate a regression of the change in land allocation on the initial efficiency loss, initial log consumption per person and the product of these two variables. Table 3 gives the results by region, with and without the interaction term which is only significant in about half the regions, though not nationally at the 10% level.

Focusing on the specification without the interaction term, we find that nationally the response of land allocation to the initial efficiency loss is 0.54, implying that over this five year period about half of the efficiency loss (log efficient allocation minus log actual) was made up by

land re-allocation.[10] The response to the initial efficiency loss varies greatly by region, from a low value of 0.39 in the Mekong Delta to a high of 0.71 in the Northern Uplands. The Mekong Delta stands out for its low adjustment coefficient and we will consider why in the next section.

The regional differences are even more marked for the "equity term" given by the effect of initial consumption on subsequent land re-allocation. For the national sample, the coefficient is -0.63, but it varies from a low of -0.15 in the Mekong Delta (where it is only significantly different from zero at the 9% level) to a high of -0.86 in the Central Coast. Preferences for equality appear to be stronger outside the South's Mekong Delta; we return to this point.

5.2 Parametric models with controls

Table 4 gives augmented models with controls (equation 8). We give results without the interaction effect, though results with this term were very similar. We use a range of initial household demographic, education, other types of land and commune dummy variables. We also added controls for the changes in selected characteristics, notably changes in the number of household members of working age, and deaths.

Let us focus first on the national results. Consistently with Table 3 we find a highly significant positive coefficient on the initial efficiency loss, implying that the land re-allocation process was in the direction of a more efficient allocation. However, equity also played a role, as indicated by the significant negative coefficient on initial consumption.

Additionally, we also find signs of a number of other factors influencing land-re-allocation. There is a relationship with age of the head, with younger household heads favored up to 61 years (near the upper end of the age distribution). Smaller households were also favored

[10] The fact that this is higher than the unconditional coefficient of 0.33 reflects of course the fact that initial consumption has a negative effect on land re-allocation and is positively correlated with the initial efficiency loss (on the latter point see Ravallion and van de Walle, 2001).

in the land re-allocation process. This could well be an effect of economies of size in household consumption; if instead one was to use household consumption normalized by household size to the power of θ then the coefficient on log household size implies a value for θ of 0.67, which is not an implausible allowance for economies of size in consumption.

Other covariates of land re-allocation are suggestive of market forces that might not be captured well by our measure of the efficiency loss from the initial administrative allocation. Having certain other types of land resulted in significantly higher access to land, and there is a highly significant effect of an increase over the time period in the number of persons of working age and new people joining the household. (We also tried dropping the latter variable given possible endogeneity concerns, but other results were affected little in the national model.) There were also many significant commune effects. These could reflect prices rather than institutional factors.

There are some regional differences in the model with controls. For all regions, the initial efficiency loss and initial consumption effects mirror the highly significant positive and negative effects found at the national level. Although the welfare effect is now more pronounced and more statistically significant in the Mekong Delta than in the model without controls for household and geographic characteristics (as shown in Table 3), this effect is still weaker than for the national and other regional samples. Being from an ethnic minority household helped increase annual land holdings in the Central Coastal region, while it tended to reduce holdings in the Mekong Delta; note, however, that the ethnic groups are not the same in these two regions. Ethnic effects also become significant and positive in the Northern Uplands and North Coast regions when we omit the number of new household members in 1998. By contrast, the dummy for being a social fund transfer recipient becomes insignificant in both the Northern Uplands and

the Red River. Otherwise, results are robust to dropping this variable. Having a member who works for an SOE has a pronounced negative impact on annual land changes in the Northern Uplands though it has no impact elsewhere. In both the Northern Uplands and Central Coast regions a higher share of good quality irrigated land reduced the land re-allocation over time.

We also tested for effects of the initial efficiency of land allocation on the probability of becoming landless (in terms of allocated annual land). Table 5 gives the proportion of the 1997/98 sample that had no allocated land classified by both initial (1992/93) consumption and the estimated initial loss relative to the efficient allocation in 1992/93. (The groupings are self-explanatory, and were chosen to assure at least 10 landless households in each cell.) We can see that the higher the loss relative to the efficient allocation the higher the probability of having no allocated land in 1997/98. This effect is most marked for the poor. However, the poor as a whole were not more likely to dispose of their allocated land (Table 5). The highest incidence of allocated annual landlessness that emerged over the period was for the poor who had started off at the beginning of the period with the least land relative to the efficient allocation.

Additionally, we estimated probits for landlessness using the same regressors as in Tables 3 and 4. We did this for both disposal of allocated annual land and disposal of all cultivated land. Virtually the only significant predictors in any of these regressions was the proportionate efficiency loss, which had a significant positive coefficient in most cases, and geographic dummy variables. Becoming landless was more likely for households who had too little land relative to the efficient allocation, and it was more likely in the South than the North.

Our results are suggestive of a "land polarization" process amongst those who started off with too little land relative to the efficient allocation. The bulk of these households "traded up," acquiring more land in the more market-oriented economy. However, a minority simply

disposed of their allocated land. This was more likely if the household was initially poor. However, it should be recalled that the bulk of the poor with too little land were still able to raise their holdings. And poor households per se were not more likely to dispose of their allocated land. The results in Table 5 are more suggestive of an interpretation in which a subset of those poor households who started out with too little land (relative to the efficient allocation) simply "cashed in," possibly to take up other non-farm activities or pay-off debts.

The difference in behavior of those households who disposed of their allocated land raises a concern about the possibility of sample selection bias in our main regressions for land re-allocation.[11] In fact there are two possible sources of such bias. The first stems from the fact that our preferred specification for the functional form entailed that some observations had to be dropped (and, as we shall see, these observations do behave differently); the second is panel attrition, in that some of the original random sample could not be interviewed in the second survey for various reasons (they had left their original address or they chose not to participate again). Motivated by the approach to testing for panel attrition bias in Fitzgerald, Gottschalk and Moffitt (1998), we tested for both sources of bias using initial land allocation as the auxiliary endogenous variable in a probit for whether a household dropped out of the sample (for either reason), with controls for all other observable exogenous characteristics in the baseline survey. (We used the same set of controls as in our model of land re-allocation.) This assumes that the initial land allocation is correlated with the selection-bias error component in the main regressions but does not appear on the RHS of our model of land re-allocation independently of

[11] It might be conjectured that this explains why we get a better fit using the log difference specification; since the observations that disposed of their allocated land behaved very differently to differences in the initial inefficiency of their allocation, dropping these (because one cannot take the log of zero) improved the fit. However, we got a better fit with the log specification across the same (truncated) sample when compared to other values of η (tested at 0.1 intervals over the [0,1] interval).

the initial efficiency loss; the latter exclusion restriction is implied by our theoretical model (as discussed in the previous section). The initial land allocation variable was statistically insignificant (at the 10% level) nationally and for all regions, suggesting that there is little or no bias due to sample selection in our regressions for land re-allocation.

5.3 Why is the Mekong Delta so different?

After re-unification between the North and the South in the mid-1970s, farmers in the South's Mekong Delta had resisted collectivization, and by the time the country de-collectivized 13 years later, less than 10 percent of all of the region's farmers had been organized into collectives. By contrast, virtually all of the crop land in the North and the South's Central Coastal provinces was collectivized by that time (Pingali and Xuan 1992; Ngo 1993).

The market economy was thus more developed in the Mekong Delta at the beginning of the transition. It might be expected that this historical difference would mean that land allocation would adjust more rapidly in the Mekong. But we find the opposite. Why?

One possible explanation is that rural per capita income growth was higher in the South over this period, fuelled in part by improvements in farmers' terms of trade arising from external trade reforms; Benjamin and Brandt (2002) report a 95% increase in real income per person in the South over 1993-98, versus 55% in the North. With such rapid growth in real incomes it might be argued that the pressure to secure extra efficiency gains from land re-allocation was dampened, particularly in South.

Other possible explanations can be found in the pre-reform differences between the Mekong Delta and the North. The distribution of land was more equal in the North.[12] The

[12] This difference shows up in the results from the VLSS of 1992/93. The coefficient of variation in the log of allocated annual agricultural land was 8.3% in the North's Red River Delta, versus 15.3% in the South's Mekong Delta (Ravallion and van de Walle 2001). (Among the five regions for which the sample size was deemed adequate, these were the regions with lowest and highest land inequality respectively.)

widespread collectivization of agriculture in the North over roughly a generation fostered a more equitable allocation at the time of de-collectivization. In the South, the fall back position was the land reform allocation pre-unification; although this is purported to have been quite equitable in the early 1970s, it was much less so by the late 1980s given demographic and other household changes. In the North, the realized allocation was closer to an equal allocation of irrigated-land equivalents than in the South. Ravallion and van de Walle (2001) simulated an equal allocation of irrigated land equivalents on a per-capita basis across all households. This approximated well the overall welfare outcomes (mean consumption, inequality and poverty) of the actual allocation of land in the North, but less so in the Mekong.

Lower inequality in the North may well have made it easier to achieve cooperative outcomes, including more efficient assignments of land-use rights.[13] A related manifestation of this difference can be found in the performance of (formal and informal) institutions that deal with risk and are also likely to matter to land allocation. The safety net in rural areas of Vietnam is largely community-based; central and provincial programs have weak coverage (van de Walle, 2002). It is widely believed that villages in the North are better organized socially than in the South, so that when a farm household in the North suffers a negative shock (such as crop damage or ill-health) it will almost never need to sell land to cope. For example, writing about Son La province, Smith reports that:

> "..there is a tendency for the local authorities to seek to protect households from the dangers of a market in land, despite the provisions of the 1993 Law. This constitutes an attempt to protect poor households who may be tempted to sell their land for short term gain and lose their principal means of subsistence." (Smith, 1997, p.11.)

[13] For an excellent review of the theoretical arguments as to why high inequality can impede efficiency see Bardhan et al., (1999).

By contrast, an Oxfam team in the province of Tra Vinh in the Mekong Delta (in which the NGO had been working for a few years) reported that:

> "The crucial problem is that there are no safety nets for helping households who encounter temporary crises. … It is no surprise that many families resort to transferring or mortgaging their land, discounting the future to cope with the current crisis" (de Mauney and Vu, 1998, p.23).

This difference between the North and the South is no doubt in part a legacy of the longer period of collective organization in the North. However, the more equal land allocation in the North after breaking up the collectives could well have facilitated this, by making it easier to continue to achieve quasi-cooperative arrangements within communities. Better insurance in the North is likely to have also made it easier for land transactions to be made on efficiency grounds. Landholdings in the South, by contrast, are likely to have been less flexible, since land would be more likely to be held as insurance than in the North.

6. Conclusions

The standard policy prescription for transforming a socialist economy into a market economy is to privatize productive assets and then change the law to permit free transactions in those assets. We have put this model to the test in the context of Vietnam's agrarian transition. We find partial support for the standard model during a period that included major liberalizing reforms to land laws. There are clear signs that land allocation responded to the inefficiencies of the initial administrative assignment at de-collectivization. Households that had received less than the competitive market allocation of land under the pre-reform administrative allocation were able to catch up substantially through the subsequent process of re-allocation allowed under the new land laws. The partial adjustment coefficient was about 0.5 in the aggregate, meaning that half of the initial gap between the actual allocation and the efficient allocation was eliminated within five years.

The adjustment coefficient is appreciably lower in the South's Mekong Delta. One possible explanation is that higher initial land inequality and weaker rural institutions for insurance in that region may have made it harder to achieve cooperative, efficiency enhancing, re-allocations of land. More rapid agricultural growth in the Mekong during this period may also have dulled incentives for pursuing efficiency gains from land re-allocation.

Our results also suggest that the process of transition to a market economy was constrained significantly by the local political economy, which appears to have assured that equity was not sacrificed as much as would have been the case in more rapid transition to the free market solution. The non-market forces were evidently mediated through the continuing power of local cadres. Initially poor households were favored at any given level of the initial efficiency loss. There is also a sign of an interaction effect, such that the efficiency gains favored the poor. This was stronger in some regions than others. Taken overall, our results suggest that Vietnam's agrarian transition traded-off efficiency with equity.

The continuing exercise of communal control over land in the post-reform period should clearly not be seen as some exogenous distortion to the free working of the market economy. Rather, it is more likely to have been a response to that economy — an endogenous safety net which recognized the welfare risks that a free market in land would entail, given other market imperfections, notably incompleteness in the markets for credit and insurance. It is this role of local institutions in taming market forces — given market imperfections and constraints on other redistributive policy instruments — that we find missing from the standard economic model of transition based on privatization and legal reform.

Table 1: Variable definitions and summary statistics

Variable definitions	Full Sample		Kept allocated annual land in 1998		No allocated annual land in 1998		Mekong Delta		Full sample minus Mekong Delta	
	Mean	st.dev.	mean	st.dev	Mean	st.dev	Mean	st. dev.	mean	st. dev.
Log change in allocated irrigated land equivalent (m^2)	0.142 (n=2361)	0.66	0.142	0.66	0	0	0.002 (n=308)	0.75	0.163 (n=2053)	0.64
Change in allocated irrigated land equivalent (m^2)	206.708	3527.38	494.22	3203.79	-3221.619	5078.94	-521.438	6891.17	337.633	2459.15
Log real per capita 1993 consumption expenditure (1993 dongs)	13.801	0.46	13.789	0.44	13.952	0.59	14.053	0.48	13.756	0.436
Real per capita 1993 consumption expenditure ('000 1993 dongs)	1100.111	604.98	1076.842	548.77	1377.579	1030.01	1432.131	824.85	1040.412	535.13
Change in real per capita consumption 1993-98 (1998 dongs)	813.883	408.29	809.698	403.83	863.765	456.25	1009.039	653.47	778.777	334.60
Proportional efficiency loss (log efficient allocation minus log actual in 1993)	-0.016	0.78	-0.072	0.72	0.651	1.17	0.038	0.94	-0.085	0.74
Religion: 1 if h'hold head is Buddhist or Christian (0 if other, animist or none)	0.307	0.46	0.305	0.46	0.338	0.47	0.572	0.50	0.260	0.44
Ethnic: 1 if h'hold head is of ethnicity other than majority Kinh or Chinese	0.121	0.33	0.116	0.32	0.177	0.38	0.087	0.28	0.127	0.33
Local born: 1 if head is born locally	0.861	0.35	0.867	0.34	0.783	0.413	0.844	0.364	0.864	0.34
Age of household head	44.758	14.69	44.496	14.54	47.874	16.09	47.385	14.18	44.285	14.73
Gender of household head (male=1)	0.791	0.41	0.792	0.41	0.778	0.42	0.787	0.41	0.791	0.41
Log h'hold size in 1993	1.516	0.44	1.520	0.44	1.468	0.49	1.652	0.45	1.492	0.44
Dependency ratio: 1- (ratio of labor age members to all members) in 1993.	0.564	0.19	0.563	0.19	0.576	0.21	0.573	0.19	0.562	0.19
Labor age adult member is handicapped	0.007	0.09	0.008	0.09	0	0	0	0	0.009	0.09
SOE: member has primary or secondary occupation in State owned enterprise	0.018	0.14	0.017	0.14	0.035	0.21	0.013	0.11	0.019	0.15
Gov't job: member has worked for gov't in primary/secondary occupation for 5+ yrs or retired from gov't*	0.059	0.25	0.056	0.25	0.096	0.30	0.085	0.31	0.055	0.24
Social subsidy: dummy var. for receipt of gov't transfers to war heroes, martyrs, disabled etc	0.103	0.30	0.095	0.29	0.197	0.40	0.044	0.20	0.114	0.32
Household head's years of education	6.107	3.83	6.197	3.81	5.035	3.98	4.213	3.09	6.448	3.858
Other h'hold adults' years of education	10.648	9.22	10.76	9.22	9.343	9.16	10.197	9.70	10.729	9.13
H'hold's private irrigated land (m^2)	158.853	658.68	169.018	680.34	37.641	269.42	300.949	1579.04	133.303	245.43
H'hold's private non-irrigated land (m^2)	228.824	955.31	224.399	951.56	281.581	999.96	215.256	1638.92	231.263	771.23
H'hold's private perennial land (m^2)	349.057	1492.13	312.983	1436.01	779.207	2001.22	935.467	1656.14	243.616	1435.91

H'hold's private water surface land (m^2)	55.913	478.74	52.806	442.33	92.965	794.15	121.842	1169.92	44.059	154.66
H'hold cultivates swidden land=1	0.108	0.31	0.107	0.31	0.126	0.33	0.021	0.142	0.124	0.33
Share of good irrigated land	0.304	0.39	0.318	0.39	0.131	0.32	0.109	0.30	0.339	0.39
Share of good non-irrigated land	0.374	0.46	0.362	0.46	0.520	0.49	0.587	0.49	0.335	0.44
No. of members >=16 in 1993 who died by 1998	0.109	0.33	0.104	0.33	0.162	0.40	0.131	0.35	0.105	0.33
No. of members >=50 in 1993 who died by 1998	0.089	0.30	0.085	0.30	0.146	0.37	0.113	0.33	0.085	0.30
Change in number of disabled adults 1993-98	-0.004	0.15	-0.005	0.15	0	0.10	-0.005	0.12	-0.004	0.15
Change in no. of able bodied working age members 1993-98	-0.138	1.19	-0.141	1.20	-0.106	1.13	-0.172	1.45	-0.132	1.14
H'hold has new individual aged 8-99 in 1998	0216	0.60	0.213	0.60	0.247	0.59	0.321	0.78	0.197	0.56
No. observations	2559		2361		198		390		2169	

Source: 1992/93 and 1997/98 Viet Nam Living Standards Surveys. Note: * We identify government work through professional codes 20 and 21.

Table 2: Proportionate gain in allocated annual agricultural land from 1992/93 to 1997/98

		Households ranked by consumption per person in 1992/93; quintiles				
		1 (poorest 20%)	2	3	4	5 (richest 20%)
Household ranked by estimates of loss ($L_i^* - L_i^A$) from admin-istrative allocation of land 1992/93	1 (Gained relative to the efficient allocation)	**-0.147** (0.527) [147]	**-0.190** (0.365) [123]	**-0.229** (0.528) [82]	**-0.339** (0.596) [56]	**-0.152** (0.708) [47]
	2	**0.249** (0.448) [131]	**0.109** (0.511) [157]	**-0.028** (0.360) [145]	**-0.217** (0.514) [71]	**-0.315** (0.657) [19]
	3	**0.520** (0.685) [110]	**0.344** (0.543) [122]	**0.208** (0.542) [137]	**0.001** (0.584) [111]	**-0.043** (0.602) [65]
	4	**0.960** (0.817) [34]	**0.734** (0.841) [46]	**0.426** (0.629) [94]	**0.280** (0.708) [148]	**0.069** (0.542) [154]
	5 (Lost relative to the efficient allocation)	**0.717** (0.624) [10]	**0.667** (0.677) [17]	**0.771** (1.010) [35]	**0.390** (0.838) [93]	**0.173** (0.696) [207]
		0.250 (0.671) [432]	**0.174** (0.607) [465]	**0.148** (0.632) [493]	**0.091** (0.716) [479]	**0.062** (0.649) [492]

Note: standard deviation in (.); number of sampled households in [.]

Table 3: Regressions for change in land on initial efficiency and welfare measures

	Northern Uplands		Red River		North Coast		Central Coast		Mekong Delta		Full Sample	
Efficiency loss	0.708	0.703	0.621	0.626	0.477	0.502	0.524	0.524	0.394	0.385	0.541	0.543
	(11.93)	(14.30)	(10.61)	(10.74)	(5.94)	(6.46)	(11.75)	(11.63)	(4.80)	(5.03)	(15.68)	(16.19)
Initial	-0.763	-0.757	-0.696	-0.694	-0.501	-0.486	-0.856	-0.851	-0.150	-0.163	-0.635	-0.638
consumption	(-6.50)	(-6.91)	(-9.43)	(-9.37)	(-4.29)	(-4.22)	(-11.21)	(-11.06)	(-1.80)	(-2.01)	(-11.66)	(-11.64)
Interaction effect	-	-0.225	-	-0.051	-	-0.215	-	0.012	-	-0.191	-	-0.071
		(-2.27)		(-1.12)		(-3.35)		(0.28)		(-2.98)		(-1.55)
Constant term	0.390	0.414	0.048	0.055	0.047	0.079	0.346	0.343	0.049	0.067	0.173	0.185
	(4.17)	(4.54)	(1.60)	(1.65)	(0.75)	(1.26)	(6.74)	(5.87)	(0.89)	(1.21)	(6.01)	(6.17)
R^2	0.316	0.324	0.296	0.296	0.181	0.195	0.411	0.411	0.139	0.150	0.262	0.264
RMSE	0.616	0.613	0.431	0.432	0.524	0.521	0.450	0.451	0.701	0.698	0.566	0.565
F stat	100.49	79.51	57.61	39.31	19.98	17.94	85.53	56.20	12.14	16.63	124.83	92.97
Prob>F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
No. observations	432	432	790	790	459	459	269	269	308	308	2361	2361

Table 4: Determinants of changes in allocated annual agricultural land

	Northern Uplands	Red River	North Coast	Central Coast	Mekong Delta	Full sample
Proportional	0.735	0.555	0.616	0.546	0.368	0.542
efficiency loss	(14.15)	(10.96)	(7.89)	(17.47)	(4.43)	(14.95)
Log per capita	-0.645	-0.537	-0.684	-0.753	-0.334	-0.555
consumption	(7.32)	(7.71)	(8.19)	(11.39)	(3.29)	(12.13)
Religion	0.115	-0.014	-0.009	-0.009	0.165	0.013
	(1.39)	(0.29)	(0.09)	(0.11)	(2.99)	(0.34)
Ethnic	0.205	-0.084	0.163	0.776	-0.367	0.055
	(1.91)	(1.26)	(1.67)	(13.00)	(2.23)	(0.57)
Local born	0.115	0.027	0.148	0.152	-0.011	0.066
	(1.45)	(0.40)	(1.25)	(1.99)	(0.09)	(1.49)
Age of head	0.017	-0.027	-0.025	-0.009	-0.010	-0.018
	(1.28)	(2.02)	(1.83)	(0.47)	(0.47)	(2.74)
Age² of head x 10^3	-0.259	0.232	0.174	0.067	0.061	0.134
	(1.74)	(1.60)	(1.27)	(0.32)	(0.28)	(1.92)
Log household size	-0.236	-0.098	-0.103	-0.175	-0.330	-0.162
	(2.12)	(1.17)	(1.23)	(1.24)	(2.13)	(3.24)
Dependency ratio	-0.300	-0.002	-0.119	-0.096	-0.066	-0.036
	(1.25)	(0.02)	(0.99)	(0.60)	(0.31)	(0.50)
Gender of head	0.047	0.036	0.026	-0.008	0.082	0.044
	(1.30)	(0.81)	(0.53)	(0.10)	(0.78)	(1.58)
Disabled adult	0.018	-0.179	0.055	-0.222	--	-0.179
	(0.08)	(0.95)	(0.28)	(1.23)		(1.77)
Government job	-0.092	-0.044	-0.060	-0.078	0.107	-0.055
	(0.75)	(0.60)	(0.69)	(0.38)	(0.73)	(1.01)
SOE job	-0.480	0.052	-0.095	-0.156	0.274	0.007
	(8.74)	(0.31)	(0.62)	(1.21)	(1.15)	(0.06)
Education of head	-0.015	-0.005	-0.006	-0.007	0.024	-0.004
	(1.34)	(0.94)	(1.01)	(0.81)	(1.12)	(0.82)
Education of other	0.00005	-0.003	-0.002	-0.0002	0.011	0.001
Adults	(0.01)	(0.87)	(0.54)	(0.03)	(1.67)	(0.29)
Social subsidy	0.157	-0.143	0.185	-0.064	-0.123	-0.012
recipient	(2.07)	(2.09)	(2.21)	(0.46)	(0.55)	(0.27)
private irrigated x 10^3	0.012	0.212	0.256	0.010	0.041	0.053
	(0.16)	(1.40)	(2.12)	(0.12)	(2.08)	(2.33)
Private non-irrigated	0.029	0.079	0.134	0.031	0.085	0.028
x 10^3	(0.30)	(2.85)	(1.59)	(0.56)	(5.60)	(1.20)
Private perennial x 10^3	-0.020	0.041	-0.104	0.121	0.040	0.026
	(0.40)	(0.41)	(1.01)	(1.58)	(1.62)	(1.85)
Private water x 10^3	0.335	-0.004	0.028	--	0.054	0.068
	(2.85)	(0.08)	(0.24)		(5.09)	(5.03)
Cultivates swidden	-0.137	0.216	0.141	0.056	0.215	0.057
land	(1.95)	(4.26)	(1.05)	(0.53)	(2.72)	(0.84)
Share of good	-0.237	-0.0005	-0.048	-0.177	0.277	-0.063
irrigated land	(2.60)	(0.01)	(0.64)	(2.61)	(1.68)	(1.31)
Share of good non-	-0.081	-0.043	0.033	-0.075	0.003	-0.011
irrigated land	(0.99)	(0.80)	(0.48)	(1.23)	(0.03)	(0.35)
Adult member died	-0.008	0.052	-0.022	-0.018	0.188	0.004
1993-98	(0.04)	(0.52)	(0.10)	(0.15)	(1.05)	(0.05)
Elderly member died	-0.046	-0.080	0.042	-0.196	-0.139	-0.027
1993-98	(0.20)	(0.76)	(0.19)	(1.65)	(0.70)	(0.31)

change in the number of disabled 1993-98	0.293 (2.64)	0.125 (1.04)	0.121 (1.72)	0.013 (0.16)	0.064 (0.29)	0.092 (1.45)
Change in no. of able bodied members 93-98	0.103 (4.69)	0.113 (6.76)	0.098 (4.21)	0.036 (1.00)	0.058 (1.81)	0.084 (7.43)
New member 8-99	0.162	0.219	0.203	0.091	0.220	0.170
1993-98	(3.17)	(5.32)	(3.21)	(1.54)	(3.89)	(6.77)
Constant	-4.352 (7.20)	-2.821 (4.22)	-3.856 (5.60)	-4.404 (6.04)	-2.632 (3.24)	-3.808 (9.43)
R^2	0.648	0.497	0.534	0.616	0.415	0.510
RMSE	0.464	0.378	0.415	0.391	0.627	0.474
F stat	118.77	7058.09	47.14	6.96	118.71	568.78
Prob>F	0.0000	0.0000	0.0000	0.0018	0.0000	0.0000
No. observations	432	790	459	269	308	2361

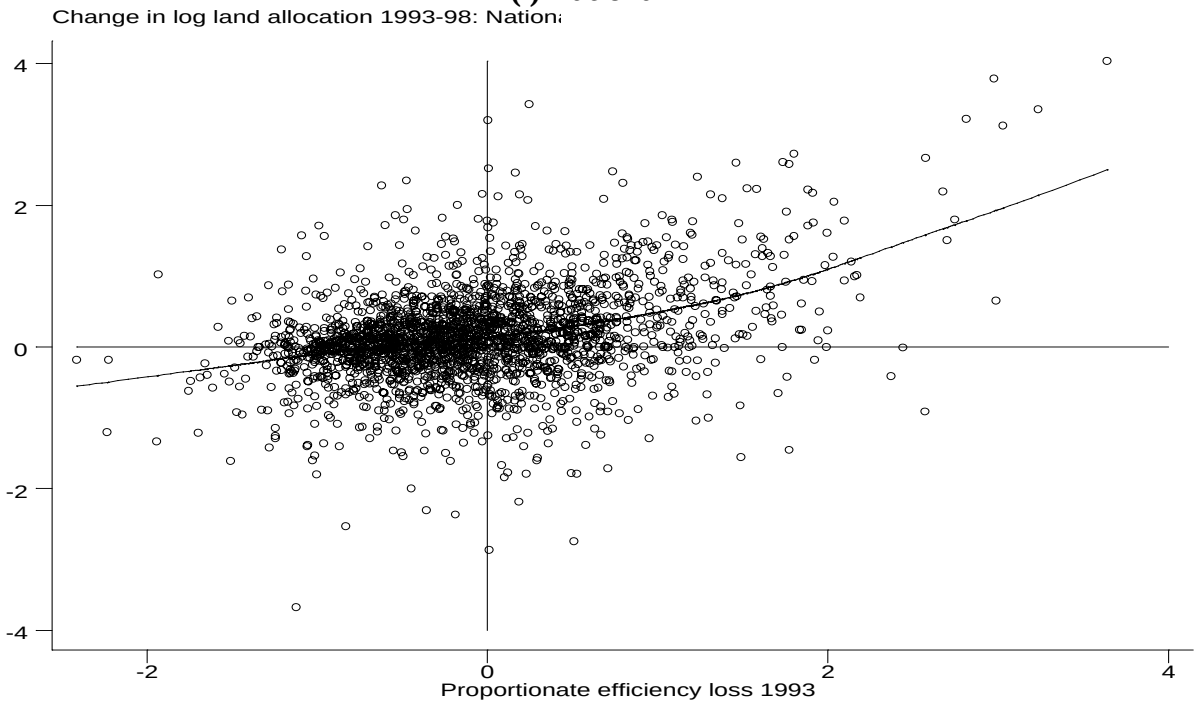
Note: The dependent variable is the log change in annual agricultural allocated land between 1993 and 1998. Commune fixed effects included. T-ratios in parentheses are based on standard errors corrected for heteroskedasticity and clustering. Unless otherwise noted, all variables are initial 1993 values.

Table 5: Disposal of allocated land (% of households having no allocated annual agricultural land in 1997/98)

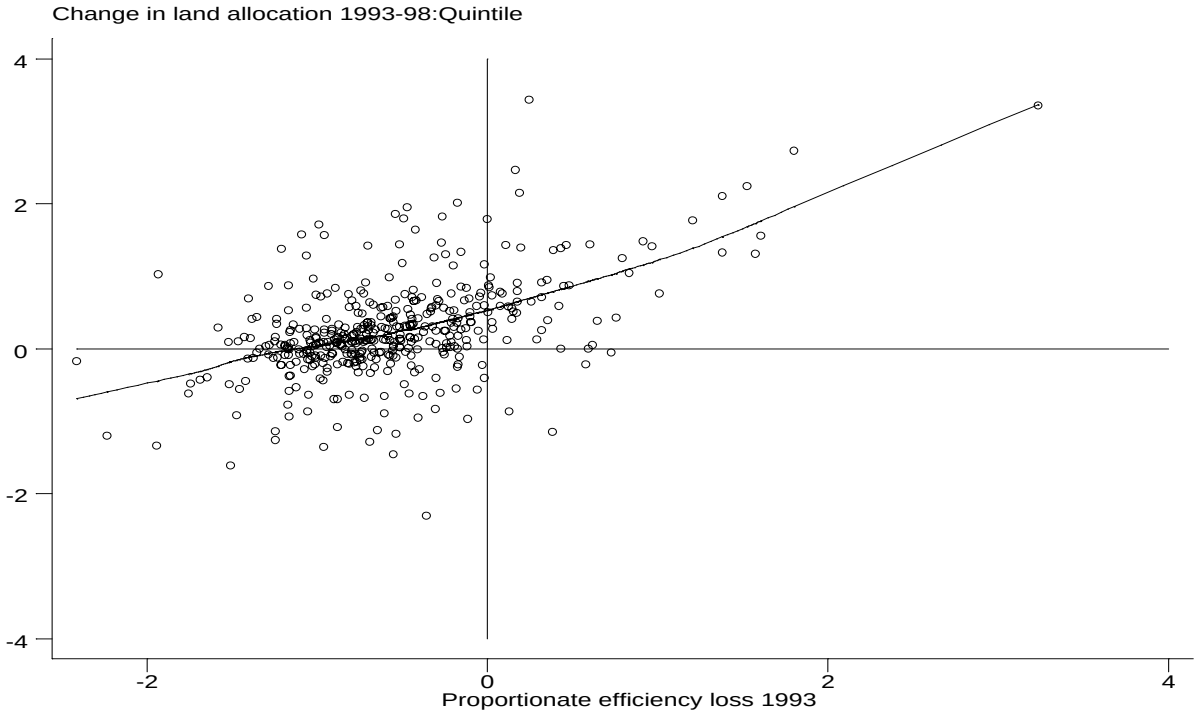
		% land-less	Households ranked by consumption per person in 1992/93		
			Poorest 40%	Middle 40%	Richest 20%
Household ranked by estimates of loss ($L_i^* - L_i^A$) from administrative allocation of land 1992/93	1 (Gained relative to the efficient allocation)	4.6 [477]	3.3 [577]	2.7 [619]	9.6 [145]
	2	2.6 [537]			
	3	5.9 [579]	7.9 [252]		
	4	10.7 [533]	14.9 [94]	8.3 [264]	12.0 [175]
	5 (Lost relative to the efficient allocation)	16.4 [433]	30.8 [39]	15.8 [152]	14.5 [242]
% landless in 1998/99		7.7 [2559]	6.8 [962]	6.1 [1035]	12.5 [562]

Figure 1: Proportionate land allocation changes between 1993-98 relative to the 1993 proportionate efficiency loss

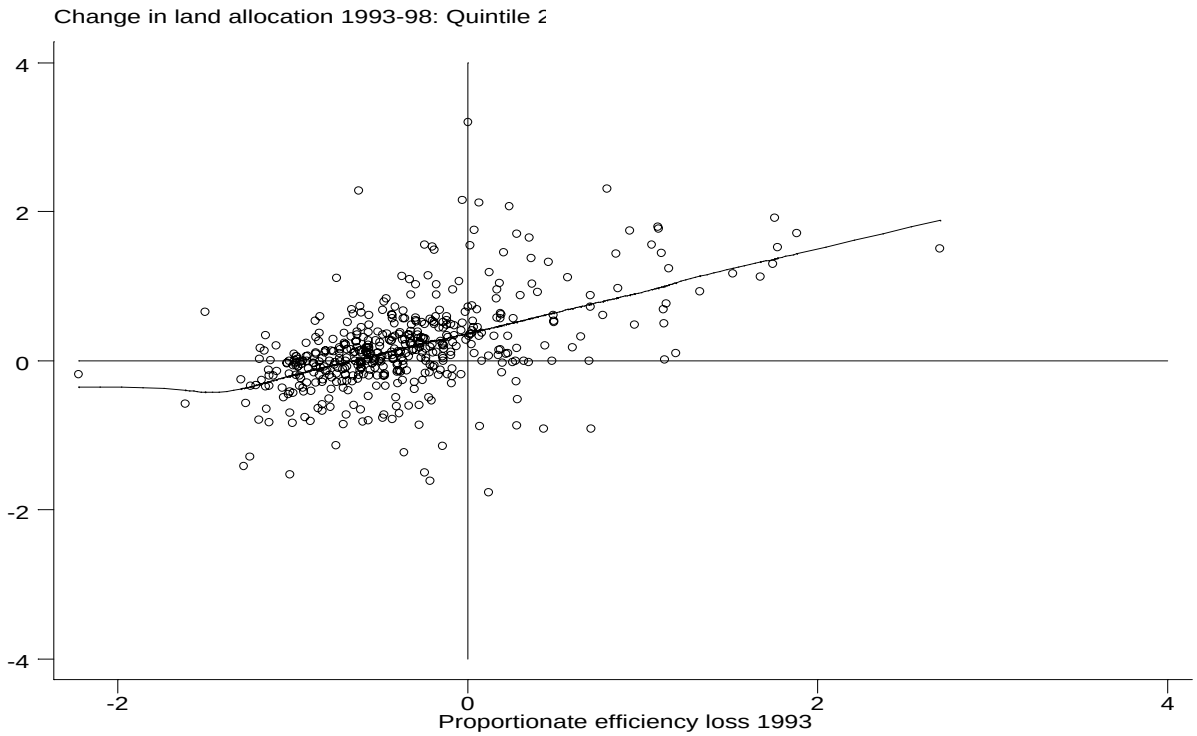
(i) National



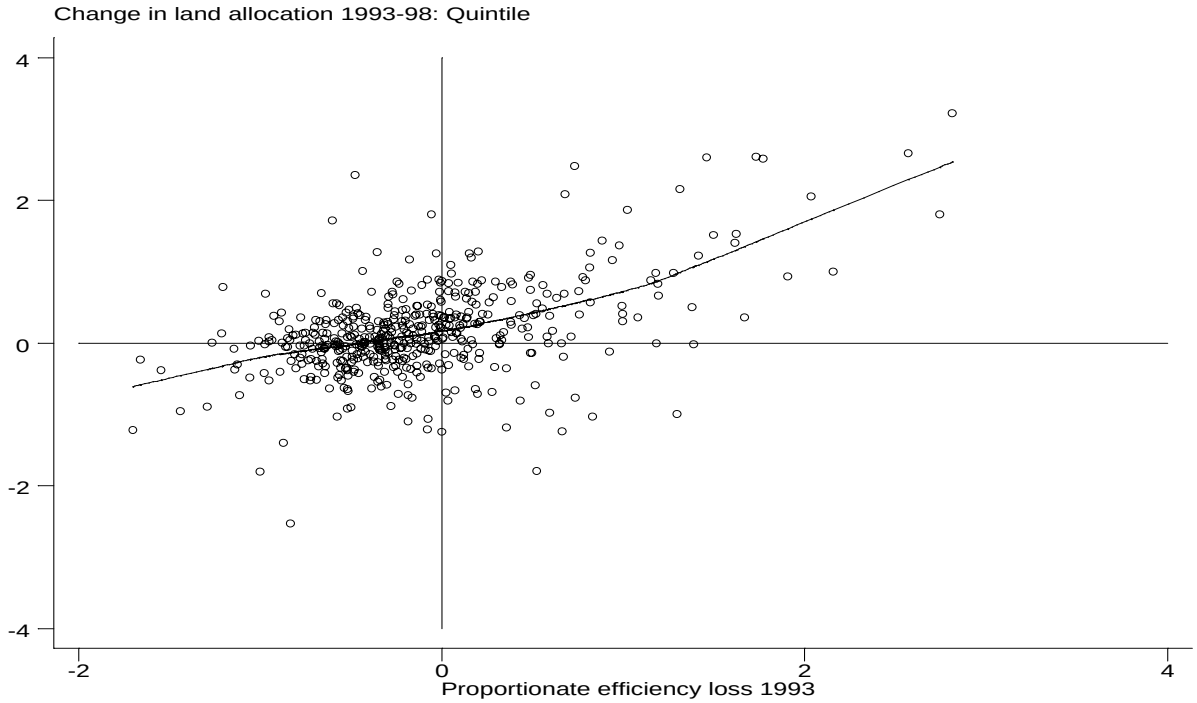
(ii) Quintile 1



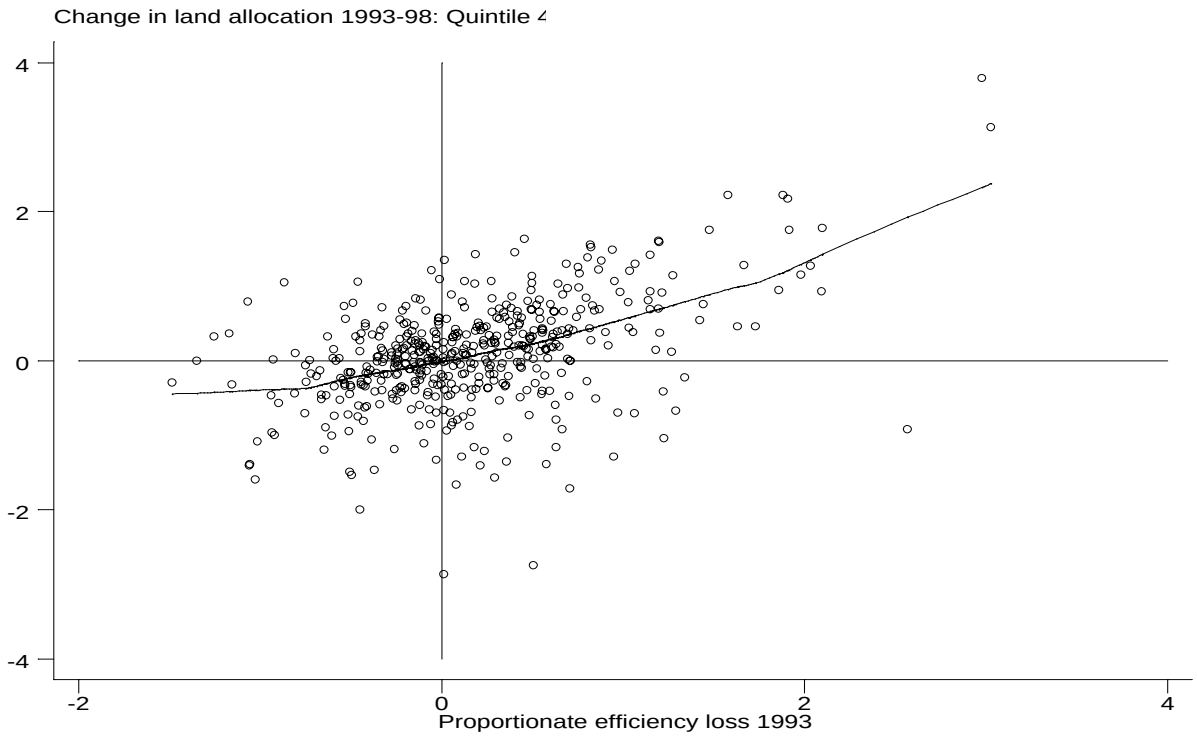
(iii) Quintile 2



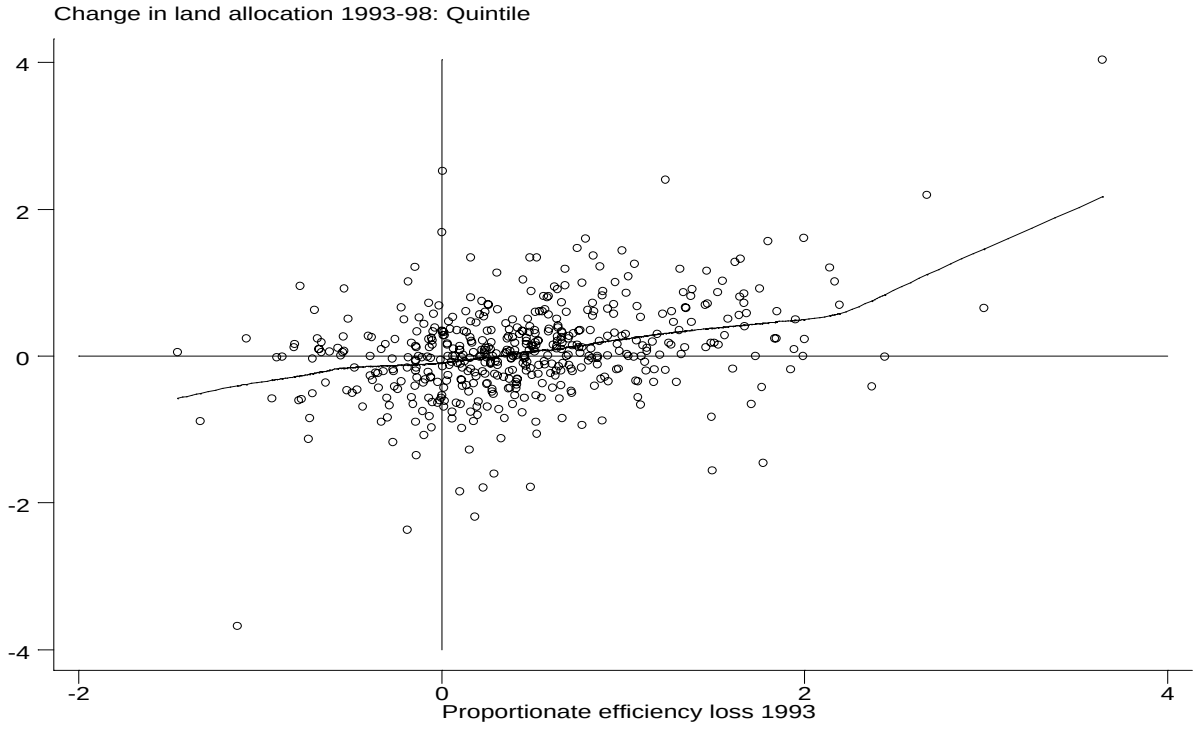
(iv) Quintile 3



(v) Quintile 4



(vi) Quintile 5



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