# LAND ALLOCATION IN VIETNAM'S AGRARIAN TRANSITION
# PART 1: BREAKING UP THE COLLECTIVE FARMS

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# Land Allocation in Vietnam's Agrarian Transition: Part 1: Breaking up the Collective Farms

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**Abstract:** The de-collectivization of Vietnamese agriculture was a crucial step in the country's transition to a market economy. The assignment of land-use rights had to be decentralized, and local cadres ostensibly had the power to capture this process. We assess the realized land allocation against explicit counter-factuals, including the allocation implied by a competitive market-based privatization. Depending on the region, we find that 95-99% of maximum aggregate consumption was realized by a land allocation that generated lower inequality overall, with the poorest absolutely better off. We attribute this outcome to initial conditions at the time of reform and actions by the center to curtail the power of local elites.

Key words: Decentralization, land reform, privatization, equity-efficiency trade-off, Vietnam

JEL codes: D60, P21, Q15

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## 1. Introduction

In what was surely one of the most radical land reforms in modern times, Vietnam switched over a period of just a few years, staring in the late 1980s, from the socialist mode of agricultural production — whereby all rural workers were organized into "brigades" that jointly farmed the commune's land — to a system in which individual farm-households had the responsibility for production. Virtually the entire agricultural land area was scheduled for effective privatization over a relatively short period. Given the importance of access to land to the livelihoods of poor people in Vietnam, one would expect de-collectivization to be hugely important to living standards and their distribution. Yet we know very little about the welfare-distributional outcomes.[2] Could higher efficiency gains have been achieved with some other allocation? What would the implications have been for equity?

The central government had little choice but to decentralize de-collectivization. The new Land Law of 1988 and its key implementation directive, "Resolution 10," assigned responsibility to the commune level. The center could not control the local authorities, which were (naturally) much better informed about local conditions. So the center faced an accountability problem in this decentralized reform. Malarney (1997, p.900) describes the problem faced by the reformers:

> "..given the institutional dominance of the Communist Party, local politicians with party backgrounds, which is to say all, are compelled by the party to be impartial and committed to official policies; yet, as politicians drawn from local kin and community, they are also pressured to nurture interpersonal relations, selectively avoid official dictates, and use their positions to bring advantages to kin and/or co-residents."

This echoes concerns in recent literature and policy discussion about decentralized development programs (Bardhan and Mookherjee, 2000; Galasso and Ravallion, 2003). In developing country

[2] China had undertaken a similar reform in the late 1970s. Fan (1991) and Lin (1992) have argued that China's de-collectivization enhanced agricultural productivity. However, like Vietnam, the literature for China has not assessed the welfare distributional outcomes of the assignment of land-use rights at de-collectivization.

settings, the center often faces high costs of acquiring the information needed to control outcomes locally, and local agents may well have little sympathy with the center's aims.

This paper offers an assessment of the welfare distributional outcomes of the assignment of land-use rights achieved by Vietnam's de-collectivization. We model the actual allocation of land at de-collectivization using a quite general theoretical model, capable of encompassing a potentially wide range of objectives for local administrators, ranging from benevolent egalitarianism to a corrupt self-interest. We then use a micro model of farm-household consumption conditional on the land allocation to simulate the impacts of alternative counter-factual allocations, holding other factors constant such as agricultural terms of trade and the joint distribution of non-land endowments such as human capital.

We use two counter-factuals. One is an equal allocation of (quality-adjusted) land; this is of obvious interest as an "equity" benchmark for assessing the actual allocation. The other counter-factual is the allocation that would have maximized the commune's aggregate consumption, as would have been achieved by a competitive market-based privatization under ideal conditions. This is an obvious efficiency benchmark. We do not claim that a competitive market was a feasible option at the time in Vietnam. Agricultural land markets were virtually non-existent. And other markets (notably for credit) and institutions (for property rights enforcement) were probably not functioning well enough to assure an efficient market-based privatization of land. However, a reasonably close approximation to the market allocation might still have been in reach by non-market means. Very little mobility had been allowed. So people may well have been well enough informed within each village to know if one family attached an appreciably higher value to extra land than another, even though a market did not exist. The competitive market allocation is then an interesting benchmark. Comparing this with the actual

allocation allows us to estimate the implicit value that was placed on efficiency versus distributional goals in the allocation of land. We can also characterize the specific distributional outcomes of the realized land allocation; possibly efficiency was sacrificed, but the poor would have been better off if it had not been.

The following section describes the de-collectivization. Section 3 outlines our approach, while section 4 describes its empirical implementation. Section 5 discusses our data. Section 6 presents the regressions and section 7 discusses their welfare implications. Section 8 concludes.

## 2. Allocating the collective's land

Vietnam's 1988 Land Law and Resolution 10 abandoned collective farming and granted households long-term use rights over land and greater freedom over production choices.[3] Land remained the property of the State, reverting back to the authorities when a household moved or stopped farming.[4] The de-collectivization was virtually complete by 1990 (Ngo 1993).

The new Land Law made recommendations on how the land was to be allocated. The commune authorities were instructed to take account of the household's labor force, as well as its historical claims to land prior to collectivization. Certain limits were stipulated on how much land could go to any one household.[5] The new land law also entreats the cooperatives to provide

[3] Use rights for crop land were granted for 10 to 15 years; longer periods applied to tree crops. Some flexibility was allowed in that 10-15% of the cooperative's land could be kept aside for new households and demobilized soldiers, and available for hire by households in the meantime (Tran 1997).

[4] Although Resolution 10 affirms the right to transfer land use and legate it to one's offspring, such rights were not fully guaranteed legally (Bloch and Oesterberg 1989). It did not recognize the right to exchange, lease, or mortgage land. These rights were only extended in the 1993 Land Law. Land policies have evolved since, but it is the impact of the 1988 Land Laws that is our main interest in this paper.

[5] Article 27 of the 1988 Land Law stipulates that the land allocation to each household should not exceed ten percent of the total farm land area of each concerned village. It further decrees regional per capita land ceilings for those contracting land for long term use from state operated farms. It has been claimed that ceilings were officially set at two hectares in the fertile but densely populated Red River Delta and three hectares in the South (ANZDEC 2000), though we find no mention of this in Resolution 10 or the 1988 Land Law.

appropriate jobs and good arable land to the families of war heroes and martyrs, to those who significantly contributed to the revolution, to the injured and unable-bodied and to others facing considerable difficulties. But it then dilutes this request by adding that the well-being of these groups is really the responsibility of the local Peoples' Committees and that the Ministry of Labor, War Invalids and Social Affairs and the Ministry of Finance will devise policies on social assistance to them (Vietnam Communist Party 1988).

While the new land law extended some guidelines, it left local cadres with considerable power over land allocation and the conditions of contracts. The center's directives were disseminated by Provincial Peoples' Committees, who in turn relied on the local authorities, allowing them wide berth in adapting the guidelines to local conditions, priorities and customs. One can expect foot dragging on their part, and the pursuance of quite different objectives in implementing the central directives. Those who were making the decisions locally were often the same cadres who had positions of relative privilege as the managers of the cooperatives, and relatively high living standards under the collective mode of agricultural production (Selden, 1993; Sikor and Truong, 2000). The reform threatened to undermine their power and privilege.

So there was a real risk that the benefits of reform would be captured by self-interested local cadres, potentially undermining the center's aims. There is anecdotal evidence of abuse of local power, against the center's interests. Gabriel Kolko (1997, p. 92) argues that:

> "From its inception, the land redistribution was marred by conflict, ambiguity and corruption. Cadres in many villages immediately began to distribute the best land to their families and relatives, and abuse was rife."

There were numerous public disputes at the time, stemming from (amongst other things) conflicting historical claims over land, disputes over village and commune boundaries and complaints about corrupt party cadres (Nguyen 1992; Pingali and Xuan 1992; Kolko 1997). It has also been argued that those with the weakest prior claims on plots did poorly in the land

allocation. For example, Ngo (1993) argues that war veterans and demobilized soldiers were short-changed in the land allocations and were over-represented as protagonists in disputes.

It is unimaginable that such an enormous land reform was free from corruption. However, the interpretation of the existing qualitative evidence on this issue is unclear. Cases of extreme abuse of power by local elites were visible when they boiled up in local protests—Vietnam's "hot spots" (Kolko 1997, cites many examples). However, the fact that local protests were possible can also be interpreted as evidence that there were constraints on local abuse of power.

The possibility for bias in the historical-qualitative account cannot be ignored; the cases of abuse may well have been uncommon but far more visible. Objective village-level assessments were rare. In the only village study we know of to address this issue, Tanaka (2001) describes the elaborate efforts of the "land allocation committee" in a North Vietnamese village to equalize land allocation. Such efforts are unlikely to have attracted much publicity at the time. While one would not want to generalize from one village study, it is no less hazardous to infer from the available evidence that capture by local elites was the norm.

There were some constraints on the power of the cadres, in part due to actions by the center. Formally, Article 54 of the Land Law threatens punishment for officials found to have abused their power in the allocation process. Enforcement is, of course, another matter. However, there were other instruments. Peasant resistance to the collective system was common in the 1980s, and has been identified as a factor motivating the center's de-collectivization reforms (Beresford 1985, 1993; Selden, 1993; Kerkvliet 1995). With the center's support, the Vietnam Peasant Union (VPU) was created in 1988 with the explicit aim of giving peasants a stronger voice in reform policies and—implicitly at least—promoting the center's reforms locally. As with past peasant unions, it seems that the VPU was eventually captured by local

elites; Wurfel (1993, p.32) argues that by 1990 the VPU had been "tamed by local party cadre, who had interests to protect." But for a critical period the VPU appears to have acted as a counter-weight to the cadres (Wurfel, 1993). During the reform period, the center also gave greater freedom to the press. The press subsequently carried much criticism of the bureaucracy, again helping the reform process (Wurfel 1993).

The reform movement was clearly driven by more than the center's concerns about the welfare of peasants. The same inefficiencies of the collective farming system constrained the resources available to the center for its industrialization plans, and created food shortages in urban areas (Beresford 1993; Kerkvliet 1995). Arguably then, the reforms were only possible through an implicit coalition between the peasants and reformers at the center—a coalition that clearly aimed to constrain the power of local cadres to capture the process.

History provided reference points in deciding how the land should be allocated. Collectivization came soon after the completion of land reform programs that had gone a long way toward redressing the high inequality of land ownership under French Colonial rule (Beresford 1985; Pingali and Xuan 1992). The pre-collectivization allocation may have influenced land allocation at de-collectivization. There are reports that some households simply went back to farming the land they had originally handed over to the cooperative or collective, or land they had some historical claim to.[6] While there was no legal commitment to restore the pre-collectivization land allocation, that was an option for the local authorities.

The 1988 Land Law did not allow voluntary re-contracting of land-use rights after the de-collectivization. Informal exchanges were no doubt going on. However, it is a reasonable

[6] Smith and Binh (1994) quote a number of Son La households in the North as professing, in 1994, to be farming the same land they had at the time of the departure of the French. Tran (1997) claims that land was redistributed according to household original contributions to the cooperatives in some areas.

assumption that most parties would then have been aware that the allocation made in 1988 was likely to be "sticky" in the sense of being unresponsive to changing needs.[7] Land had to be allocated in anticipation of the various uncertainties facing households in this setting.

There were important differences between the North and the South at the time of the reform. In the South's Mekong Delta, farmers had resisted collectivization, and by the time Resolution 10 was introduced less than 10 percent of all the region's farmers had been organized into collectives. In contrast, virtually all of the crop land in the North and in the South's Central Coastal provinces—where joining the collectives was seen as a means of rebuilding after the war—was collectivized by the time of the reform (Pingali and Xuan 1992; Ngo 1993). Southern Vietnamese farm households who participated did so for a much shorter period, while many never participated in the collectives, notably in the Mekong Delta. However, the land allocation in the South was still administratively determined and periodically re-allocated (Pingali and Xuan 1992); the difference with the more collectivized North is that in the South (especially the Mekong Delta) farmers continued to farm individually rather than collectively. Prior to reunification, agricultural land in the South had also undergone a series of land reforms.[8] Resolution 10 allowed farmers in the South to recover land owned prior to 1975, though former "landlords" were explicitly barred from doing so (Pingali and Xuan 1992). There are reports that in the Mekong Delta the implementation of Resolution 10 often entailed restoring the land allocation that prevailed prior to reunification (Hayami, 1993; ANZDEC, 2000).

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[7] In 1993 a new law was passed 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 could be legally transferred and exchanged, mortgaged and inherited. (However, even then local authorities retained considerable power over land allocation, notably through their ability to veto transactions; see, for example, Smith, 1997, and Sikor and Truong, 2000.)

[8] The South's land reform programs prior to reunification had initially consisted of lease price control and ownership ceilings, but were followed in 1970 by substantial land redistribution and titling under a "land-to-the tiller" program (Callison 1983; Pingali and Xuan 1992).

## 3. Theoretical model of the actual and counter-factual land allocations

Motivated by the above observations we shall test whether the local implementation of decollectivization served distributional goals—possibly reflecting capture by local elites—at some loss to aggregate consumption. We construct a model that allows us to estimate that loss, and to compare the observed allocation against explicit counter-factuals. One of those will be an equal allocation of land per capita. This is easily calculated. The other is the allocation that maximizes aggregate consumption of the commune; this requires a model of consumption.

The allocation of land at de-collectivization had to be determined in advance of the realization of the uncertainties facing households in this setting, such as health shocks or agro-climatic conditions affecting farm yields. Furthermore, the allocation could not be re-negotiated once the state of nature was revealed. We assume that there is a fixed and known *ex ante* probability distribution $p = (p_1,.., p_m)$ for the *m* possible states of nature.

The actual decision-making process might be anything from administrative fiat (according to the cadre's personal preferences) to a complex bargaining game. We only assume that the outcome (however it is reached) is *ex ante* Pareto optimal, in that no commune member's expected utility can be increased without someone else being worse off. To characterize all possible solutions, we represent the problem as maximizing a weighted sum of welfare levels across all farm-households. The Pareto weight attached to the expected utility of household *i* is $w_i = w(X_i)$ where $X$ is a vector of exogenous household characteristics. Naturally, different weighting functions imply different distributions of land and utility. If the weights tend to be negatively (positively) correlated with household welfare then one can say that the outcome will tend to be "pro-poor" ("pro-rich").

The utility of the *i*'th farm-household in state *j* is assumed to depend solely on its

consumption of a composite commodity. The household receives $L_i$ of land under the administrative allocation, which yields an output of $F_j(L_i, X_i)$ in state $j$ (=1,…,$m$). (For now we treat land as homogeneous; in the empirical work we allow for observable heterogeneity, and we consider the consequences of latent heterogeneity in the next section.) The household also has (positive or negative) non-farm income, $Y_j(X_i)$. At the time of the reform (and since), agricultural labor markets were virtually non-existent in Vietnam, so to simplify the exposition we close off this market in our model. We also ignore saving/dissaving and borrowing/lending; incorporating these features would complicate the model in unimportant ways for our purposes. The household's consumption is then its income:

$$C_{ij} = C_j(L_i, X_i) = F_j(L_i, X_i) + Y_j(X_i) \tag{1}$$

We assume that the functions $F_j$ ($j$=1,.., $m$) are increasing and strictly concave in $L_i$ for all states of nature. Utility is in turn an increasing concave function of consumption, $U_{ij} = U(C_{ij})$.

The commune selects an allocation of the total available land $n\bar{L}$ across $n$ households, with mean $\bar{L}$. The realized land allocation is:

$$(L_1,..,L_n) = \arg\max[\sum_{i=1}^{n} w(X_i)\sum_{j=1}^{m} p_j U[F_j(L_i, X_i) + Y_j(X_i)] \Big| \sum_{i=1}^{n} L_i = n\bar{L}] \tag{2}$$

which solves:

$$w(X_i)\sum_{j=1}^{m} p_j[U'(C_{ij})F_{jL}(L_i, X_i)] = \mu \quad (i = 1,..,n) \tag{3}$$

where $F_{jL}(L_i, X_i)$ is the marginal product of land in state $j$ and $\mu$ is the shadow price of land in the commune (the Lagrange multiplier on the aggregate land constraint in equation 2).

Compare this to the allocation that maximizes the commune's aggregate current (state-

specific) consumption:

$$(L^*_{1j},..,L^*_{nj}) = \arg\max[\sum_{i=1}^{n} C_j(L_i, X_i) \Big| \sum_{i=1}^{n} L_i = n\bar{L}] \tag{4}$$

We call this the "consumption-efficient allocation." This equates $F_{jL}(L^*_i, X_i)$ with the multiplier $\lambda_j$ on aggregate land in (4), giving

$$L^*_{ij} = L_j(X_i, \lambda_j) \ (i=1,..,n) \tag{5}$$

Mean consumption in state *j* is then:

$$\bar{C}^*_j = \sum_{i=1}^{n} C_j(L^*_{ij}, X_i)/n \tag{6}$$

The consumption loss from the actual allocation is then $\bar{C}^*_j - \bar{C}_j$ where $\bar{C}_j$ is the actual mean.

The consumption-efficient allocation is also the competitive equilibrium allowing costless re-contraction in each state of nature. In such a market-based land allocation, each household's consumption will be $F_j(L_{ij}, X_i) + Y_j(X_i) - \lambda_j L_i$ where $\lambda_j$ is the market price of land in state *j*. Demands then equate $F_{jL}(L_{ij}, X_i) = \lambda_j$ over all *i*, which is the allocation that maximizes aggregate consumption. Naturally the market solution will also vary with the joint distribution of the *X*'s as well as the state of nature.

Notice that if holding land gives utility independently of consumption then the market allocation of land will differ from the consumption-maximizing one. For example, if land provides insurance against risk then it will have value independently of current consumption. Then our interpretation of the consumption-maximizing allocation as the market solution also requires that risk markets worked perfectly. Since we have no basis for assigning a value to land independently of the current consumption it generates we cannot calculate a "conditional"

market solution (conditional on other market failures).

Nonetheless, the consumption-maximizing allocation remains a natural benchmark even without accepting the conditions required for interpreting it as the market solution. By comparing the actual allocation with that benchmark we will be able to quantify the equity-efficiency trade off facing administrative land allocation.

## 4. Empirical implementation

There was no nationally representative household survey prior to de-collectivization; when the communes controlled all production, household surveys made little sense for most purposes. Furthermore, even if there had been a survey prior to the reform, there was no household-level assignment of land-use rights under collectivized farming. So a conventional pre-intervention "baseline" is impossible in this setting.

We will use survey data on a random sample of farm households collected 2-3 years after the de-collectivization was completed. The survey data are taken to reveal household circumstances in one state of nature. We then assess the observed land allocation with the consumption efficient allocation for that state of nature, as well as the equal land allocation.

We make the following assumptions on functional forms:

Assumption 1: Utility is given by log consumption:

$$U(C_{ij}) = \ln C_j(L_i, X_i) \tag{7}$$

Assumption 2: Log consumption is given by:

$$\ln C_{ij} = \alpha_j + \beta_j \ln L_i + X_i \gamma_j + \varepsilon_{ij} \tag{8}$$

where $0 < \beta_j < 1$ and $\varepsilon_{ij}$ is a zero-mean i.i.d. error term uncorrelated with $\ln L_i$ and $X_i$.

Assumption 3: The welfare weights take the form:

$$\ln w_i = X_i b + \upsilon_i \tag{9}$$

where $\upsilon_i$ is a zero-mean error term uncorrelated with $X_i$.

Assumptions 1-3 imply that the land allocation satisfying equation (2) can be written in explicit form as the regression model:

$$\ln L_i = \ln(\sum_{j=1}^{m} p_j \beta_j / \mu) + X_i b + \upsilon_i \tag{10}$$

This identifies directly the parameters of the implicit welfare weights of the local land-allocation authority. Substituting (10) into (8) generates the reduced form equation for consumption:

$$\ln C_{ij} = \alpha_j + \beta_j \ln(\sum_{j=1}^{m} p_j \beta_j / \mu) + X_i(\beta_j b + \gamma_j) + \varepsilon_{ij} + \beta_j \upsilon_i \tag{11}$$

The consumption-maximizing allocation by contrast is given by:[9]

$$\ln L_{ij}^* = \frac{\alpha_j + \ln(\beta_j / \lambda_j)}{1 - \beta_j} + \frac{X_i \gamma_j}{1 - \beta_j} + \frac{\varepsilon_{ij}}{1 - \beta_j} \tag{12}$$

Comparing (10) and (12), it can be seen that if $\gamma_j /(1 - \beta_j) = b$ then the actual allocation responds to changes in $X$ the same way as the consumption-efficient allocation in state $j$. So if the two allocations are essentially the same then we should be able to accept the restriction that $b = \beta_j b + \gamma_j$ when imposed on the reduced form equations, (10) and (11). If we cannot accept this restriction then it is of interest to calculate the consumption-efficient land allocation, $(L_{1j}^*, L_{2j}^*, ..., L_{nj}^*)$, from which we can then measure the distribution of consumption losses implied by the actual allocation, using the fact that the proportionate consumption loss for

[9] Given (8), the consumption-efficient allocation to household $i$ solves $\ln L_{ij}^* = \ln(\beta_j / \lambda_j) + \ln C_{ij}^*$ where $\ln C_{ij}^* = \alpha_j + \beta_j \ln L_i^* + X_i \gamma_j + \varepsilon_{ij}$.

household $i$ is $(L_{ij}^{*} / L_i)^{\beta_j} - 1$.[10]

One possible concern about this empirical model is that we only identify effects of land allocation on current consumption. We do not look at impacts on farm output *per se*. Consumption is clearly the more appropriate welfare indicator for our purposes. Current income is likely to be far more heavily influenced by transient factors that would not presumably have much impact on the local allocation of longer-term land-use rights. However, by the same token one would probably prefer to measure consumption over a longer period than is possible with a single survey round. Given the data limitation, we must assume instead that current consumption reveals longer-term consumption up to some random error term.[11]

Another possible concern is that, while allocated land is endogenous in this model, it is taken to be exogenous to consumption (i.e., Cov($\upsilon, \varepsilon$)=0). This is a standard assumption in past empirical work for Vietnam and in other settings in which land allocation is done administratively rather than through markets.[12] The assumption can also be defended on the grounds that the land allocation preceded the survey-based consumption measure by 3-4 years.

However, the assumption that the land allocation is exogenous to consumption can still be questioned. Our estimates of the parameters of equation (8) will be biased if there are omitted variables that jointly influence the welfare weights and consumption levels. The most serious concern in this respect is heterogeneity in land quality. Higher land quality will probably result in higher consumption at given land quantity. Assuming that the quality differences are public knowledge within the commune, the administrative land allocation will take them into account,

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[10] The simplest procedure is to use the constraint on aggregate land availability to solve for the term $[\alpha_j + \ln(\beta_j / \lambda_j)]/(1-\beta_j)$ in (12) (rather than solving for the Lagrange Multiplier directly).

[11] More precisely, the error term in (8) is the log of the ratio of current consumption to consumption measured over a suitably long period.

[12] See for example Wiens (1998) and van de Walle (1998).

with more land being used to compensate for lower quality. We will include available controls for differences in the average quality of land holdings, though latent heterogeneity will still create a negative correlation between the error terms in the estimated consumption equation and the land allocation equation ($\mathrm{Cov}(\upsilon, \varepsilon)<0$).

Notice however that our test for systematic differences between the efficient and actual land allocations is robust to heterogeneity in land quality. Our test is based on the reduced form coefficients in (10) and (11); it does not require the (potentially biased) parameters of (8). On the other hand, our estimates of the parameters of the implicit equation for the efficient allocation (equation 12) do require the parameters of the structural model in (8). So bias due to latent heterogeneity in land quality will contaminate our estimates of the efficient allocation.

In principle this could be dealt with by introducing an instrumental variable that influences land allocation but not consumption conditional on land, i.e., at least one element of the parameter vector $b$ in (9) would have to be set to zero, while leaving the corresponding element of $\gamma$ unrestricted. However, there is no theoretical basis for such an exclusion restriction; anything that can be included from our data set could presumably have been observed or anticipated by the local authorities.

It should also be noted that, while there is likely to be heterogeneity in land quality across plots within communes, it was common to combine land from different plots when forming a package for each household mean (Lam, 2001). This means that the variance across households in the average quality of their allocations can be considerably less than the underlying inter-plot variance. For example, Tanaka (2001) finds that such plot fragmentation in North Vietnamese villages was used to produce land parcels of relatively even quality. Then heterogeneity in land quality would not be a problem for our analysis.

## 5. Data

Our data are from the Vietnam Living Standards Survey (VNLSS) of 1992/93. This is one of the national, multi-purpose, surveys sponsored by the World Bank under the Living Standards Measurement Study (LSMS).[13] The VNLSS follows established LSMS practices (World Bank 1995). Our sample is the 2810 rural farming households in the VNLSS with complete data. Some 400 households had to be dropped due to missing data on key variables. There are also 419 households in the rural farming sample without any allocated irrigated or non-irrigated agricultural land identified in the survey. Our reading of the literature and casual observations suggest that it is unlikely that there is genuine censoring, such that some farming households were deliberately left out of the land privatization because doing so would probably have created conspicuous destitution, which would not have been accepted. Under that assumption, we focus solely on the sample of farming households with complete data.

Table 1 gives summary statistics on the variables we will use from the data set, by region. Household consumption includes the value of consumption from own production, imputed expenditures on housing and the depreciated value of consumer durables. It is deflated by a monthly price index to allow for variation in the time of the household interviews and by a spatial price index to take account of regional price variation (World Bank, 1995).

Geographic heterogeneity across communes is to be expected, given likely differences in the shadow price of land ($\mu$ in equation 10) and differences in production functions (in that a different state of nature is revealed in different locations). While the sample size does not permit estimation of a separate model for each commune, all regressions included a complete set of commune dummy variables. And all parameters are allowed to vary regionally. Vietnam is

routinely divided into seven regions reflecting geographical and historical similarities. We conduct the analysis both nationally and separately for the Northern Uplands (NU), Red River (RR), North Coast (NC), Central Coast (CC) and Mekong Delta (MD) regions.[14]

Within annual crop-land, the survey identifies five land types: (i) Allocated land: This is the land allocated to households by the cooperative or productive group under Resolution 10; this accounts for the bulk of the North's crop land; (ii) Long-term use land: Predominant in the South, this differs from allocated land only in that the farmer owes no contracted output (in addition to obligatory taxes for all allocated land) to the cooperative or productive group that allocated the land; (iii) Auctioned land: This refers to a part of the cooperatives' land reserved for bidding by households, with a three to five year tenure depending on the region; (iv) Private land: This consists of land inherited and used by households as a garden area, as well as an area equal to 5% of the commune's agricultural land that has been handed to households for their private use; this land requires no payment; and (v) Sharecropped or rented land.

What we refer to here as "allocated land" is annual crop land, either irrigated or unirrigated, which is defined as either "allocated land" by the survey respondents or "long-term use land." This includes all allocated land, including any that is not actually cultivated by the household. There is also an allocation mechanism for perennial, forest and water surface land. However, since these other land types followed a much slower and haphazard allocation process, we limit our analysis here to allocated annual irrigated and non-irrigated cropland.

We aggregate irrigated and non-irrigated land using region-specific weights to obtain

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[13] The VNLSS is public access, subject to standard conditions. For further information on the LSMS see http://www.worldbank.org/lsms/.

[14] In the Central Highlands region, land is mostly perennial. In the South East there were too few observations in the sample; after excluding non-farming households and those with missing data we are left with a sample of only 99 observations in the South East.

irrigated land equivalents. To calculate the weights, we estimated region-specific regressions of farm profit on total irrigated and non-irrigated annual crop land, perennial, forest and other land amounts (including swidden, bald hill and newly cleared land), and commune effects.[15] Controls were also included for household characteristics (the head's religion, ethnicity, age and age squared and whether born locally; household size, the share of male adults in the household, the years of primary schooling of the head and of other adults and a dummy variable for whether the household is a social subsidy beneficiary). The ratio of the coefficients on non-irrigated to that on irrigated land was then used as the weight on non-irrigated land to calculate an allocated irrigated land equivalent for each household. The weights seemed plausible.[16]

The survey asked respondents to assign their total annual crop land into the categories "good," "medium" and "poor" quality. Unfortunately, the questionnaire design does not allow us to separately identify quality for allocated land versus other land types. So we cannot use these quality assessments in calculating our measure of allocated irrigated land equivalents. These quality assessments are problematic from other points of view. The categories are probably quite well defined within communes, but are unlikely to be comparable between communes. Nor can it be assumed that they would account fully for omitted heterogeneity in land quality in our main results. The exogeneity of these land quality variables is also questionable. Against these considerations, excluding these variables adds to the aforementioned concerns about omitted heterogeneity in land quality. So we chose to include each household's proportions of good

[15] We exclude water surface land from the farm profits regressions because we are unable to adequately calculate net profits from water surface land. The questionnaire does not allow a separation of expenses incurred in raising water products from that of raising livestock, and assumptions must also be made about consumption from own production.

[16] Our estimated weights for non-irrigated land are 0.739 for the national sample, 0.241 for the Northern Uplands, 0.407 for the Red River, 0.495 for the North Coast, 0.838 for the Central Coast and 0.906 for the Mekong Delta. On the measure of farm profit see van de Walle (1998).

irrigated and non-irrigated land in the consumption and land allocation regressions, as controls for quality.[17] We also tested robustness to dropping these variables.

We treat private land in a special way. As can be seen in Table 1, land classified this way is not negligible and falls under all usages. The category is clearly broader than residential or garden area. Private land has typically been with the household for a long time and the amounts were clearly known at de-collectivization. So it is reasonable to treat private land as exogenous. We treat all other land as endogenous, so that it does not appear in the model.

Our data were collected five years after the 1988 Land Law (though prior to the 1993 Land Law). In trying to explain the allocations we want to use variables that reflect the situation around 1988. We have no explicit information on the methods for allocating land use rights in the communes. As we have noted, Resolution 10 left this quite vague. Some observers mention that household size was taken into account (Ngo, 1993; Hayami, 1993), while in other cases it seems that an effort was made to take into account available labor.[18] Our demographic variables include household size and the dependency ratio. Household size is that reported in the 1992/93 survey minus all members younger than six years of age. The dependency ratio is one minus the ratio of labor age members (between 20 and 65 for men and 20 and 60 for women) to all household members minus those aged less than six years.

We include dummies for the gender of the head, whether he/she was born locally, whether he/she reports practicing the Christian or Buddhist religions (as opposed to no religion, animism or "other") and for whether the head of household belongs to an ethnic group other than

[17] Very few households reported that they had "bad quality" irrigated land or "good quality" non-irrigated land. So we aggregated the categories into two; by "good quality non-irrigated land" we mean "good" or "medium" quality.

[18] For example, Tran (1997) describes one local allocation rule as giving a full share to members of working age (defined as 16 to 60 for men and 16 to 55 for women), half a share to those above working age and in the 13 to 15 age range, and one third share to the youngest. Also see Hayami (1993).

the majority Kinh or the relatively well-off Chinese ethnic groups. We include a dummy variable for whether the household reports cultivating swidden land. This aims to capture a ethno-cultural particularity of those who practice shifting cultivation. Since at least the sixties, the government has pursued policies to sedentarize such groups by apportioning land to them (Bloch and Oesterberg 1989). Resolution 10 also states that practical measures should be adopted to promote permanent agriculture and settlement. One might therefore expect these households to get more allocated land as a result.

We also include a dummy variable for whether a household contains a handicapped adult of labor age.[19] The latter could influence the land allocation decision negatively, through effects on productivity. Against that, the Vietnamese government has had a number of policies bestowing preferential treatment to the disabled and those individuals and their families who suffered in the wars. A handicapped adult might thus be favored. However, this variable will not fully capture the possibility that soldiers and their families were treated differently to others as decreed by Resolution 10 (Vietnam Communist Party 1988) and alleged by Ngo (1993). We test for this by also adding a dummy variable for whether the household or one of its members is a recipient of social subsidy transfers from the government. These transfers are targeted to the disabled, war wounded and the families of war heroes and martyrs. Receipt of this transfer appears to be the best way to identify such households in our data. There are, however, possible concerns about the endogeneity of this variable (notably if the nonpoor select out of the program). So we did our analysis with and without this variable.

The survey did not identify members of the Communist Party. However, we do know if a

[19] We create this variable from those individuals 21-65 for men and 21-60 for women who said they did not work during the last 12 months, or look for work in the last 7 days, and gave being handicapped as the main reason.

household member worked for the cooperative, a social organization, a State Owned Enterprise (SOE) or the government for five years or more, either in their primary or secondary jobs. On *a priori* grounds it is unclear how these variables would influence land allocation. On the one hand, other sources of employment may entail a substitution effect, with the commune allocating less land to such households. On the other hand, it may well come with a "power effect," whereby households with such employment also have more power over local decisions (interpretable as an effect on the welfare weights in equation 2).

The collectives had also owned and controlled the farm capital stock (tools, machinery, draft animals) that also had to be allocated among farm households. It is sometimes claimed that this process more easily allowed cooperative officials to favor themselves, their families and friends than the more visible land allocation process. It is possible that the most egregious abuse and corruption occurred in the distribution of collectively owned farming implements and draft animals rather than that of land. If so, we would expect to find positive impacts on consumption through the returns to land for favored households. We will test this by including in the consumption equation an interaction effect between land and whether a household member worked for a cooperative at or prior to de-collectivization. This is an imperfect test as it allows only for favoritism through household member ties, but this is the best we can do with the data.

## 6. Regressions for consumption and allocated land

For the sample as a whole and each region, we can convincingly reject the null hypothesis (with probability less than 0.00005) that the observed land allocation responded the same way to household characteristics as the consumption-efficient allocation that one would have expected from a competitive market-based privatization, under our assumptions. The reduced form regressions for consumption and test statistics for the hypothesis that the two allocations are the

same can be found in the Appendix. So we proceeded to estimate the efficient allocation.

Table 2 gives the structural model of consumption (equation 8). The results are generally unsurprising. Household consumption is a rising function of household size, with an elasticity less than unity. In most regions consumption is higher for households with a government or SOE job. It is increased by higher household education. And consumption rises with the amount of allocated land in all regions.

Table 3 gives the reduced form equation for the actual land allocation (equation 10) and the estimated parameters of the implied equation for the consumption-efficient allocation (equation 12). There is diversity between regions in how much the two allocations differ, notably between the North (the Northern Uplands, the Red River and North Coast) and South (the Central Coast and Mekong Delta). For example, in the North, the actual allocation is more responsive to household size than the efficient allocation would have been. This reverses in the South. The dependency ratio significantly negatively affects the actual allocations in the North but not in the South (the CC and MD). The negative coefficient on the dependency ratio indicates that the administrative allocation in the North put higher weight on household members who were of prime working age than the consumption-efficient allocation would have required.

In the North (except the Uplands), being in a minority group significantly increases the administrative allocation, but decreases the efficient allocation (though only significantly so in the RR). In the other two regions there is less difference in how ethnicity affected the two allocations. The positive and significant effect of being a minority household in the northern regions probably captures the fact that the minorities were given more land as a result of having contributed more to the collectives originally, as allowed by Resolution 10.

Having a household member with a government job or in a SOE tended to reduce the

administrative allocation, though the effect is generally not significant. But these characteristics would have resulted in a higher efficient allocation — suggestive of greater access to credit and/or productive inputs by these households. Again there are some regional differences in these effects. For example, there is no significant effect of SOE on the efficient allocation in the South; the significant national effect stems from the NU and RR.

Administrative allocations responded positively to male household headship, and much more so than the efficient allocation. This offers support for the claim of Scott (1999) that female-headed households are generally not treated equally in local administrative allocation decisions. Generally, education of the household head had no significant effect on the actual allocation (the sole exception is in the CC, where higher education reduced the allocation.) The education of others in the household was also insignificant in the actual allocation. However, the consumption maximizing allocation would have favored households with higher education, presumably reflecting complementarities between education and land productivity. The MD is the one exception.

Receipt of a social subsidy is found to have reduced the actual land allocation nationally, though this effect was confined solely to the Mekong Delta. This provides some support for the claims that war veterans and their families were unequally treated in the land allocation process in the South. In contrast, we found this variable to be insignificant in the consumption equation for all regions (suggesting that the social transfer compensated fully for the income loss due to war disability). The efficient allocation would have ignored whether or not the household received social subsidies. All other results were robust to including this variable.

The practice of cultivating swidden land increased the administrative allocation in the RR and the MD, but not elsewhere. The positive effect in these regions can be interpreted as a

policy effort to discourage this form of land usage (on the assumption that lack of access to regular cropland encouraged swidden farming.) The efficient allocation in the MD would also have given weight to this characteristic, but considerably less so than the actual allocation.

As discussed in section 5, while we do not know from our data how farm capital was allocated, we can test for an interaction effect between allocated irrigated land equivalents and a dummy for whether a household member worked for a cooperative. On doing so, we found no sign of any effect on consumption in the national or individual regional samples. However, in testing the interaction with private land amounts, we find a significant positive effect of water surface land on consumption in the national sample and in the Red River and Northern Uplands. There was also a significant negative interaction effect with private perennial land in the North Coast, and a significant negative interaction effect with non-irrigated private land in the Central Coast, though at the same time there was a positive interaction with private irrigated land in that region. On balance, our results suggest that having a cooperative job provided no advantage in deriving benefits from a given land allocation, though there are signs of limited impact on the productivity of other land types, notably water surface land in some regions.

In the aggregate sample, the proportion of good quality land (irrigated or not) had no significant effect on either the actual or efficient allocation. This holds in all regions except NU and RR, where there is an indication that households with higher quality non-irrigated land tended to get lower total land allocations. Other coefficients in both equations were little affected by dropping these land quality variables (given possible endogeneity concerns).

## 7. Welfare comparisons

The first panel of Table 4 gives various summary statistics on welfare outcomes for the actual allocation, namely mean consumption and measures of inequality and poverty. The

inequality measure is the Theil index (E(0)), given by the difference between log mean consumption per capita and the mean of log consumption per capita. The poverty measures are the headcount index (% below the poverty line) and the squared poverty gap index (Foster et al., 1984) which penalizes inequality among the poor. The poverty line is from Glewwe et al. (2000) and aims to measure the cost of a set of basic food and non-food consumption needs. The poverty line was developed on the same survey and agreed to by the government. The second panel in Table 4 gives results for the simulated consumption-efficient allocation at the survey date, for which we give mean consumption and inequality. The third panel is for an equal allocation, in which the irrigated land equivalent is equalized on a per capita basis across all households within the commune.

Recall that the socialist mode of agricultural production had been in place for a shorter time in the South and that the Mekong Delta, in particular, had been far less collectivized than the North and the Central Coast (though still subject to other controls under socialist agriculture).[20] So the land allocation in the MD at the time of de-collectivization was undoubtedly more influenced by the pre-Communist allocation, as determined by historical land rights and prior land reforms (section 2). Thus it is notable that, relative to the consumption-efficient allocation, we find that the actual allocation in the MD entailed a greater loss of aggregate consumption, with a four percent consumption loss (Table 4). A seemingly plausible explanation is that the historical (pre-unification) land allocation had become less efficient over time but was nonetheless the more natural fall-back position in the MD. Ironically then, it can be argued that the fact that socialist agriculture had been more short-lived in the South meant that the region could not achieve the potential efficiency gains available to the North from land re-

[20] Recall that the Central Coast was probably a somewhat special case given that it had been a war zone and so collectivization was more easily adopted (Pingali and Xuan 1992; Ngo 1993).

allocation under de-collectivization. The history of Vietnam meant that the North was in a somewhat better position to achieve a relatively efficient land allocation.

Both the efficient and "equal-land" allocations would have resulted in a lower poverty rate than the actual allocation, though the differences are small (two percentage points overall). This is somewhat deceptive since we found that the poverty line turns out to be close to the intersection of the cumulative distribution functions. However, the poverty lines used here are higher (in real terms) than the poverty lines used in Vietnam at the time of the 1988 allocations (Dollar and Glewwe, 1998). So it can be argued that poverty incidence would have been higher under the efficient allocation when assessed by the local standards of poverty at the time.

These observations are reinforced by Figure 1, which plots percentage losses from the actual allocation (relative to the consumption-maximizing allocation) against actual consumption, and a non-parametric regression function (using Cleveland's, 1979, local regression method). It can be seen that the losses from the actual allocation tend to rise with consumption, both nationally and within each region. Nationally, mean consumption gains are about 15% for the poorest, with losses of about 20% for the richest (comparing end points on the regression function in Figure 1(a)). The mean proportionate gains are roughly linear in log consumption. The point where the mean gain is zero is fairly close to the poverty line (indicated by the vertical line). The gains to the poorest are also reflected in the squared poverty gap measures in Table 4, which are higher for the consumption-efficient allocation.

It is evident from Figure 1 that there are large differences between regions in the conditional variance of the proportionate losses. In particular, the relationship between welfare losses and consumption levels is less precise (though still positive) for the MD, where there are clearly other factors at play in determining the incidence of the losses relative to the

consumption-efficient allocation. Again, historical (pre-unification) allocations are likely to have had greater influence in this region.

An equal allocation of land (in terms of its irrigated equivalent) across all households would have achieved a close approximation to the levels of mean consumption and inequality observed in the data. There were of course deviations from equal land in practice, but the overall outcomes for the distribution of consumption were similar. However, under the equal-land allocation the poorest are generally better-off relative to the actual allocations as evidenced by lower squared poverty gap indices. It is notable again that the region where the equal allocation differed most from the actual is the Mekong Delta.

It might be conjectured that the market-based allocation would have achieved substantially higher average consumption if only land could have been redistributed between communes. To address this question, Table 5 repeats the simulations reported in Table 4 except that we ignore commune boundaries when making the calculations. Thus the calculation entails maximizing aggregate consumption over the entire region subject only to the aggregate amount of (irrigation-equivalent) land in the region. In practice this would of course require moving households between communes, which was rare in Vietnam. However, this simulation gives an idea of how much immobility constrains the problem.

Maximum attainable consumption would of course have been higher allowing households to be moved between communes, so that only aggregate land endowments at the regional level matter. The difference is not large however (comparing Tables 4 and 5). The actual allocation within communes, without redistribution between them, entailed losses in mean consumption between one and nine percent as compared to a consumption maximizing land allocation with redistribution allowed. Impacts on poverty are similar. The headcount index of poverty is lower

everywhere but the Red River region, while the very poorest households would have a worsening under the efficient allocation with mobility across communes. When we compare the outcomes under the actual allocation with those resulting from the equalization of land at the regional level, we find the losses in consumption to be slightly lower— ranging from one to eight percent. This scenario shows the largest impact on poverty. Both the rate and the severity of poverty would be lower under a region-wide equal-land allocation relative to the actual land allocation.

Again the Mekong Delta stands out as having high unrealized consumption gains from land re-allocation. If mobility were possible within the region, the actual land allocation entails a nine percent loss of aggregate consumption relative to the consumption maximizing allocation, and eight percent relative to an equal allocation; in both cases this is about twice the overall mean consumption loss (Table 5). Lack of mobility under Communism appears to have come at an unusually large cost in the MD. This is consistent with our casual observations that household plot sizes vary greatly within the region.

## 8. Conclusions

The heavy reliance on decentralized implementation of policy reforms in developing countries has raised concerns about capture by local elites whose interests are not well served by the center's aims. We have tried to see if such concerns are borne out by evidence on how land-use rights were allocated in practice under the massive reform to land laws introduced by Vietnam in 1988. This reform was arguably the most important step in the country's transition to a market-based agricultural economy after abandoning collective farming. Individual households had to be assigned the use rights for virtually the entire agricultural land area (about four million hectares) of a country in which three-quarters of the workforce depended directly on farming. We have used a model of household consumption to assess the distribution of

consumption impacts relative to counter-factual allocations, including the one that would have maximized aggregate consumption, which would have been the competitive market allocation under our assumptions.

Our results are not consistent with the picture that many commentators have painted of an inegalitarian land allocation stemming from the power of relatively well-off local cadres to capture the process. In terms of the impact on average consumption and consumption inequality, the observed allocation of land in our data was roughly equivalent to giving every household in the commune the same irrigated-land equivalent.

The observed allocation was significantly different to what one would have expected from an efficient allocation, as would be achieved by a competitive privatization at market-clearing prices. The consumption-efficient allocation would have put greater weight on education (which raised the marginal utility of land), and given less weight to household size, labor force, minority-groups and male heads of household. We find no evidence that land allocation unduly favored households with government or semi-government jobs; indeed, the market allocation would have given higher weight to these attributes, because such households would have put a higher value on land, possibly because of better access to other farm inputs.

This decentralized reform achieved a more equitable outcome than one would have expected from a consumption-efficient allocation, as would have been achieved by free markets under our assumptions. Our results are suggestive of an effort to protect the poorest and reduce overall inequality, at the expense of aggregate consumption. The solution that was arrived at entailed an equity-efficiency trade-off, indicating that both objectives were valued positively.

How then could the historical record of seemingly widespread abuse be so wrong? It is important to note that we do find some large individual deviations from the efficient allocation.

Looking again at Figure 1, while we see that losses tend to be centered close to zero, there are sizable losses for many, particularly at middle and upper expenditure levels, and corresponding gains for others. There is ample scope in Figure 1for Vietnam's "hot spots" of the 1990s. But our results suggest that it is flawed as a generalization of how land-use rights were assigned at the time of de-collectivization.

Combined with our reading of the history of Vietnam around this time, we can identify two main reasons for the favorable overall welfare outcomes implied by our results. The first factor was the formation of a pro-reform coalition between peasants and reformers in the center. The latter were fully aware of the risks of local capture that were intrinsic to a decentralized administrative allocation of land and other farm inputs at the time of decollectivization. This is not to deny the importance of the fact that the desire for reform was not just coming from the top, but reflected more deeply-rooted concerns about the inefficiency of collective agriculture among those who were losing most, namely the peasants. The reforms followed many years of peasant resistance. Nonetheless, the center was an active player. To help shift the balance of local power at the time of reform, the center (for a limited time) actively promoted peasant organizations and used the press to channel complaints and expose corruption.

The second reason is that initial conditions at the time of the reform appear to have been favorable to achieving an equitable assignment of land-use rights at modest cost to total consumption. Vietnam's low inequality in the initial distribution of education — stemming from social policies under communism — meant a smaller trade-off than would have been faced otherwise (assuming that it would have been the poor who had relatively less education without those policies). The history of past, but not too far past, redistributive land reforms prior to the introduction of socialist agriculture probably also helped in providing a relatively equitable

fallback position in deciding how land should be allocated at the time of de-collectivization.

A natural question to ask next is: what happened to the allocation of land after the de-collectivization? We have compared the administrative allocation to counter-factual allocations calibrated to our 1992-93 survey data. The stickiness of the administrative allocation (whereby it had to be fixed *ex ante*) may mean that it became less efficient over time, relative to a market allocation with state-contingent re-contracting. Against this conjecture, a new land law introduced in late 1993 (after our survey) attempted to foster free transactions in land-use rights. Possibly this change in the law allowed a closer approximation to the efficient allocation, though possibly at the expense of equity. Against that view, the same features of the setting that helped assure an equitable allocation at the time of de-collectivization may well have operated to moderate any un-equalizing forces generated by the emerging market economy. In the second part of this paper we will study the evolution of land allocation after the relatively equitable starting point achieved on breaking up the collectives.

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**Table 1: Variable definitions and descriptive statistics**

| Variable definitions | Northern Uplands | | Red River | | North Coast | | Central Coast | | Mekong Delta | | Full sample | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mean | st.dev. | mean | st.dev | mean | st.dev | mean | st. dev. | mean | st. dev. | mean | st. dev. |
| Log h'hold real consumption expenditure (dongs) | 15.236 | 0.52 | 15.205 | 0.54 | 15.113 | 0.53 | 15.391 | 0.62 | 15.667 | 0.53 | 15.311 | 0.58 |
| Real consumption expenditure per capita ('000 dongs) | 947.665 | 474.91 | 1114.444 | 506.65 | 899.983 | 391.30 | 1146.167 | 556.84 | 1422.439 | 847.95 | 1117.792 | 628.68 |
| Religion: 1 if h'hold head is Buddhist or Christian (0 if other, animist or none) | 0.333 | 0.47 | 0.264 | 0.44 | 0.180 | 0.38 | 0.116 | 0.32 | 0.564 | 0.50 | 0.313 | 0.46 |
| Ethnic: 1 if h'hold head is of ethnicity other than majority Kinh or Chinese | 0.345 | 0.48 | 0.075 | 0.26 | 0.032 | 0.18 | 0.083 | 0.28 | 0.079 | 0.27 | 0.116 | 0.32 |
| Local born: 1 if head is born locally | 0.798 | 0.40 | 0.947 | 0.22 | 0.893 | 0.31 | 0.849 | 0.36 | 0.831 | 0.38 | 0.859 | 0.35 |
| Age of household head | 40.376 | 13.59 | 43.507 | 14.53 | 45.437 | 15.31 | 47.895 | 15.26 | 46.648 | 14.26 | 44.463 | 14.75 |
| Gender of household head (male=1) | 0.814 | 0.39 | 0.758 | 0.43 | 0.798 | 0.40 | 0.757 | 0.43 | 0.786 | 0.41 | 0.782 | 0.41 |
| Log h'hold size excluding those < 6 yrs old | 1.346 | 0.48 | 1.173 | 0.49 | 1.272 | 0.50 | 1.381 | 0.47 | 1.466 | 0.48 | 1.304 | 0.50 |
| Dependency ratio: 1- (ratio of labor age members to all members > 6 yrs old). | 0.459 | 0.25 | 0.422 | 0.28 | 0.454 | 0.28 | 0.469 | 0.25 | 0.485 | 0.24 | 0.452 | 0.26 |
| Labor age adult member is handicapped | 0.008 | 0.09 | 0.007 | 0.09 | 0.006 | 0.08 | 0.018 | 0.13 | 0 | 0 | 0.007 | 0.08 |
| SOE: h'hold member has primary or secondary occupation in State owned enterprise and had it 5 years ago | 0.006 | 0.08 | 0.032 | 0.19 | 0.012 | 0.11 | 0.007 | 0.08 | 0.011 | 0.11 | 0.019 | 0.14 |
| Gov't job: member has worked for gov't in primary/secondary occupation for 5+ yrs, or did so 5 yrs ago or retired from gov't* | 0.068 | 0.25 | 0.040 | 0.21 | 0.069 | 0.28 | 0.047 | 0.23 | 0.084 | 0.30 | 0.058 | 0.25 |
| Social subsidy: dummy var. for receipt of gov't transfers to war heroes, martyrs, disabled etc | 0.103 | 0.30 | 0.118 | 0.32 | 0.134 | 0.34 | 0.091 | 0.29 | 0.050 | 0.22 | 0.101 | 0.30 |
| Household head's years of education | 6.252 | 3.71 | 7.226 | 3.70 | 7.051 | 3.80 | 4.562 | 3.79 | 4.312 | 3.13 | 6.162 | 3.83 |
| Other h'hold adults' years of education | 9.808 | 9.25 | 10.681 | 8.56 | 11.174 | 9.54 | 10.203 | 9.93 | 9.765 | 9.55 | 10.441 | 9.24 |
| Log allocated irrigated land equivalent ($m^2$) | 7.197 | 0.73 | 7.447 | 0.62 | 7.400 | 0.79 | 7.603 | 0.73 | 8.416 | 1.29 | 7.587 | 0.93 |
| Allocated irrigated land equivalent ($m^2$) | 1679.569 | 1117.37 | 2007.701 | 997.03 | 2084.141 | 1312.36 | 2621.580 | 2403.59 | 7296.937 | 6514.12 | 3003.256 | 3646.40 |
| H'hold's private irrigated land ($m^2$) | 159.616 | 238.56 | 157.051 | 167.05 | 86.213 | 157.35 | 136.424 | 545.33 | 279.165 | 1505.35 | 155.887 | 648.13 |
| H'hold's private non-irrigated land ($m^2$) | 242.92 | 401.20 | 113.382 | 521.38 | 250.951 | 389.62 | 310.033 | 598.75 | 209.016 | 1561.83 | 218.544 | 921.38 |
| H'hold's private perennial land ($m^2$) | 278.719 | 507.38 | 120.698 | 353.67 | 90.713 | 204.60 | 188.533 | 463.52 | 903.740 | 1672.80 | 343.747 | 1453.46 |
| H'hold's private water surface land ($m^2$) | 58.320 | 163.23 | 60.732 | 176.88 | 30.012 | 116.36 | 0 | 0 | 116.259 | 1102.29 | 55.738 | 459.87 |
| H'hold cultivates swidden land=1 | 0.289 | 0.45 | 0.037 | 0.19 | 0.043 | 0.20 | 0.225 | 0.42 | 0.020 | 0.14 | 0.104 | 0.31 |
| Share of good irrigated land | 0.184 | 0.343 | 0.510 | 0.390 | 0.308 | 0.351 | 0.242 | 0.378 | 0.106 | 0.297 | 0.306 | 0.390 |
| Share of good non-irrigated land | 0.276 | 0.397 | 0.175 | 0.369 | 0.681 | 0.425 | 0.239 | 0.377 | 0.589 | 0.487 | 0.372 | 0.460 |
| No. observations | 484 | | 956 | | 506 | | 276 | | 443 | | 2810 | |

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

## Table 2: Determinants of consumption

| | Northern Uplands | Red River | North Coast | Central Coast | Mekong Delta | Full sample |
|---|---|---|---|---|---|---|
| religion | -0.086 | -0.007 | -0.041 | 0.124 | -0.059 | -0.022 |
| | (2.07) | (0.14) | (0.54) | (1.18) | (1.00) | (0.82) |
| ethnic | -0.062 | -0.193 | -0.117 | -0.649 | 0.141 | -0.070 |
| | (0.86) | (2.34) | (1.23) | (2.90) | (1.90) | (1.65) |
| local born | -0.077 | 0.027 | 0.101 | -0.138 | -0.062 | -0.035 |
| | (1.57) | (0.78) | (1.53) | (3.65) | (0.86) | (1.29) |
| Age of head | -0.0002 | 0.016 | -0.003 | 0.002 | 0.005 | 0.007 |
| | (0.02) | (2.32) | (0.32) | (0.21) | (0.47) | (1.83) |
| Age² of head x $10^3$ | 0.038 | -0.158 | 0.025 | 0.012 | -0.046 | -0.059 |
| | (0.42) | (2.19) | (0.33) | (0.15) | (0.45) | (1.46) |
| Log household size | 0.451 | 0.462 | 0.534 | 0.532 | 0.452 | 0.482 |
| | (6.90) | (7.62) | (10.24) | (6.24) | (6.92) | (15.73) |
| dependency ratio | -0.066 | -0.026 | -0.120 | -0.186 | -0.110 | -0.071 |
| | (0.65) | (0.41) | (1.71) | (1.73) | (1.19) | (2.00) |
| gender of head | 0.074 | 0.030 | 0.014 | 0.025 | -0.078 | 0.008 |
| | (1.65) | (0.75) | (0.37) | (0.61) | (1.34) | (0.34) |
| disabled adult | -0.348 | 0.003 | -0.432 | -0.067 | -- | -0.162 |
| | (3.81) | (0.01) | (1.37) | (0.61) | | (1.68) |
| government job | 0.103 | 0.149 | 0.103 | 0.296 | 0.181 | 0.140 |
| | (2.13) | (3.10) | (1.70) | (4.15) | (3.72) | (4.83) |
| SOE job | 0.540 | 0.109 | -0.044 | 0.498 | 0.046 | 0.130 |
| | (4.16) | (2.26) | (0.58) | (1.45) | (0.40) | (2.74) |
| education of head | 0.021 | 0.027 | 0.024 | 0.033 | 0.009 | 0.025 |
| | (3.87) | (5.45) | (4.48) | (4.93) | (1.46) | (9.48) |
| education of other adults | 0.010 | 0.011 | 0.013 | 0.005 | 0.010 | 0.011 |
| | (4.72) | (7.74) | (4.89) | (1.89) | (4.21) | (11.32) |
| social subsidy recipient | 0.007 | 0.044 | 0.041 | -0.034 | -0.025 | 0.031 |
| | (0.17) | (1.10) | (0.56) | (0.52) | (0.30) | (1.15) |
| Log allocated irrigated land equivalent | 0.097 | 0.084 | 0.052 | 0.214 | 0.188 | 0.131 |
| | (2.82) | (2.30) | (2.39) | (3.81) | (6.89) | (7.45) |
| private irrigated x $10^3$ | 0.137 | 0.239 | 0.236 | 0.049 | 0.017 | 0.028 |
| | (3.34) | (2.32) | (3.01) | (1.04) | (1.56) | (2.54) |
| private non-irrigated x $10^3$ | 0.015 | -0.002 | 0.089 | 0.047 | 0.022 | 0.012 |
| | (0.31) | (0.05) | (2.50) | (0.77) | (1.24) | (0.98) |
| private perennial x $10^3$ | 0.064 | 0.109 | 0.038 | 0.033 | 0.042 | 0.019 |
| | (3.47) | (1.73) | (0.40) | (0.51) | (3.59) | (1.76) |
| private water x $10^3$ | 0.189 | 0.175 | 0.313 | -- | 0.016 | 0.040 |
| | (2.15) | (3.40) | (4.16) | | (0.72) | (1.50) |
| cultivates swidden land | 0.070 | -0.082 | -0.092 | -0.018 | 0.112 | -0.009 |
| | (1.15) | (0.86) | (0.70) | (0.26) | (3.83) | (0.24) |
| share good irrigated land | -0.004 | 0.032 | 0.084 | -0.055 | 0.111 | 0.042 |
| | (0.06) | (0.57) | (1.21) | (0.63) | (1.55) | (1.47) |
| share good non-irrigated land | 0.017 | 0.004 | -0.008 | -0.037 | 0.016 | 0.020 |
| | (0.25) | (0.10) | (0.27) | (0.54) | (0.20) | (0.81) |
| Constant | 13.320 | 13.415 | 13.377 | 12.712 | 13.300 | 13.474 |
| | (41.53) | (49.55) | (50.75) | (28.17) | (37.69) | (68.80) |
| $R^2$ | 0.679 | 0.671 | 0.703 | 0.666 | 0.570 | 0.673 |
| RMSE | 0.305 | 0.318 | 0.300 | 0.383 | 0.367 | 0.340 |
| F stat | 53.10 | 971.45 | 456.46 | 71.89 | 438.67 | 92.43 |
| Prob>F | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| No. observations | 484 | 956 | 506 | 276 | 443 | 2810 |

Note: The dependent variable is log household consumption expenditures. Commune fixed effects included. T-ratios in parentheses are based on standard errors corrected for heteroskedasticity and clustering.

**Table 3: Actual land allocations compared to consumption-efficient allocations**

| | Northern Uplands | | Red River | | North Coast | | Central Coast | | Mekong Delta | | Full Sample | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | actual | efficient | actual | efficient | actual | efficient | actual | efficient | actual | efficient | actual | efficient |
| Religion | -0.123 | -0.095 | 0.047 | -0.007 | 0.130 | -0.043 | 0.035 | 0.157 | 0.162 | -0.073 | 0.078 | -0.025 |
| | (1.48) | (2.03) | (0.66) | (0.14) | (0.93) | (0.54) | (0.47) | (1.16) | (1.86) | (1.00) | (1.24) | (0.81) |
| Ethnic | 0.023 | -0.068 | 0.309 | -0.210 | 0.462 | -0.124 | -0.116 | -0.826 | 0.364 | 0.174 | 0.013 | -0.080 |
| | (0.39) | (0.85) | (2.56) | (2.29) | (2.78) | (1.22) | (0.47) | (2.73) | (1.51) | (1.91) | (0.11) | (1.65) |
| local born | 0.032 | -0.086 | -0.029 | 0.030 | -0.086 | 0.107 | 0.024 | -0.176 | 0.146 | -0.077 | 0.045 | -0.040 |
| | (0.72) | (1.59) | (0.54) | (0.78) | (0.51) | (1.51) | (0.38) | (3.69) | (1.73) | (0.87) | (1.07) | (1.29) |
| age of head | -0.008 | -0.0002 | -0.0003 | 0.017 | -0.012 | -0.003 | 0.045 | 0.002 | 0.028 | 0.006 | 0.003 | 0.008 |
| | (0.49) | (0.00) | (0.81) | (2.29) | (0.88) | (0.32) | (2.23) | (0.22) | (1.75) | (0.47) | (0.46) | (1.82) |
| age² of head x $10^3$ | 0.081 | 0.042 | -0.065 | -0.173 | 0.041 | 0.026 | -0.486 | 0.016 | -0.213 | -0.057 | -0.056 | -0.068 |
| | (0.44) | (0.42) | (0.81) | (2.17) | (0.27) | (0.33) | (2.32) | (0.14) | (1.39) | (0.45) | (0.75) | (1.45) |
| log h'hold size | 0.724 | 0.499 | 0.794 | 0.504 | 0.696 | 0.563 | 0.661 | 0.676 | 0.243 | 0.557 | 0.695 | 0.555 |
| | (6.63) | (8.01) | (14.38) | (9.41) | (5.18) | (10.79) | (4.39) | (7.50) | (2.21) | (8.08) | (11.93) | (18.70) |
| dependency ratio | -0.498 | -0.073 | -0.478 | -0.029 | -0.386 | -0.127 | -0.292 | -0.237 | 0.092 | -0.135 | -0.420 | -0.082 |
| | (2.59) | (0.66) | (6.91) | (0.41) | (2.52) | (1.71) | (1.34) | (1.68) | (0.50) | (1.21) | (6.07) | (2.02) |
| gender of head | 0.070 | 0.082 | 0.070 | 0.032 | 0.147 | 0.015 | 0.103 | 0.032 | 0.155 | -0.096 | 0.094 | 0.009 |
| | (0.77) | (1.69) | (1.90) | (0.75) | (2.43) | (0.37) | (1.19) | (1.68) | (1.21) | (1.34) | (2.82) | (0.35) |
| Disabled adult | -0.125 | -0.385 | -0.086 | 0.003 | -0.094 | -0.456 | 0.118 | -0.085 | -- | -- | -0.053 | -0.186 |
| | (1.19) | (3.81) | (0.70) | (0.00) | (0.45) | (1.36) | (0.57) | (0.61) | | | (0.64) | (1.68) |
| gov't job | -0.221 | 0.114 | -0.122 | 0.162 | -0.200 | 0.109 | -0.049 | 0.377 | 0.095 | 0.223 | -0.160 | 0.161 |
| | (1.28) | (2.17) | (1.90) | (2.93) | (1.63) | (1.71) | (0.29) | (3.48) | (0.92) | (3.74) | (2.75) | (4.77) |
| SOE | -0.767 | 0.598 | -0.232 | 0.119 | 0.134 | -0.046 | -0.049 | 0.634 | 0.342 | 0.056 | -0.174 | 0.150 |
| | (2.26) | (3.90) | (4.09) | (2.22) | (0.43) | (0.57) | (0.13) | (1.35) | (0.88) | (0.40) | (2.32) | (2.69) |
| education of head | -0.012 | 0.024 | -0.006 | 0.029 | -0.009 | 0.026 | -0.018 | 0.042 | 0.018 | 0.011 | -0.001 | 0.028 |
| | (1.06) | (3.81) | (1.10) | (5.26) | (1.10) | (4.38) | (2.53) | (4.35) | (1.46) | (1.45) | (0.30) | (9.12) |
| education of other adults | -0.005 | 0.011 | 0.002 | 0.012 | 0.005 | 0.014 | 0.004 | 0.007 | 0.010 | 0.012 | 0.003 | 0.013 |
| | (1.31) | (4.81) | (0.74) | (6.95) | (0.86) | (5.04) | (0.84) | (1.87) | (1.45) | (4.09) | (1.29) | (11.04) |
| social subsidy | 0.005 | 0.008 | -0.079 | 0.048 | 0.035 | 0.044 | -0.192 | -0.044 | -0.371 | -0.030 | -0.088 | 0.036 |
| recipient | (0.07) | (0.17) | (1.61) | (1.09) | (0.37) | (0.57) | (1.58) | (0.52) | (3.50) | (0.30) | (2.26) | (1.15) |
| private irrigated | 0.471 | 0.152 | 0.399 | 0.261 | 0.084 | 0.249 | 0.144 | 0.063 | 0.028 | 0.021 | 0.151 | 0.033 |
| x $10^3$ | (2.79) | (3.41) | (3.28) | (2.28) | (0.71) | (2.95) | (5.79) | (1.07) | (2.05) | (1.55) | (3.14) | (2.54) |
| private non irrigated | -0.033 | 0.017 | -0.013 | -0.003 | 0.174 | 0.093 | -0.086 | 0.059 | -0.004 | 0.027 | -0.012 | 0.014 |
| x $10^3$ | (0.66) | (0.30) | (0.21) | (0.00) | (1.62) | (2.49) | (1.85) | (0.78) | (0.16) | (1.24) | (0.69) | (0.97) |
| private perennial | 0.015 | 0.071 | 0.028 | 0.119 | 0.054 | 0.040 | -0.084 | 0.042 | 0.022 | 0.052 | 0.005 | 0.022 |
| x $10^3$ | (0.27) | (3.59) | (0.62) | (1.68) | (0.38) | (0.40) | (2.32) | (0.50) | (0.62) | (3.63) | (0.57) | (1.76) |
| private water x $10^3$ | -0.017 | 0.209 | 0.041 | 0.192 | 0.346 | 0.330 | -- | -- | 0.058 | 0.020 | 0.063 | 0.046 |
| | (0.11) | (2.17) | (0.77) | (3.51) | (2.62) | (4.42) | | | (6.50) | (0.71) | (5.00) | (1.50) |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cultivates swidden | 0.121 | 0.077 | 0.230 | -0.089 | 0.050 | -0.097 | 0.046 | -0.023 | 0.465 | 0.138 | 0.078 | -0.010 |
| land | (1.10) | (1.26) | (2.32) | (0.87) | (0.40) | (0.69) | (0.40) | (0.26) | (7.90) | (4.08) | (0.93) | (0.24) |
| share of good | 0.302 | -0.005 | -0.032 | 0.035 | -0.100 | 0.089 | 0.050 | -0.070 | 0.051 | 0.136 | 0.013 | 0.048 |
| irrigated land | (1.20) | (0.00) | (0.74) | (0.57) | (0.78) | (1.20) | (0.52) | (0.62) | (0.48) | (1.57) | (0.18) | (1.48) |
| share of good non- | -0.434 | 0.019 | -0.201 | 0.004 | 0.029 | -0.008 | 0.221 | -0.047 | -0.019 | 0.020 | -0.035 | 0.023 |
| irrigated land | (2.89) | (0.24) | (3.46) | (0.10) | (0.44) | (0.26) | (3.30) | (0.53) | (0.38) | (0.04) | (0.89) | (0.81) |
| Constant | 5.729 | -- | 6.881 | -- | 4.778 | -- | 6.614 | -- | 7.003 | -- | 5.876 | -- |
| | (18.39) | | (38.40) | | (12.97) | | (15.73) | | (17.44) | | (13.74) | |
| $R^2$ | 0.543 | | 0.630 | | 0.627 | | 0.610 | | 0.771 | | 0.675 | |
| RMSE | 0.512 | | 0.389 | | 0.503 | | 0.482 | | 0.648 | | 0.545 | |
| F stat | (14, 15)= | | (20,31)= | | (16,17)= | | (10,11)= | | (18,22)= | | (21,109) | |
| | 135.92 | | 2020.27 | | 2120.20 | | 230.57 | | 1066.59 | | =874.10 | |
| Prob>F | 0.0000 | | 0.0000 | | 0.0000 | | 0.0000 | | 0.0000 | | 0.0000 | |
| No. observations | 484 | 484 | 956 | 956 | 506 | 506 | 276 | 276 | 443 | 443 | 2810 | 2810 |

Note: The dependent variable for "actual" is the log of the allocated irrigated-land equivalent held by each household. Commune fixed effects included. T-ratios in parentheses are based on standard errors corrected for heteroskedasticity and clustering. The coefficients under "efficient" are derived from the first-order conditions for maximizing aggregate consumption based on the regressions in Table 2.

**Table 4: Mean consumption, inequality and poverty under alternative land allocations**

| | Northern Uplands | Red River | North Coast | Central Coast | Mekong Delta | Full Sample |
|---|---|---|---|---|---|---|
| | | | *Actual allocation* | | | |
| Mean consumption ('000 dongs)/ h'hold | 4725.083 | 4594.556 | 4183.381 | 5725.078 | 7300.921 | 5258.276 |
| Inequality in per capita expenditures | 0.101 | 0.085 | 0.079 | 0.124 | 0.130 | 0.115 |
| Headcount index of poverty (%) | 81.322 | 67.523 | 85.143 | 61.975 | 49.919 | 68.455 |
| Squared poverty gap index (x100) | 13.014 | 7.386 | 13.464 | 9.719 | 5.639 | 9.271 |
| | | | *Consumption-efficient counter factual* | | | |
| Maximum consumption ('000 dongs)/ h'hold | 4821.796 | 4656.408 | 4227.616 | 6000.305 | 7688.655 | 5448.437 |
| (%) loss (1-actual/efficient) | 2.006 | 1.328 | 1.046 | 4.587 | 5.043 | 3.490 |
| Inequality of consumption under the efficient land allocation | 0.120 | 0.101 | 0.087 | 0.185 | 0.176 | 0.150 |
| Headcount index of poverty under the efficient land allocation (%) | 78.393 | 66.691 | 83.959 | 59.664 | 50.526 | 66.331 |
| Squared poverty gap index under the efficient land allocation (x100) | 13.564 | 8.083 | 13.712 | 11.976 | 6.724 | 10.330 |
| | | | *Equal land counter factual* | | | |
| Mean consumption at equal land per household | 4773.223 | 4620.384 | 4205.749 | 5829.239 | 7546.890 | 5345.507 |
| (%) loss | 1.009 | 0.559 | 0.532 | 1.787 | 3.259 | 1.632 |
| Inequality of consumption at equal land allocation | 0.101 | 0.087 | 0.080 | 0.122 | 0.117 | 0.116 |
| Headcount index of poverty at equal land allocation (%) | 79.620 | 66.985 | 84.653 | 61.134 | 46.440 | 66.505 |
| Squared poverty gap index at equal land allocation (x100) | 12.700 | 7.411 | 13.331 | 9.167 | 4.548 | 8.928 |

Note: Inequality is given by the difference between log mean consumption per capita and the mean of log consumption per capita.

**Table 5: Mean consumption, inequality and poverty with mobility between communes**

| | Northern Uplands | Red River | North Coast | Central Coast | Mekong Delta | Full sample |
|---|---|---|---|---|---|---|
| | | | *Consumption-efficient counter factual* | | | |
| Maximum consumption ('000 dongs)/ h'hold | 4836.772 | 4674.562 | 4245.877 | 6111.004 | 8386.244 | 5580.237 |
| (%) loss | 2.309 | 1.712 | 1.472 | 6.315 | 12.942 | 5.770 |
| Inequality under the efficient allocation | 0.117 | 0.101 | 0.088 | 0.186 | 0.223 | 0.146 |
| Headcount index of poverty under the efficient allocation (%) | 78.195 | 66.422 | 82.898 | 59.174 | 49.555 | 64.562 |
| Squared poverty gap index under the efficient allocation (x100) | 13.271 | 8.029 | 13.605 | 11.551 | 6.526 | 9.457 |
| | | | *Equal land counter factual* | | | |
| Mean consumption at equal land per household | 4792.570 | 4639.757 | 4226.545 | 5938.658 | 8105.723 | 5488.358 |
| (%) loss | 1.408 | 0.974 | 1.021 | 3.596 | 9.929 | 4.192 |
| Inequality at equal land | 0. 098 | 0.087 | 0.080 | 0.122 | 0.149 | 0.113 |
| Headcount index of poverty at equal land allocation (%) | 79.185 | 67.107 | 83.755 | 60.294 | 46.804 | 65.004 |
| Squared poverty gap index at equal land allocation (x100) | 12.419 | 7.345 | 13.218 | 8.724 | 4.282 | 8.076 |

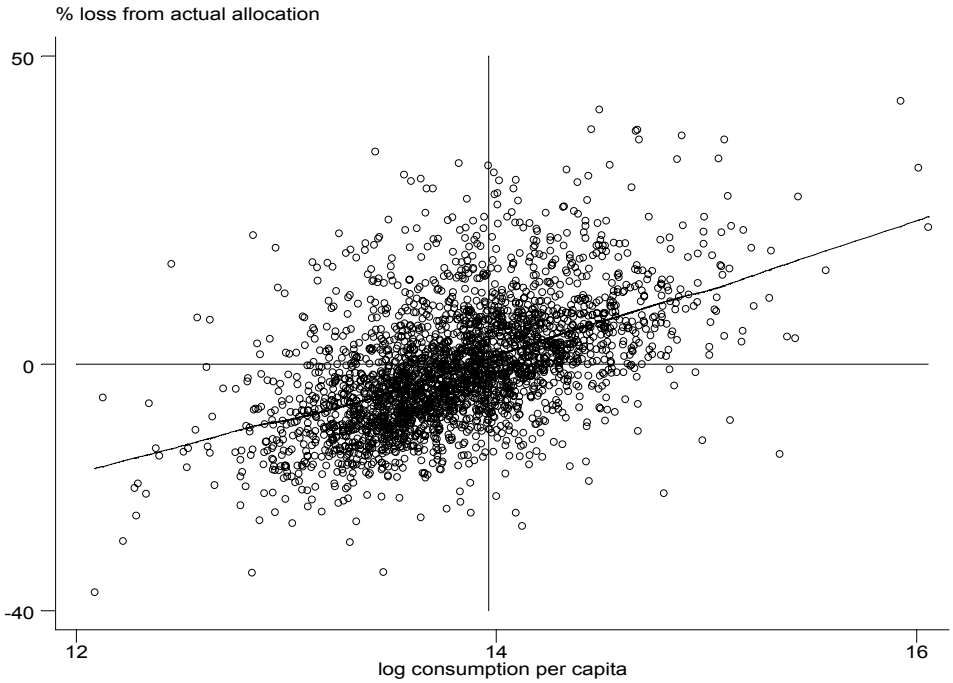
## Appendix: Reduced form regressions for consumption

| | Northern Uplands | Red River | North Coast | Central Coast | Mekong Delta | Full Sample |
|---|---|---|---|---|---|---|
| religion | -0.098 | -0.003 | -0.034 | 0.131 | -0.02 | -0.005 |
| | (1.96) | (0.06) | (0.56) | (1.60) | (0.62) | (0.25) |
| ethnic | -0.059 | -0.167 | -0.093 | -0.674 | 0.210 | -0.086 |
| | (1.14) | (1.84) | (0.71) | (2.40) | (2.15) | (2.39) |
| local born | -0.074 | 0.025 | 0.097 | -0.133 | -0.035 | -0.024 |
| | (1.55) | (0.49) | (1.47) | (1.64) | (0.62) | (1.02) |
| age of head | -0.001 | 0.016 | -0.003 | 0.012 | 0.010 | 0.008 |
| | (0.11) | (2.56) | (0.40) | (1.03) | (1.02) | (2.15) |
| age² of head x $10^3$ | 0.046 | -0.163 | 0.027 | -0.092 | -0.086 | -0.065 |
| | (0.45) | (2.46) | (0.34) | (0.82) | (0.88) | (1.77) |
| log h'hold size | 0.521 | 0.529 | 0.570 | 0.673 | 0.498 | 0.573 |
| | (8.58) | (12.56) | (10.92) | (7.93) | (8.02) | (23.64) |
| dependency ratio | -0.114 | -0.067 | -0.140 | -0.249 | -0.092 | -0.128 |
| | (1.31) | (1.22) | (1.94) | (1.89) | (0.91) | (3.61) |
| gender of head | 0.081 | 0.036 | 0.022 | 0.047 | -0.049 | 0.018 |
| | (1.86) | (1.19) | (0.54) | (0.67) | (0.90) | (0.94) |
| disabled adult | -0.360 | -0.005 | -0.437 | -0.042 | -- | -0.171 |
| | (2.20) | (0.04) | (2.43) | (0.22) | | (2.08) |
| gov't job | 0.081 | 0.138 | 0.093 | 0.286 | 0.199 | 0.118 |
| | (1.34) | (2.66) | (1.83) | (2.58) | (3.03) | (4.25) |
| SOE job | 0.466 | 0.090 | -0.037 | 0.488 | 0.110 | 0.107 |
| | (2.43) | (1.60) | (0.28) | (1.66) | (0.61) | (2.23) |
| education of head | 0.020 | 0.026 | 0.024 | 0.029 | 0.013 | 0.025 |
| | (3.77) | (6.50) | (5.04) | (3.28) | (1.69) | (10.25) |
| education of other adults | 0.010 | 0.011 | 0.013 | 0.006 | 0.012 | 0.011 |
| | (4.32) | (6.35) | (6.21) | (1.64) | (4.16) | (10.87) |
| social subsidy | 0.008 | 0.037 | 0.043 | -0.075 | -0.095 | 0.018 |
| recipient | (0.15) | (0.98) | (0.90) | (0.84) | (1.00) | (0.71) |
| private | 0.183 | 0.272 | 0.241 | 0.080 | 0.022 | 0.067 |
| irrigated x $10^3$ | (2.46) | (3.00) | (2.22) | (1.48) | (1.33) | (5.83) |
| private non | 0.012 | -0.004 | 0.098 | 0.028 | 0.021 | 0.011 |
| irrigated x $10^3$ | (0.27) | (0.13) | (2.02) | (0.56) | (1.32) | (1.25) |
| private | 0.066 | 0.112 | 0.041 | 0.015 | 0.046 | 0.020 |
| perennial x $10^3$ | (1.75) | (2.59) | (0.53) | (0.24) | (3.77) | (3.66) |
| private water x $10^3$ | 0.187 | 0.179 | 0.331 | -- | 0.027 | 0.048 |
| | (2.01) | (2.79) | (2.54) | | (1.53) | (3.26) |
| cultivates | 0.082 | -0.063 | -0.089 | -0.008 | 0.199 | -0.010 |
| swidden land | (1.77) | (0.88) | (0.83) | (0.09) | (1.23) | (0.31) |
| Share of good | 0.025 | 0.015 | 0.079 | -0.044 | 0.120 | 0.054 |
| irrigated land | (0.38) | (0.32) | (1.47) | (0.59) | (1.38) | (2.02) |
| Share of good | -0.025 | 0.001 | -0.006 | 0.011 | 0.012 | 0.016 |
| non-irrigated land | (0.47) | (0.04) | (0.17) | (0.14) | (0.20) | (0.78) |
| constant | 13.874 | -- | -- | 14.128 | 14.619 | 13.879 |
| | (71.90) | | | (46.60) | (47.99) | (137.88) |
| $R^2$ | 0.670 | 0.668 | 0.700 | 0.641 | 0.522 | 0.657 |
| RMSE | 0.309 | 0.320 | 0.301 | 0.397 | 0.387 | 0.349 |
| F stat | 25.220 | 40785.07 | 32665.58 | 14.003 | 10.360 | 39.568 |
| Prob>F | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| N | 484 | 956 | 506 | 276 | 443 | 2810 |
| test of $\gamma/(1-\beta) = b$ | F(36,894) | F(53,1804) | F(39,932) | F(31,486) | F(42,796) | F(129,5340) |
| | =8.68 | =179.15 | = 151.65 | =6.66 | =31.45 | =28.37 |
| Prob>F | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

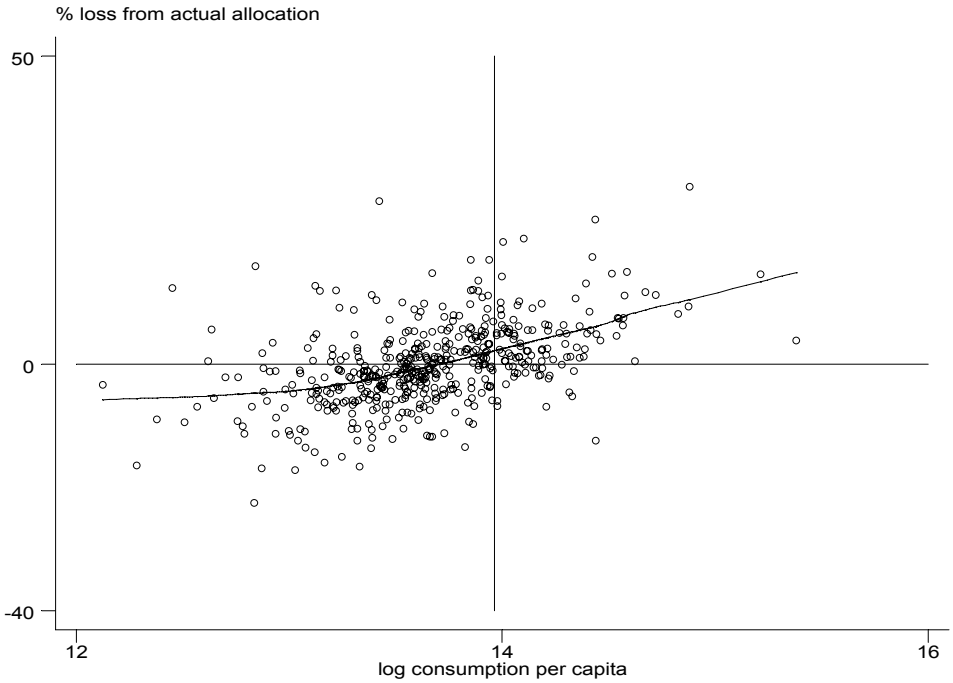
Note: The dependent variable is log household consumption expenditure. Commune fixed effects were also included.

**Figure 1: Distribution of consumption losses relative to the efficient allocation**

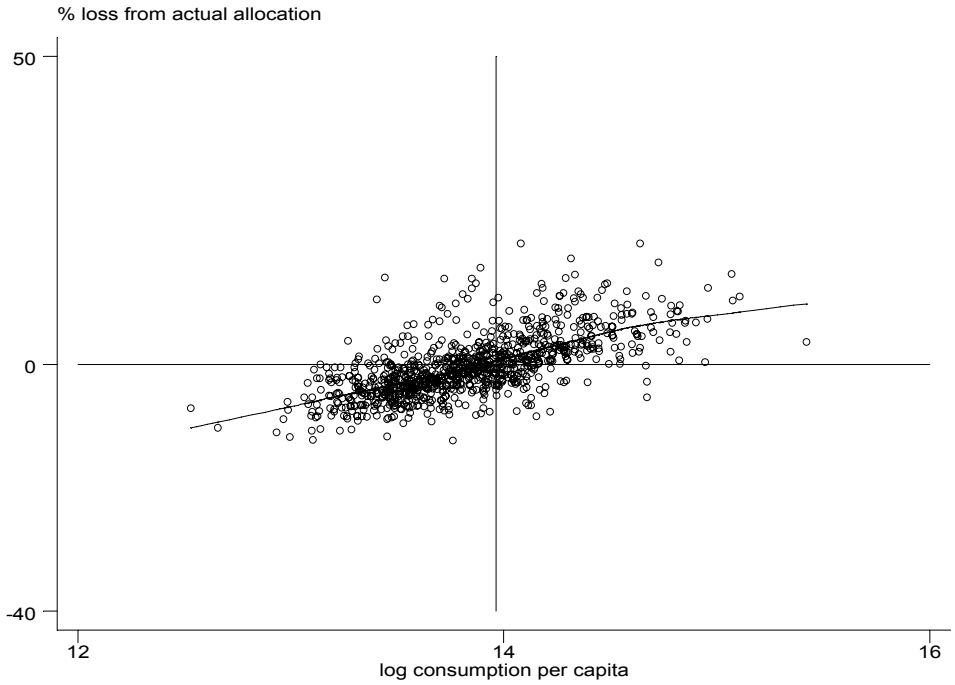
**(ii) National**



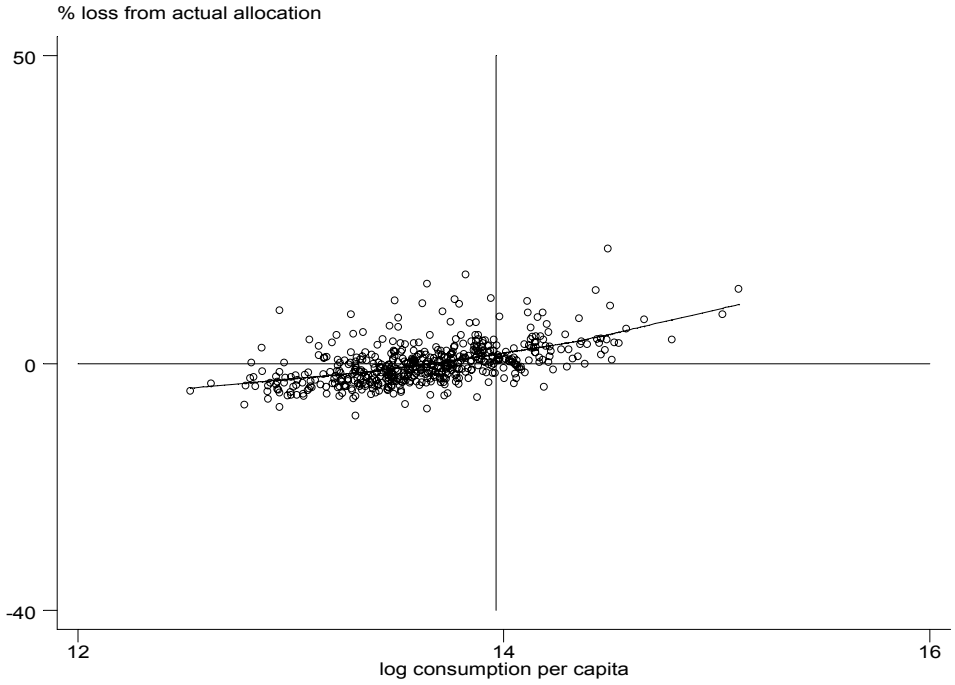

**(ii) Northern Uplands**



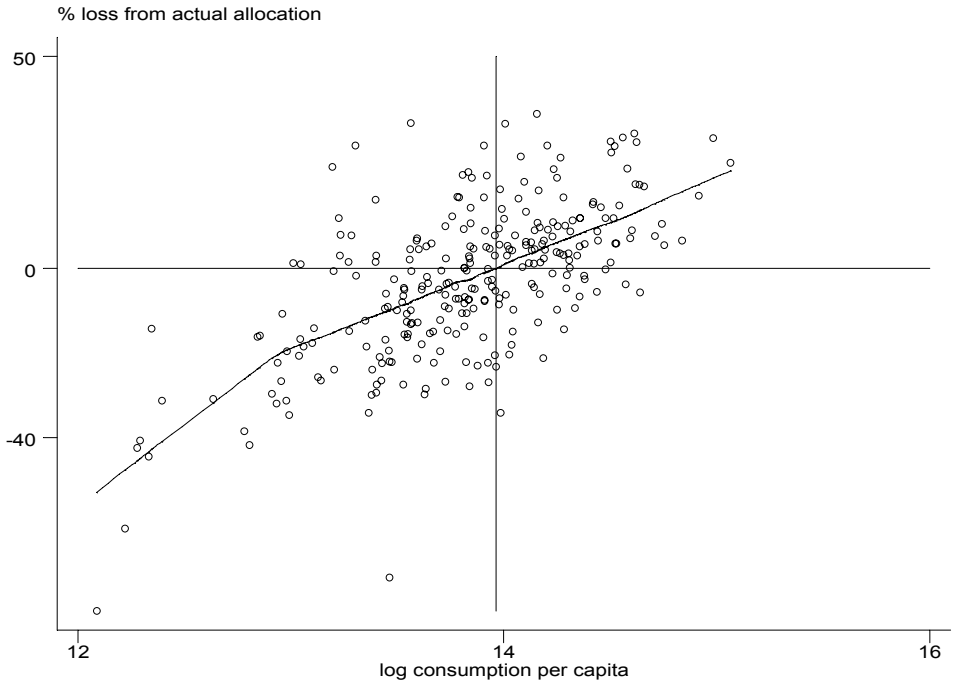
## (iii) Red River




## (iv) North Coast



## (v) Central Coast




## (vi) Mekong Delta