Land Titling and Rural Transition in Vietnam*

Quy-Toan Do† Lakshmi Iyer‡

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Abstract

We examine the impact of the 1993 Land Law of Vietnam which gave households the power to exchange, transfer, lease, inherit and mortgage their land-use rights. We use household surveys before and after the law was passed, together with the considerable variation across provinces in the speed of implementation of the reform to identify the impact of the law. We find that the additional land rights led to statistically significant increases in the share of total area devoted to long-term crops and in labor devoted to non-farm activities. However, these changes are not large in magnitude and appear to be driven mainly by the increased security of tenure provided by the law, rather than by increased access to credit markets or greater land market participation.

JEL Classification: Q15, Q12, O13.

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†Development Research Group, The World Bank. qdo@worldbank.org

‡Harvard Business School. liyer@hbs.edu

1 Introduction

There is a certain amount of consensus among economists that better property rights institutions lead to improved economic outcomes (see North and Thomas 1973, Knack and Keefer 1995 or Acemoglu, Johnson and Robinson 2001 for analyses of general property rights institutions). Scholars such as De Soto (2000) have argued that the major barrier to prosperity in developing countries is the inability to convert property into usable assets, because of a lack of clear-cut legally recognized rights. However, the empirical evidence on the importance of issuing formal titles to land is inconclusive, both on the overall effect of having property titles and on which dimensions of land rights are crucial. Alston, Libecap and Schneider (1996) find that investments in land as well as land values are positively associated with the possession of formal titles in Brazil; an analysis of land titling in Indonesia reached similar conclusions (SMERU 2002). Galiani and Schargrodsky (2006) also find urban land titles leading to increased investment in housing in Buenos Aires. Besley (1995) finds that more secure land rights lead to greater investment, but investment on the land may also have been undertaken with a view to strengthening land rights. On the other hand, Braselle, Gaspart and Platteau (2002) review a number of studies in African countries which show very little impact of land titling on investment. Looking at labor market activities, Field (2003) finds that urban land titling is associated with an increase in formal labor market participation in Peru. Several studies on land titling have examined the impact on credit markets and the results are mixed. Feder et al. (1986) in Thailand and SMERU (2002) in Indonesia find that possession of legal titles leads to an increase in credit access for the poor, while Boucher et al. (2002) in Nicaragua and Honduras, and Field and Torero (2004) in Peru show that access to credit remains low even after land reforms have been implemented. Galiani and Schargrodsky (2006) also find no impact of formal property rights on access to credit markets in Buenos Aires.

This paper investigates the impact of a specific legal change to land rights in Vietnam. Land rights are an important issue in Vietnam, where agriculture accounts for nearly a quarter of Gross Domestic Product (GDP) and two thirds of the workforce is engaged in agricultural activities. Agricultural land in Vietnam was decollectivized in 1988 and land-use rights were granted to households. We focus on the subsequent land law of 1993, which

gave households the right to inherit, transfer, exchange, lease and mortgage their land-use rights. This was implemented by issuing land titles (or Land-Use Certificates as they are known in Vietnam) to all households. This law initiated an extensive land titling program in Vietnam: by the year 2000, nearly 11 million land titles had been issued to rural households, making this one of the largest rural titling programs in the developing world, not only in scale but also in speed of implementation. To view this program in comparative perspective, 8.7 million land titles have been distributed in Thailand since the early 1980s and 1.87 million in Indonesia between 1996 and 2000 (SMERU 2002); the largest urban titling program, aimed at squatters in Peru, distributed 1.2 million titles (Field 2003). The economic consequences are thus of interest not only to Vietnam, but also to other developing countries contemplating land titling programs.

Our study contributes to the literature on land titling in several distinctive ways: first, we study a large nationwide titling program, rather than one restricted to certain areas or certain classes of people. This is in contrast to almost all the studies cited above. This means that our results include any potential general equilibrium effects of such titling programs. Second, our work focuses on the impact of granting new rights to land, including the rights to mortgage and trade, rather than a formalization of existing rights (as is the case in most programs aimed at squatters). Further, by looking at different outcomes, we are able to make inferences regarding which of these new rights was most effective. Third, our focus on the 1993 reform enables us to distinguish the effects of land titles from the incentive effects of decollectivization. Our work is complementary with other studies of agrarian transition in Vietnam such as Benjamin and Brandt (2004), and Ravallion and van de Walle (2003).[1] However, the use of measures of land reform progress across provinces enables us to distinguish the incremental impact of the 1993 land law from the overall effect of economic growth during this period.

We use household-level data from two waves of the Vietnam Living Standards Survey, which took place in 1992-93 and 1997-98 respectively. Since individual-level information on possession of land titles is not available in these surveys, we collected province-level

[1]Deininger and Jin (2003) and Ngo (2004) also look at similar issues in Vietnam during that same period by looking at different land tenure arrangements. Their analyses do not directly relate to the 1993 land law that is the main purpose of our investigation.

information on the issuance of land-use certificates. We verify that there are no systematic differences in pre-reform characteristics between provinces which issued titles faster and those which were slower in issuing titles. We then compare the change in outcomes for households between the two time-periods, across provinces at different stages of the land titling process. We find that households in provinces which have made greater progress in land titling increase the proportion of cultivated area devoted to multi-year crops. While this effect is statistically significant, it is not large in magnitude: a one standard deviation increase in land titling results in a 0.09 standard deviation increase in the proportional area devoted to long-term crops. We also find that households in provinces with more land titles devote more time to non-farm activities. Providing titles to all households would result in an increase of 11-12 weeks of nonfarm work by the household.

Our results provide little support to the view that such increased investment is financed by credit since we find no significant increase in household borrowing. Analysis of land market transactions is hampered by severe under-reporting; while we do find that the overall volume of transactions increases after the reform, the increase is not significantly different in provinces which are at an advanced stage of the titling process. Overall, our results overall suggest that the main driving force underlying these changes of Vietnam's rural economy is the increased security of tenure associated with the 1993 land law.

The paper is structured as follows: Section 2 describes the evolution of land rights in Vietnam, Section 3 presents a simple theoretical framework to analyze the effects of land titling and Section 4 describes our data and empirical strategy. Section 5 documents the variation in the implementation of the land reform across provinces. Our main results on crop and labor choice are discussed in Section 6 and an investigation of the potential mechanisms at work is undertaken in Section 7. Section 8 concludes.

2 Land Rights in Vietnam

The history of Vietnam in the second half of the twentieth century is punctuated by three key dates: 1954 marked the independence of the country from the French and its division into two parts, North and South; in 1975, the so-called "Vietnam war" ended with the reunification of

North and South Vietnam, and 1986 saw the implementation of sweeping economic reforms (the "Doi Moi" policy) and a move towards a market-oriented economy, which continues to the present day. The material in this section is largely based on Boothroyd and Pham (2000), Pingali and Vo-Tong (1992), and Wiegersma (1988).

2.1 The Institutional Framework until 1988

Before the Geneva Accord of 1954, Vietnam was under French colonial rule. During the colonial period, most farmland in Vietnam was owned either by French plantation owners or by large Vietnamese landlords: 52 percent of the land was owned by only 3 percent of the indigenous population and more than 60 percent of farmers across the country were landless in the mid-1940s.

After independence a major land reform was carried out in the North. As a reward for their war efforts, land and ownership rights were distributed to farmers and a rapid increase in agricultural output and productivity followed. However, the policy was reversed and land began to be collectivized in the late 1950s, as communist ideology gained strength. As a result, 86 percent of all peasant households and 68 percent of total farmland were brought into cooperatives by 1960. Despite significant declines in output, the collectivization process continued so that 90 percent of all peasant households in the North were working in cooperatives by the mid-1960s. An illuminating stylized fact illustrates the impact of such an incentive system: while individual rural households were allocated 5 percent of private farmland, they derived 60 to 70 percent of their earnings from this small plot.[2]

Land institutions in the South during the same period were driven by political conflicts. At times where the government sought support from the local elites, pro-landowner policies were adopted. When the war against North Vietnam began, the government tried to gain popular support by adopting the Land-to-the-Tiller law in 1970. Tillers of the soil were to enjoy all the benefits of their work, and this would be accomplished by providing ownership rights to cultivators and putting a retention limit on landlords as low as 20 hectares. However, the law found opposition from landlords and the lack of independence of the bureaucracy

[2]Boothroyd and Pham (2000), Chapter 2.

made enforcement uneven throughout South Vietnam.

In 1975, when the war ended and the country was reunified, land collectivization started in the South but was implemented with little success: as late as 1986, only 5.9 percent of farmers in the Mekong Delta and 20 percent in the Southeastern region were part of cooperatives, while this figure amounted to 85 percent in the Central Lowlands region (Pingali and Vo-Tong, 1992). Under the collective system, all households were paid a share of output according to their recorded labor hours on the communal land. In 1981, the first changes were made to these arrangements: workers were now allowed to keep all of the surplus they produced over a contracted output. However, this policy was later modified and quotas were constantly renegotiated, resulting in a decline of public confidence. Agricultural yields were extremely low in this period and even as late as 1985, Vietnam was a net importer of rice.

Faced with a worsening economic crisis, the government announced in 1986 the program of "Doi Moi", or Renovation, and began a gradual movement towards a market economy. As part of a major structural adjustment program, production and consumption subsidies were eliminated from the State budget, government spending was reduced to 6 percent of GDP, the government work force was reduced by 15 percent, 500 000 soldiers were demobilized, interest rates on loans to State-owned firms were raised and central bank credit was no longer used to finance the budget deficit. The economy started opening up to trade, and the central bank undertook a massive devaluation of the currency to the prevailing black market rate. Inflation rates were brought down from 400 percent in 1986-87 to 10 percent in 1993. Financial markets were partially deregulated, foreign banks were allowed to operate in Vietnam and a stock exchange was opened in 2000. In the agricultural sector, Resolution 10 of 1988 granted land-use rights to individual households, while the land law of 1993 made these rights pledgeable and tradable. These two changes are described in detail in following sections.

These reforms have had a dramatic impact on the economy. During the period 1990-2005, the Vietnamese economy experienced annual growth rates of 7.5%. Crop production grew at a rate of 5.5% percent over the period 1990-2004 and accounted for 29 percent of total non-oil exports in 2003. By 2002, Vietnam was the third largest exporter of rice, and the second largest exporter of coffee, pepper, and cashew. Exports and imports amounted to 75 percent

of GDP by 1995.[3] The benefits from growth have been fairly widespread: poverty rates are estimated to have declined from 75 percent in 1984 to 55 percent in 1993,[4] 37 percent in 1998 and 29 percent in 2002. In January 2007, Vietnam joined the World Trade Organization (WTO) as its 150th member.

2.2 The 1988 Land Law

The 1988 land law was aimed at liberalizing the agricultural sector in Vietnam. Resolution 10 of this law consisted of transferring control and cash-flow rights from the farming cooperative to the individual household. Land was allocated to households with 10-15 years of secure tenure, output markets were privatized and investment decisions were decentralized and left to households. Private property was virtually instituted. However, as land-use rights were given to families without the possibility to trade such rights, a proper land market did not develop despite some informal transactions.

Land allocation to individual households was conducted by the commune authorities, and encountered some difficulties across the country. In the North and in some regions of the South, land was distributed on a fairness basis, taking into account soil and socio-demographic characteristics of the region. Comparing the realized land allocation process with a simulated market-based outcome, Ravallion and van de Walle (2003) conclude that the realized process generated lower inequality and made the poorest better off. However, the process sometimes relied on arbitrary considerations, leading to favoritism and disputes. For instance, Hayami (1993) reports that "a farmer (...) in Hai Hung Province complained that he received too small a land allocation because his eldest son was in military service and his other children were so young that they received only one-third of an adult's allocation at a time. Thus, he expects that his unfavorable allocation will be corrected at the end of the ten-year tenure period" (p. 13). The situation in the South was complicated by the fact that Resolution 10 stipulated that farmers should be assigned the land they owned prior to 1975 and this generated disagreement between farmers and former landlords, although a

[3] World Development Indicators Online database.

[4] Dollar and Litvack, 1998.

1989 ordinance gave rights to farmers. The allocation was thus not immune to controversy and disputes were still being settled in July 2001, as land allocation was being brought to completion in rural areas.

To many Vietnamese, Resolution 10 is perceived as the major land reform undertaken since 1975, and some scholars attributed Vietnam's agricultural output growth to such liberalization (see e.g. Pingali and Vo-Tong, 1992). There is no denying that newly assigned property rights have unleashed farmers' incentives to invest and put effort, but much remained to be done to achieve further economic efficiency. The 1993 land law was an additional step towards this end.

2.3 The 1993 Land Law and the Issuance of Land-Use Certificates

The main focus of this paper is the 1993 land law. The spirit of the law is in continuation of the reforms undertaken by the government since 1988. Despite the allocation of land and its corresponding use rights, no transactions could be made officially. The 1993 land law made up for this deficiency. It granted five rights to the household: the right to transfer, exchange, inherit, rent and mortgage.[5] The law also extended the lease term to twenty years for annual crop land and fifty years for perennial crop land (Land Law of Vietnam 1993, Article 20). The implementation of the land law consisted of providing land-use certificates (LUCs) for the purpose of exercising these rights: for instance, if a landowner wanted to use his land as collateral for a loan, the LUC would be handed over to the lender. As the actual procedure for issuing the land titles has some relevance for our empirical strategy, it is worth going into some detail.

The issuance of LUCs is done as follows: individuals first have to apply for a land-use certificate (alternatively known as Land-Tenure Certificate or Red Book) through the commune-level People's Committee. The District Bureau of Land Administration then does the groundwork, which includes making a list of all land users, training the staff, purchasing

[5]There were further modifications to the land law in 1998 and in July 2001. The 1998 revisions granted further rights by making it possible to sub-lease land and also allowed Vietnamese entrepreneurs to use such rights as their contribution to a joint venture with a foreign company. The 2001 additions simplified procedures in urban areas.

materials, checking and updating the documents related to land such as cadastral maps, land survey records etc. In the meantime, a land registration committee is set up, which includes members from the District Bureau of Land Administration, as well as officials from the commune-level, district-level and sometimes province-level People's Committees. This process takes about four to five weeks. Application forms for land registration are then given out to all the land users in the commune, who are asked to list all the plots of land owned or allocated to them. This form has finally to be signed, not only by the land user himself, but also by all neighboring households in order to certify the absence of disputes regarding claims on the land.

The land registration committee scrutinizes all these forms and then decides whether a given land user is eligible or not. Land users are classified as ineligible if (i) they obtain the land through an illegal land transfer, i.e. without registering the transaction, without paying transfer taxes, or without a legal contract, (ii) they inherit the land from parents without a formal inheritance letter, so that old documents are still in the parents' names, (iii) they have no legal documents to prove their claim to the land, (iv) they are illegally occupying unallocated land, (v) they have not paid all their land taxes in the past, or (vi) there are disputes regarding their ownership or the boundaries of the land they claim. Within 10 days of sending these application forms, a public meeting is held where information regarding eligibility is made public. At this time, the land administration also tries to resolve these disputes. The list of land users who are eligible for receiving the LUC is then sent to the district-level People's Committee. Unresolved disputes are referred to a special working group within the General Department of Land Administration (henceforth GDLA, now part of the Ministry of Natural Resources and Environment, MONRE). After approval at the district-level, work begins on making the actual LUC for the land user. This stage is estimated to take about 1500-2000 man days per commune in urban areas, and this figure is likely to be similar in rural areas. In 1998, there were (on average) 160 communes per province, and 1300 households per commune.

Like some previous land reforms, the 1993 land law was unevenly implemented throughout the country. Because province-level differences in the speed of implementation of this reform is the key to our empirical strategy, we investigate the sources of such heterogeneity. According to Vo (1997), district Bureaus of Land Administration have on average five

members and most communes have only one land officer, which makes registration a lengthy process. Haque and Montesi (1996) also report the major reasons for this slow progress to be "a lack of adequate finances, a lack of trained cadres, a lack of interest and enthusiasm on the part of officials, a lack of proper direction and supervision and disputes among the cadres," which is consistent with the information given to us by the GDLA. GDLA also pointed out that another major factor which slowed down the process was the number of disputes that needed to be resolved prior to LUC issuance. An additional reason for delay may also be due to the fees related to registration and the backlog of taxes that some households may be required to pay to become eligible. However fees are not very high, below VND 20 000 (less than USD 1.50) in most areas.

Some aspects of this large land titling program gave rise to concerns regarding the long-term sustainability of this reform. The guidelines for implementation of the five rights was formulated and approved by GDLA in late 1998. In the meantime, substantial volumes of transactions had not been reported to the commune authorities, raising the concern that commune-level land registries would be outdated in a few years' time (Asian Development Bank, 1998). The certificates were issued at the household level rather than the plot level, which caused problems in updating the land-use certificate in the event of a land transaction. Following the passage of the New Land Law in November 2003, the government began issuing certificates at the plot-level.

3 What is the Potential Impact of the Land Law?

What is likely to be the impact of the land law and more specifically the issuance of LUCs? The longer lease term and the right to inherit decrease the likelihood that an individual and her offspring will be expropriated by the State, hence increasing the security of tenure on land and providing an incentive to undertake long-term investments. If such investment (e.g. planting perennial crops) is labor-saving, there may also be a shift to non-agricultural activities. The rights to transfer, exchange and lease LUCs create a formal market for land, which may achieve a better allocation of land than a centralized/informal system. The right to mortgage LUCs may allow farmers to undertake investments which have high up-front

costs, such as planting multi-year crops; however, access to credit markets might reduce the need to diversify economic activities as a means of consumption or income smoothing. The incremental impact of this right will depend on the relative inability of the commune to put in place implicit or explicit contracts aimed at providing incentives to reimburse loans.[6] We formalize these intuitions in a formal model below.

3.1 The Basic Setting

Consider a small open economy populated with farmers $i \in \{1, ..., N\}$, each having one plot of land. Each individual is endowed with one unit of labor that can be split between the three available technologies: non-farm activity, rice cultivation and perennial crop cultivation. The production functions are simply specified as follows: for any individual $i \in \{1, ..., N\}$, and plot of size μ,

$$\begin{aligned} nonfarm(l) &= f(l) &&= l \\ rice(l, \mu) &= g(l, \mu) &&= Gl^{\sigma}\mu^{1-\sigma} \\ perennial(l, \mu) &= h(l, \mu) &&= Hl^{\gamma}\mu^{1-\gamma} \end{aligned}$$

where l is the amount of labor invested by individual i. We assume that agricultural production exhibits constant returns to scale. Let $\{n, r, p\}$ represent the amounts of time devoted to non-farm activities, rice cultivation and perennial crop cultivation respectively. The key difference is that non-farm activities and rice cultivation are assumed to yield returns immediately, while returns from perennial crops are realized only in the future. Let ρ denote the share of land area devoted to perennial crop cultivation; the remaining $1 - \rho$ is used to grow rice. Aggregate land area is normalized to 1. Farmers have access to a credit market, where they can borrow in order to buy land or pay for any opportunity costs of undertaking long-term investments.

Economic activities are undertaken over two periods as follows:

- $T = 0$: Financial contracts between farmers and lenders are signed. Land exchange arrangements and investments are undertaken. Returns on non-farm activity and rice

[6] Anecdotal evidence collected during field work suggests that in some places, before 1993, commune authorities would commit not to reallocate land to households who defaulted on a loan.

cultivation are realized. Intermediate consumption takes place.

- $T = 1$: Farmers choose to repay loans or default, in which case their land is seized by the lenders. Output on perennial crops is realized. Final consumption takes place.

We assume that expropriation is characterized by a constant probability of expropriation α (reflecting the general insecurity of property rights and the possibility of land being taken over by the state for reallocation), and a probability of expropriation which is contingent on default β, where default is defined by the non-reimbursement of a loan contracted at time $T = 0$. In summary, agents have a probability α of losing their land even if they do not default on their loans, and a probability $\alpha + \beta$ if they do. The land expropriated unconditionally is redistributed to agents in a lump-sum manner, while the land expropriated under default is given to creditors in case of default. The timing of the economy also implies that expropriation matters only if perennial cultivation is undertaken. We model the land law as a change in the probability of $T = 1$ land expropriation as follows:[7]

Land Law: The land law is the transition of (α, β) from $(\alpha^{pre}, \beta^{pre})$ to $(\alpha^{post}, \beta^{post})$, such that $\alpha^{pre} \geq \alpha^{post}$ (improved security of tenure) and $\beta^{pre} \leq \beta^{post}$ (increased ability to pledge land as collateral).We assume that the land law is unanticipated by agents.

Land markets: A land allocation is a partition of the overall surface i.e. each individual i is allocated a plot of area μ_i, so that $\sum_{i=1}^{N} \mu_i = 1$. $(\mu_i)_{i\in\{1,\dots,N\}}$ denotes the land allocation schedule at the end of time $T = 0$, while the initial distribution of land is exogenous and is denoted $(\mu_i^0)_{i\in\{1,\dots,N\}}$. In the pre-1993 economy, μ is not a choice variable, i.e. $\mu = \mu^0$. In the post-1993 economy, μ is the outcome of a land market equilibrium, where η denotes the price of a marginal piece of land. We set the land price $\eta = 0$ in the pre-1993 economy.

Credit markets: Agents have access to an intertemporal saving technology with the risk-free rate normalized to 1. Furthermore, there exists an atomistic market, in which risk-neutral lenders can access funds at the risk-free rate, and lend these funds back to farmers. We assume free entry in the credit supply sector, so that lenders break-even in equilibrium. A financial contract for individual i consists of the following: (i) an amount B borrowed at

[7]Parameters and equilibrium values of the pre-1993 economy will henceforth have a superscript *pre* while post-1993 variables will be noted with a superscript *post*.

time $T = 0$, (ii) an interest rate τ so that τB is due at the beginning of time $T = 1$. We denote $\delta = 1$ if agent i defaults on her loan at $T = 1$.

Individual Preferences: Farmers' utility functions are defined over consumption in both time periods as follows:

$$U\left[C_0, C_1\right] = \ln C_0 + \ln C_1.$$

Farmers make consumption decisions $\{C_T\}_{T=0,1}$, savings decisions S, borrowing and reimbursement decisions $\{B, \delta\}$, and land, labor, and capital investment decisions $\{\rho, n, r, p, k\}$, in order to maximize their utility. In the post-1993 economy, they also make land market decisions.

We can decompose this optimization problem into two stages. In the first stage, farmers have μ_0 amount of land and one unit of labor, and take the vector (α, β, μ) as given. The optimization problem results in a reduced-form utility function as follows:

$$V\left(\alpha, \beta, \mu_i\right) = \max_{\substack{C_0, C_1, S, B \geq 0, \delta = \{0,1\} \\ \rho, n, r, p \in [0,1] \\ n+r+p \leq 1}} U\left[C_0, C_1\right]$$

subject to

$$\begin{cases} \eta\left(\mu - \mu^0\right) + C_0 + S & \leq & B + f\left(n\right) + g\left[r, \left(1-\rho\right)\mu\right] \\ \left(1-\delta\right)\tau B + C_1 & \leq & S + \left(1 - \alpha - \beta\delta\right) h\left(p, \rho\mu\right) \\ \left[1 - \left(1-\delta\right)\tau\right] B & \leq & \beta\delta h\left(p, \rho\mu\right) \end{cases}$$

In the second stage, farmers make land market decisions to maximize utility. In the pre-1993 economy, the land distribution is not a choice variable so that

$$V^{pre}\left(\alpha^{pre}, \beta^{pre}, \mu^{pre}\right) = V\left(\alpha^{pre}, \beta^{pre}, \mu^0\right).$$

In the post-1993 economy, farmers take land prices η as given in order to maximize their reduced-form utilities so that

$$V^{post}\left(\alpha^{post}, \beta^{post}, \mu^{post}\right) = \max_{\mu} V\left(\alpha^{post}, \beta^{post}, \mu\right).$$

The land market clearing condition determines land price η, given that $\sum_{i=1}^{N} \mu_i^{post} = 1$.

3.2 Equilibrium outcomes

We solve for a subgame-perfect equilibrium of the economy described above. Choosing to invest in perennial crops will depend on the ability to borrow in order to cover land purchases and the opportunity cost of intermediate consumption. Since perennial crops face a risk of expropriation α, farmers will allocate land across crops in order to maximize profits. Finally, depending on investment choices, the allocation of land across farmers will either be irrelevant (due to constant-returns-to-scale) or driven by how stringent credit constraints are. We summarize the main results below, deferring details of the proofs to the Appendix. For ease of exposition, we restrict attention to two extreme cases: either access to credit is unrestricted ($\beta = 1$), or absent ($\beta = 0$).

Result 1 (Crop choice): If expropriation risk α is high enough, then farmers devote the entire land area to rice cultivation. If α is not too high, and access to credit is unrestricted, then the entire land area is devoted to cultivating perennial crops. However, if access to credit is absent, then the need for intermediate consumption requires farmers to diversify across the two types of crops. Formally, the conditions are as follows:

$$\begin{array}{lll} \frac{1}{\sigma}\left(\sigma G\right)^{\frac{1}{1-\sigma}} \geq \frac{1}{\gamma}\left[\gamma\left(1-\alpha\right)H\right]^{\frac{1}{1-\gamma}} & \Rightarrow & \rho^* = 0 \\ \frac{1}{\sigma}\left(\sigma G\right)^{\frac{1}{1-\sigma}} < \frac{1}{\gamma}\left[\gamma\left(1-\alpha\right)H\right]^{\frac{1}{1-\gamma}} \quad \text{and } \beta = 1 & \Rightarrow & \rho^* = 1 \\ \frac{1}{\sigma}\left(\sigma G\right)^{\frac{1}{1-\sigma}} < \frac{1}{\gamma}\left[\gamma\left(1-\alpha\right)H\right]^{\frac{1}{1-\gamma}} \quad \text{and } \beta = 0 & \Rightarrow & \rho^* = \frac{\left[1-\eta\left(\mu^*-\mu^0\right)\right](1-\gamma)}{\frac{1-\sigma}{\sigma}\left(\sigma G\right)^{\frac{1}{1-\sigma}}\mu^*} - \gamma \end{array} \tag{1}$$

The interesting case is when perennial crops are a more productive technology in the absence of expropriation:

$$\frac{1}{\sigma}\left(\sigma G\right)^{\frac{1}{1-\sigma}} < \frac{1}{\gamma}\left(\gamma H\right)^{\frac{1}{1-\gamma}} \tag{2}$$

In this case, if α^{pre} was high enough such that $\frac{1}{\sigma}\left(\sigma G\right)^{\frac{1}{1-\sigma}} \geq \frac{1}{\gamma}\left[\gamma\left(1-\alpha^{pre}\right)H\right]^{\frac{1}{1-\gamma}}$, then an increase in the security of tenure i.e. a decrease in α leads to an increase in the proportional area dedicated to perennials.

Result 2 (Labor choice): In the absence of credit constraints, aggregate off-farm employment increases if and only if

$$(\sigma G)^{\frac{1}{1-\sigma}} \geq \left[\left(1-\alpha^{post}\right)\gamma H\right]^{\frac{1}{1-\gamma}}. \tag{3}$$

A necessary condition for this is that $\sigma > \gamma$ i.e. perennials need to be comparatively less labor intensive than rice cultivation. In the presence of credit constraints, $\sigma > \gamma$ is a sufficient condition to have an increase in aggregate off-farm employment.

Result 3 (Consumption): When households have access to credit, they maximize aggregate output and consumption is perfectly smoothed across periods. Thus, when $\beta^{post} = 1$,

$$C_0^{post} > C_0^{pre} \text{ and } C_1^{post} > C_1^{pre}.$$

In the presence of credit constraints and in the absence of any land sales or purchases i.e. $\mu^{pre} = \mu^{post}$, agricultural output at $T = 0$ necessarily drops as farmers decide to partially move away from rice, so that we have:

$$C_0^{post} < C_0^{pre}.$$

Result 4 (Land market activity): The first order condition to determine η,the market price of land is given by

$$\frac{df}{d\mu}\left[n^*(\mu)\right] + \frac{dg}{d\mu}\left[r^*(\mu), (1-\rho^*(\mu))\mu\right] + \frac{d}{d\mu}h\left[p^*(\mu), \rho^*(\mu)\mu\right]\frac{C_0^*}{C_1^*} = \eta \tag{4}$$

So there is activity in the land market only if (i) the initial land allocation was not efficient and there is access to credit or (ii) households change their decisions with regard to perennial crops and off-farm activities, and choose optimal land allocations accordingly.

4 Data and Empirical Strategy

4.1 Data

Our major source of data is the two rounds of the Vietnam Living Standards Survey, conducted by the General Statistical Office of the Government of Vietnam and funded by the

United Nations Development Program (UNDP) and the Swedish International Development Agency (SIDA). The first round of the survey was conducted in 1992-93 (henceforth VLSS-93) and the second round was conducted in 1997-98 (henceforth VLSS-98). We take the former as our pre-reform baseline data and the latter as our post-reform outcomes. Multi-stage stratified sampling techniques were used to select 4800 households in the first round. In 1998, the sample size was increased to 6000, of which 4285 households had been interviewed in the first round as well.[8] The surveys were structured on the lines of the World Bank LSMS (Living Standards Measurement Study) format and are considered high-quality data. They contain detailed information on household size and composition, educational attainment, health, employment, fertility, migration, household expenditures, agricultural activities, non-farm economic activities and borrowing and lending activities. Table 1 presents some basic characteristics of the rural households in the surveys, broken down into whether they were re-interviewed ("panel") households or new households. We note the large increase in real household expenditure between 1993 and 1998, consistent with the high growth rates enjoyed by the Vietnamese economy in this period.

Province-level data on progress of Land-Use Certificate issuance (number of households and communes with LUC), as well as the number of land department officials in each province, come from the records of GDLA in Hanoi. We have data on province-level population, agricultural yields and urbanization from the annual Statistical Yearbooks published by the General Statistical Office. We also use the 1994 Agricultural and Rural Census conducted by the Ministry of Agriculture and Rural Development to construct measures of infrastructure facilities in rural areas, as well as the extent of State farms in agriculture.

4.2 Empirical Strategy

Ideally we would like to compare economic activity choices across two households that differ only in the quality of land rights possessed by them. In our setting, we take the possession of a land-use certificate as an indicator of having good land rights. However we do not have household-level data on land registration, since the VLSS-98 does not ask this question.

[8]The attrition rate is around 7% in rural areas; it is higher for smaller, urban, more educated and richer households. The overall attrition rate is 11%.

We therefore use the province-level proportion of households with LUC as a measure of the probability that a given household would have a LUC. We will thus be using the differences in the level of LUC issuance across provinces to identify the impact of the land law. We will also use an alternative measure ("speed of registration") which captures how quickly the province issues LUCs to at least 50% of the households, which takes into account the whole process of LUC issuance over time.

We estimate the impact of the land reform using a differences-in-differences strategy, by comparing the difference between 1993 and 1998 (before and after reform) for the high-issuance provinces as compared to the low-issuance provinces. The regression equation we use is:

$$y_{ijt} = a_0 + a_1 T_t + a_2 R_j + a_3 (T_t \times R_j) + X_{ijt} b + \epsilon_{ijt} \tag{5}$$

where y_{ijt} represents the outcome of household i of province j at time t (1993 or 1998), T_t represents the time dummy (equal to 0 for 1993, and 1 for 1998), R_j is the measure of land reform implementation in province j (proportion of households with LUC in 1998 or number of years since LUC issuance crossed 50 percent threshold (speed measure))and X_{ijt} are other household characteristics. The two main outcomes we will consider are the proportion of cultivated area devoted to long-term crops, and the fraction of household labor devoted to non-farm activities. The coefficient a_1 represents the change between 1993 and 1998 for a province which had zero LUC issuance, while a_2 represents the difference between high-issuance and low-issuance provinces in 1993 (pre-existing difference). Our coefficient of interest is a_3, which tells us how much the high-issuance provinces have increased investment, compared to the low-issuance provinces over the period 1993-1998. We will be controlling for household characteristics like age, gender and education of the household head, total household size, ethnicity and total area cultivated. All our regressions are for households in rural areas only, since our land reform figures are for rural sector. Since our main explanatory variable, the LUC issuance measure, is measured at the province level, we will also cluster all our standard errors at the province level (see Bertrand et. al., 2004).

Our identification assumption is that the household-specific error term ϵ_{ijt} is uncorrelated with the province-level LUC issuance measure R_j. We should note that our estimate of a_3 will be biased upwards if there are province or household characteristics which are correlated both with the issuance of LUCs and with our outcome variables, or if households plant

long-term crops in an effort to obtain a longer lease term for their land. We should also note that since we use the province level issuance as a proxy for household land rights, our explanatory variable is likely to be subject to considerable measurement error, which can lead to an attenuation bias in our estimates.

The next section examines in greater detail whether LUC issuance is correlated with province level characteristics, and whether investments in long-term crops occur prior to land titling. We also control for all time-invariant household and province characteristics by running specification (5) using only the panel households, and including household fixed effects as follows:

$$y_{ijt} = a_i + a_1 T_t + a_3 (T_t \times R_j) + \epsilon_{ijt}$$

where a_i is a fixed effect for household i. This reduces our sample size since many households were not interviewed in both years; the panel specification could also lead to an increase in the attenuation bias caused by measurement error.

5 Implementation of the 1993 Land Law

Table 2 documents the progress of LUC issuance in Vietnam. About 24 percent of households had been issued land-use certificates at the end of 1994; by the end of 2000, this proportion had increased to 90 percent, consistent with the target of issuing certificates to more than 11 million rural households by the end of 2001. Table 2 also shows considerable variation across provinces in the speed of implementing this process. For instance, An Giang province had issued LUCs to 91 percent of households in 1994, at which time Lai Chau and Lang Son had made negligible progress. Similarly the proportion of households with LUCs in 1998 varied from 12 percent to 100 percent across different provinces. Another way of seeing this is the variation in the number of provinces which attained certain levels of LUC issuance over the years (Table 2, Panel B). For instance, 21 provinces crossed the 25 percent threshold in 1994; by 1998, 60 out of 61 provinces had attained this threshold. 16 provinces had issued LUCs to 50 percent or more of households by 1995 and 48 had attained this threshold by 1998. As of 2000, five provinces had yet to attain the 75 percent level of LUC issuance.

The identification strategy in this paper relies on the observation that the land law was not implemented homogeneously throughout the country. Our strategy is likely to give biased results if the province-level registration levels are correlated with other province-level characteristics, that also affect our dependent variables. We therefore try to see whether there are any observable systematic differences between high-LUC-issuance provinces and low-issuance ones. Table 3 reports regressions where the dependent variable is a measure of the LUC issuance in 1998, and the explanatory variables are province characteristics. Our two major measures of the prevalence of land rights due to the reform are the proportion of households with LUC in 1998,[9] and the "speed of registration" measure which we compute as 2001 minus the year in which LUC issuance reached 50 percent of households. While the first measure captures the status of issuance at a point of time, the second measure is based on the whole process of land titling over all the years. These two measures are highly correlated (correlation = 0.83).

As mentioned in section 2.3, land officials in Vietnam cited two main sources of delay in land titling: lack of manpower and the time taken to resolve disputes. To see whether this is indeed the case, we obtained (from GDLA) data on land department manpower at the province level in different years. We find that most provinces had less than two land officials per commune in these years. As expected, the number of land officials per commune (or per 1000 agricultural households) is somewhat positively correlated with measures of the speed of LUC issuance (Table 2, Panel C). However, these correlations are not very large and none of them are statistically significant. We were unable to obtain any quantitative information on the number of disputes in each province.

Table 3 shows that land registration is not strongly correlated with the land department manpower levels, or any other province characteristics such as population density, urbanization, proportion of communes having a market, mean level of education or per capita household expenditure. The results are qualitatively similar when we use land officials per 1000 agricultural households instead of land officials per commune; when we include paddy yields as an additional explanatory variable; and when we use proportion of households with LUC in years other than 1998 as a measure of the progress of land reform (results available upon request). We also tried specifications including weather variables (rainfall and sun-

[9]We choose 1998 because our household survey data are from this year; see section 4.

shine hours recorded in 1993), as well as a dummy for whether the province was already reporting coffee production in 1996: these variables do not have much explanatory power for our dependent variable; in particular, the coefficient on the coffee dummy is negative and insignificant.

We also considered the possibility that households might be planting long-term crops in advance of the LUC issuance in an effort to get a longer lease term for their land. If this is a major reason for differences in LUC issuance, we would expect to find a significant relationship between early investments in long-term crops and the extent of LUC issuance in 1998. To check for this, we regressed the LUC issuance on the proportion of land under perennial crops estimated from the 1994 Agricultural and Rural Census. By 1994, the law had been announced and several provinces had already made progress in implementing it. We find that this is not a significant predictor of LUC issuance in 1998 (Column 5). It could also be that the provinces differ on dimensions such as "good governance" or "progressiveness" which might reflect itself in both faster LUC issuance as well as greater incentives towards long-term crops. As a partial check for this, we included as an additional regressor the 2006 Provincial Competitiveness Index computed by the Vietnam Chamber of Commerce and Industry and the Vietnam Competitiveness Initiative (VNCI) and funded by the U.S. Agency for International Development. Again, this index is not a significant predictor of LUC issuance.[10] While our data and reform predate the index, this is a reasonable proxy for province level governance quality if such a characteristic changes slowly over time.

We note further that there is no significant difference in the implementation of the reform in the North and the South, despite the North's longer history of collectivization: In 1994, provinces in the North had on average 24 percent of households registered, while provinces in the South had a registration level of 23 percent. The corresponding figures for 1998 were 74 percent and 69 percent. The map in Figure 2 also demonstrates no specific geographical pattern in the progress of land reform across provinces. While it is still possible that there are some unobservable differences between high-issuance and low-issuance provinces, it is reassuring for our identification strategy that LUC issuance is not systematically related to any of the several different observable province characteristics. Since it is extremely rare to

[10]Results available from the authors on request. The results are unchanged when we use only the non-land components of the index.

find a "natural experiment" which assigns land rights in a truly random fashion (Galiani and Schargrodsky 2006, is an exception), this is probably the best that can be done to ensure comparability between treatment and control groups. The fact that our results are robust to restricting our sample to only the panel households also confirms that our results are not driven by some pre-existing province or household time-invariant characteristics.

6 Land rights and investment decisions

We first look at the impact of the 1993 land law on crop and labor decisions of rural households.

6.1 Crop choice

As discussed earlier, the additional land rights conferred by the 1993 land law might induce households to undertake more long-term investments on their land. One way of measuring this is by looking at the allocation of land between annual crops and multi-year industrial or fruit crops, which typically yield returns only after a few years. The major multi-year crops grown by Vietnamese farmers are coffee, tea, rubber, black pepper and cashew; fruit crops include citrus fruits, pineapples, bananas, and mangoes.

The difference-in-differences strategy is outlined in Table 4, panel A. Provinces have been divided into two categories, depending whether the proportion of households with land-use certificates in 1998 was above or below the sample median (80%). The numbers reported in panel A are the proportions of cultivated land devoted to perennial industrial and fruit crops in each year, averaged across all rural households, in the two categories of provinces. Thus, the differences in the bottom row are the differences across time for each of the two categories of provinces, while the differences reported on the right column shows for each year the difference in outcomes between low and high registration provinces. Finally, the bottom-right cell computes the difference-in-differences outcome: a household in a highly registered province in 1998, on average increases its share of cultivated land area devoted to perennial industrial and fruit crops by 5.6 percentage points more than a household in a

low-registration province.

Panel B of Table 4 presents a continuous version of Panel A, following specification (5). Consistent with the results of Panel A, Panel B shows that the land reform led to a statistically significant increase in the proportion of total cultivated area devoted to multi-year crops: a household in a province where everybody had a LUC would increase this proportion by 7.5 percentage points over the period 1993-98, compared to a household in a province where nobody was issued LUC (Panel B, column (2)). This means that if the proportion of households registered goes up by one standard deviation, the proportional area devoted to long-term crops will increase by 0.09 standard deviations. This increase comes at the expense of annual crops, which show a decrease of 6.5 percentage points in their share of total cultivated area (regressions not shown).[11] We control for household characteristics like age, education, gender, household size and ethnicity, as well as region fixed effects, while obtaining these estimates. The coefficients are also robust to other changes in the base specification, such as adding the household controls interacted with the time dummy, and to adding household income in 1993 or province-level mean per-capita income as additional regressors (regressions available upon request).

We perform a variety of robustness checks for our results. Column (3) reports the results when we restrict our sample to "panel" households only, who are interviewed in both 1993 and 1998, and use household fixed effects to control for any time-invariant household characteristics. The results from this are similar to the ones for the full sample, though the coefficient is smaller in magnitude.[12] This is not surprising, given that the attenuation bias of measurement error gets exacerbated in a panel regression.

We get very similar results when we use our speed of LUC issuance measure instead of the level of issuance in 1998 as the main explanatory variable: the results in column (4) indicate that if a province were to reach the 50 percent issuance level one year earlier, households in that province would on average increase the relative area devoted to long-term crops by 1.3 percentage points (0.06 standard deviations). Further, our results are also robust

[11] We should note that in the household surveys, some respondents answer questions about long-term crops by mentioning the number of trees they have, rather than the area devoted to them. Our results are robust to several ways of converting trees to areas.

[12] The results are identical when we control for time-varying effects of household characteristics.

to alternative measures of crop choice: we find positive and statistically significant results when we use a dummy for whether the household cultivates any long-term crops, as well as when we analyze multi-year crops and fruit crops separately. Finally, we should note that the coefficient on the land rights variable (a_2 in equation (5)) is usually negative, consistent with the results reported in Table 3. We thus feel that any bias in our estimates is likely to be downward, rather than in the upward direction.

Another reason why our results are likely to be underestimates is the institutional setting in Vietnam. While there is a fair amount of free choice given to households in choosing their crops, there are two main constraints. First, there can be externalities which might lead to restrictions on changing crops: a typical example of this is the planting of a tree which might cast a shadow on the neighbor's crops. Second, until recently, provincial level authorities planned aggregate crop allocations for food security purposes. Beyond these minimum quotas, districts and then communes would not receive stricter directives in terms of crop choice. Both of these obviously limit the size of the impact we can hope to find.

Given that regulatory and other concerns might result in provincial government influences on crop choice, we would like to verify that our results are not driven wholly by such influences. One way to do this is to directly control for government involvement in agricultural activity. For this, we compute agricultural areas cultivated by State farms for each province, using the 1994 Agricultural Census. We then use this variable as a control in our regressions. As can be seen in Appendix Table 1, our main coefficients of interest are largely unchanged, and in fact slightly larger than in the base specification.

6.2 Labor Choice

The 1993 land law is found to have had a significant impact on the number of weeks worked in non-farm activities per working member in the household (Table 5). Our base estimates from Panel B, column (3) indicate that a household in a high LUC-issuance province increases its non-farm activity by 2.7 weeks per working member between 1992-93 and 1997-98. The most common non-farm activities reported by households in the VLSS were sales in markets, food processing, woodworking, and work in the textiles and garment industry. In terms of

standard deviations, our estimates mean that a one standard deviation increase in the level of LUC issuance would increase non-farm weeks worked per household member by 0.06 standard deviations. While the estimate may not be too large in terms of weeks worked per household member, it corresponds to an increase of between 11 and 12 weeks worked in the nonfarm sector for the household, as the average number of working members in the household was 4.37 in 1992-93 and 4.46 in 1997-98.

We perform robustness checks for these results in columns (4)-(6) in Table 5, Panel B. Results for panel households indicate an increase of 3.2 weeks worked per household member in the nonfarm sector (column (4)); this is quite close to our base estimate of 2.7 weeks. Our results are robust to using the speed measure of land rights: attaining the 50 percent level of LUC issuance one year sooner results in an increase of 0.3 weeks worked per member in nonfarm activities (column (5)). We also check the results using the number of hours worked per week in the previous 7 days as an alternative dependent variable. The results are fairly close to our base specification: assuming that households work 8 hours a day and 52 weeks a year, the estimate of 0.365 hours per week from column (6) translates to an increase of 2.37 weeks per year. Appendix Table 2 verifies that these results are not driven solely by state involvement in the economy, by controlling for the labor employed by state farms in 1994.

6.3 Results in different sub-samples

Table 6 investigates these results further in different sub-samples. The results seem to indicate that the land reform increased the proportional area devoted to long-term crops by a larger margin for households which owned more land (Panel A, columns (4) and (5)). The impact is a little larger for households which live in communes where credit institutions are located nearby (columns (6) and (7)) and where there are alternative sources of credit available (columns (8) and (9)). This seems to indicate a role for credit institutions, though the estimates in columns (6) and (8) are not statistically different from those in (7) and (9) respectively.[13] We investigate the role of credit in greater detail in section 7.2. The impact is also somewhat higher in provinces with a more land inequality in 1993 (columns (10) and

[13]The test of significance is based on combining these regressions and estimating triple interaction coefficients. We chose to report separate regressions in the paper for expositional simplicity.

(11)), indicating that the land distribution might play a role; we investigate this possibility further in section 7.1. The results are remarkably similar across poor and rich households (columns (2) and (3)).

Similar analysis for the labor choice variable (Table 6, Panel B) indicates the impact is very similar across poor and rich households, but greater for households having less land to begin with. The impact on labor choice is higher for households living in communes where credit institutions are further away, and where there are no alternative sources of credit: this is consistent with the idea that non-farm activities can be used as a consumption-smoothing device when credit markets do not function perfectly. The results are also somewhat higher in areas with higher land inequality. Again, as for crop choice, none of these differences across subcategories is statistically significant, so there results are only indicative and not conclusive.

In the next section, we investigate the mechanisms behind our main results more closely.

7 What are the Mechanisms at Work?

In the previous section, we found an increase in long-term investments, measured by the percentage of agricultural land devoted to long-term perennial crops, as well as an increase in labor devoted to non-agricultural activities. In this section, we try to deepen our understanding of the mechanisms underlying the observed transition, based on our results in Section 3.

7.1 Land Markets

Analysis of land market transactions is complicated by the possibility of substantial underreporting by respondents. This is both because land transactions were illegal before the land law of 1993 (but were nevertheless taking place on an informal basis), and because there was a high tax (10%) imposed on land transactions until 1999.[14] Nevertheless, there

[14] Authors' conversation with GDLA officials.

is an increase in reported land market transactions between 1993 and 1998: the proportion of households who report receiving land increases ten-fold from 2.5 percent in 1993 to 25 percent in 1998, a similar ten-fold increase is seen for households reporting sales of land (from 1 percent to 10 percent). This could however simply reflect less under-reporting after the law was passed. The increase does not seem to be very different across high-issuance versus low-issuance provinces (see Table 7). The participation of households in the land rental market also increases between 1993 and 1998, but again, is not systematically related to the progress of land certificate issuance (results not shown).[15] Our theoretical framework and the results of the next section suggest that this is most probably because of credit constraints, though it is possible that the initial allocation itself was the optimal one, as suggested by Ravallion and van de Walle (2003).

A province-level analysis of land distribution also suggests that there is not much difference between provinces with high and low LUC issuance (see Table 8). Province-level Gini coefficients of land ownership decline over time (Panel A). The decrease is mainly for provinces in the South (from 0.58 to 0.50) which started at much higher levels of inequality than the North, where the Gini remains constant at around 0.37. There is no difference in the change in Gini by province LUC issuance levels. Further, there is not much evidence that formalizing land rights creates increasing landlessness, because people are now able to sell land in times of need (Table 8, Panel B). The proportion of landless households decreases from 11.4% to about 7% overall, but the trends are similar across high-issuance and low-issuance provinces.

7.2 Credit Markets

As outlined earlier, the land reform can affect crop choice both by increasing the incentive to invest in long-term crops and by making access to credit markets easier as farmers can now pledge land as collateral for a loan. In particular, having a pledgeable land-use certificate might be expected to increase a household's access to credit from formal sources such as

[15]We should note that the data on renting are not fully comparable across the two surveys: the 1993 survey asks separately about land rented in and land sharecropped, while the 1998 survey does not ask about sharecropping. In our analysis, we include sharecropping as part of land rented in.

banks and credit cooperatives. Table 9, however, shows that the issuance of LUCs does not lead to households being more likely to have an outstanding loan. Approximately half of all households in our sample have outstanding loans (51% in 1993 and 54% in 1998): the probability of having a loan is 11 percentage points lower for households in high-issuance provinces (Panel A, column (2)). This difference is, however, statistically insignificant. Households in highly-registered provinces also do not show an increase in the proportion of loans from formal sources (Panel B), nor do they show any increase in the amount they borrow (results available on request). We also see that households in communes with lower access to credit institutions show a marginally significant decline in the probability of having an outstanding loan over this period (Panel A, column (6)).

Overall, we do not find evidence that the 1993 land law resulted in increased access to credit, which is somewhat surprising given that the right to mortgage was one of the rights conferred by the law. However, in practice, it is very hard for banks to seize land in cases of default, partly because regulations to deal with defaulting households had not been fully clarified at that time, and also because commune officials were not likely to support transfers of land to people outside the village. Thus the usual practice in case of default, of the Vietnam Bank of Agriculture and Rural Development, for instance, was to try and reschedule the loans or to stop lending to the defaulting household in future.[16]

7.3 Within-Households or Between-Households?

Our model predicts that under the assumption of perennials being a labor saving technology, the shift towards perennials should take place alongside with a diversification of labor off the farm. An alternative mechanism implies specialization across households: some households would specialize in agriculture, while others would devote time to off-farm employment. In order to find additional evidence to discriminate these two potential channels, we test whether households who undertake crop changes are also the same households that devoted more time off the farm. The results in Table 10 indicate that the changes in crop choice and labor choice documented in section 6 occur mainly within households, lending little support for a specialization channel. We conduct this analysis as follows: we restrict attention to

[16] Authors' conversation with VBARD officials.

"panel" households and compute the change in crop and labor choices between 1992-93 and 1997-98. Depending on whether these differences are positive (denoted 1) or non-positive (denoted 0), households are divided into four categories (00, 01, 10, and 11 respectively).[17] We then conducted a multinomial logit regression of this categorical variable on the measure of land rights, where the base category (denoted 00) was chosen to be the category of households that did not increase either their multi-year crop cultivation or their nonfarm weeks of work. Table 9 reports the relative risk ratios that indicate how much more likely we are to observe a given category rather than the base category. In particular, an increase of the level of LUC issuance from 0 to 100% makes it 3.169 times more likely for a given household to be of category 11, than of category 00. The transition towards the two other categories (namely 01 and 10) is not significant. These results, together with those of section 7.1, suggest that the changes we observe in crop and labor choices occur more within households than between households.

7.4 Income and Consumption

An improvement in the security of tenure is expected to translate into increased lifetime income and expenditure. However, the relatively short time-lag between the implementation of the 1993 land law and the 1997-1998 survey might suggest that we do not capture steady-state outcomes, but rather transitional outcomes. This is especially true because investments in crops such as tea or coffee yield returns only after a minimum of three or four years. In the absence of credit constraints, the transition towards cultivation of perennial crops increases permanent income, which should translate to an increase in current consumption. Such an absence of credit constraints corresponds to the rate of time preference and the rate of interest being equal for the household.[18] However, when credit constraints are binding, consumption along the transition path can decrease: if investment prospects are good enough, then agents will accept a drop in consumption in the first period to enjoy higher incomes in the second period (see Result 3 in Section 3).

Table 11 shows results obtained from the estimation of (5), in which the left-hand side

[17] The medians of such differences are close to zero.

[18] We thank an anonymous referee for pointing this out.

variables of interest are real household expenditure and a measure of farm income. We find no significant effect of the 1993 land law on either of these outcomes. This, together with the results of section 7.2, indicate that the land law has not been very effective in alleviating credit constraints for rural households. The absence of any effect on consumption can admittedly be caused by an attenuation bias due to measurement error. But beyond this concern, the results obtained in this paragraph are consistent with a transition economy with credit constraints and imperfect consumption smoothing.

8 Conclusion

Vietnam's 1993 Land Law made land rights secure, pledgeable and tradable, and was implemented by means of an extensive rural land titling program. We showed that this reform had a statistically significant impact on the decisions of households to undertake long-term agricultural investments and at the same time devote labor to non-farm activities. However, these results were not very large in magnitude; in particular, issuing land titles to all households would result in only a 0.3 standard deviation increase in the proportion of land devoted to long-term crops. We find no significant impact on overall household consumption expenditure or agricultural income.

We tested several mechanisms which can account for this transition in the rural economy. We found no evidence that land titles increased access to credit on the part of rural households; neither were they significant determinants of land market activity. We also find no evidence that the 1993 land law resulted in major changes in the land distribution in Vietnam. We conclude that the results we observe stem primarily from increasing the security of tenure of the landholders, the formal title being interpreted as a guarantee against future expropriation by the State. Another conclusion of our study is that implementing land titling programs without complementary changes in the banking system and the rules regarding land transactions are not likely to result in dramatic changes in the rural economy. This conclusion is subject to two caveats related to the short period of our analysis: first, the increases in investment we observe are likely to yield greater returns in the future, and we may thus be underestimating the gains from this land reform. Second, we cannot rule

out the possibility that the reform might lead to significant changes in the functioning of the land and credit markets over time, thereby allowing households to capture the full benefits of formal land titles.

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9 Appendix

9.1 Equilibrium outcomes

We solve the model set out in Section 3 as follows:

Borrowing and consumption decisions: As lenders break-even in equilibrium, agents internalize their default decisions so that $\tau^* = 1$ and $\delta^* = 0$: default does not occur on the equilibrium path. Savings and borrowings are thus perfect substitutes, and we adopt the convention that $S^* = 0$,with a negative value of B^* denoting net savings. The incentive-compatibility constraint for the borrower determines her pledgeable income, or formally $B^* \leq \beta h\left(p^*, \rho^*\mu^*\right)$. Consumption decisions are such that time $T = 0$ and $T = 1$ budget constraints are binding:

$$\begin{cases} C_0^* &= B^* - \eta\left(\mu^* - \mu^0\right) + f\left(n^*\right) + g\left(r^*, \left(1-\rho^*\right)\mu^*\right) \\ C_1^* &= \left(1-\alpha\right) h\left(p^*, \rho^*\mu^*\right) - B^* \end{cases}$$

and the level of savings/borrowings allows individuals to smooth consumption across time periods:

$$B^* = \min\left[\beta h\left(p^*, \rho^*\mu^*\right), \Psi^*\right], \tag{6}$$

in which Ψ^* equalizes C_0^* and C_1^*. Thus, credit markets have two functions: smooth consumption over time when land purchases need to be paid up-front, or intermediate consumption needs to be financed when households adopt perennial crops.[19]

Labor and crop choices: When credit access is unrestricted, labor allocations are determined by the equalization of marginal productivity of labor with the prevailing wage rate, which is normalized to 1. Thus, for given areas $\rho^*\mu^*$ and $\left(1-\rho^*\right)\mu^*$ dedicated to perennials and rice cultivation respectively, the first-order conditions imply:

$$\begin{cases} p^* &= \left[\left(1-\alpha\right)\gamma H\right]^{\frac{1}{1-\gamma}} \rho^*\mu^* \\ r^* &= \left(\sigma G\right)^{\frac{1}{1-\sigma}} \left(1-\rho^*\right)\mu^* \end{cases}. \tag{7}$$

[19]We ignore any potential set-up cost that perennials will require. They are assimilated to opportunity costs of intermediate consumption.

Since consumption can be perfectly smoothed over time, only total output matters. Constant returns to scale implies that only one crop is going to be cultivated: $\rho^* \in \{0, 1\}$ and

$$\rho^* = 0 \Leftrightarrow \frac{1}{\sigma} (\sigma G)^{\frac{1}{1-\sigma}} \geq \frac{1}{\gamma} [\gamma (1-\alpha) H]^{\frac{1}{1-\gamma}} . \tag{8}$$

Then, we can rewrite (7) as

$$(p^*, r^*) = \begin{cases} \left([(1-\alpha)\gamma H]^{\frac{1}{1-\gamma}} \mu^*, 0 \right) & \text{if } \frac{1}{\sigma} (\sigma G)^{\frac{1}{1-\sigma}} < \frac{1}{\gamma} [\gamma (1-\alpha) H]^{\frac{1}{1-\gamma}} \\ \left(0, (\sigma G)^{\frac{1}{1-\sigma}} (1-\rho^*) \mu^* \right) & \text{otherwise} \end{cases} \tag{9}$$

When credit constraints bind ($\beta = 0 \Rightarrow B^* = 0$), optimal crop and labor choices will trade off the opportunity cost of intermediate consumption against higher final consumption levels. The first-order conditions are now:

$$r^* = (\sigma G)^{\frac{1}{1-\sigma}} (1-\rho^*) \mu^*, \tag{10}$$

while

$$\frac{\partial}{\partial l} g (r^*, (1-\rho^*) \mu^*) = \frac{\partial}{\partial l} h (p^*, \rho^* \mu^*) \frac{C_0^*}{C_1^*} \tag{11}$$

and

$$\frac{\partial}{\partial \mu} g (r^*, (1-\rho^*) \mu^*) = \frac{\partial}{\partial \mu} h (p^*, \rho^* \mu^*) \frac{C_0^*}{C_1^*}. \tag{12}$$

The left-hand sides of (11) and (12) capture the opportunity cost of moving away from rice while the right-hand side measures the gains due to increased perennial crop cultivation. As consumption is not smoothed across periods, second-period consumption is valued relatively less than in the first-best case. If (8) holds, then households dedicate land and labor to rice cultivation, and save in order to smooth consumption over time. Otherwise, access to credit allows households to borrow against future earnings, so that they dedicate land and labor to perennial cultivation.

Otherwise, when perennials are more productive but credit is not available, $T = 0$ consumption cannot be financed by credit. As $\frac{\partial}{\partial l} g (r^*, (1-\rho^*) \mu^*) = 1$, the ratio of consumption levels is equal to

$$\frac{\partial}{\partial l} h (p^*, \rho^* \mu^*) \frac{C_0^*}{C_1^*} = 1,$$

so that, after rearranging, we obtain

$$p^* = \frac{\gamma}{1-\gamma} \frac{1-\sigma}{\sigma} (\sigma G)^{\frac{1}{1-\sigma}} \rho^* \mu^*, \tag{13}$$

and

$$n^* = 1 - (\sigma G)^{\frac{1}{1-\sigma}} \left[1 - \rho^* + \frac{\gamma}{1-\gamma}\frac{1-\sigma}{\sigma}\rho^*\right] \mu^* \tag{14}$$

The optimal crop allocation is then given by

$$\rho^* = \arg\max_{\rho} \ln\left[f\left(n^*\right) - \eta\left(\mu^* - \mu^0\right) + g\left(r^*, \left(1-\rho\right)\mu^*\right)\right] + \ln\left[\left(1-\alpha\right)h\left(p^*, \rho\mu^*\right)\right].$$

The first-order conditions give the following optimal crop choice as an interior solution

$$\rho^* = \frac{\left[1 - \eta\left(\mu^* - \mu^0\right)\right]\left(1-\gamma\right)}{\frac{1-\sigma}{\sigma}\left(\sigma G\right)^{\frac{1}{1-\sigma}}\mu^*} - \gamma \tag{15}$$

Combining (8) and (15) ,we obtain **Result 1**.

Suppose that α^{pre} is such that $\frac{1}{\sigma}\left(\sigma G\right)^{\frac{1}{1-\sigma}} \geq \frac{1}{\gamma}\left[\gamma\left(1-\alpha^{pre}\right)H\right]^{\frac{1}{1-\gamma}} => \rho^{pre} = 0$. Given (2), a decrease in α eventually makes perennial crops more attractive than rice. Thus, either households entirely or partially shift towards perennials, so that the share of land devoted to perennial crops unambiguously increases:

$$\rho^{pre} < \rho^{post}.$$

Labor choice: On the labor market, $r^{pre} = \left(\sigma G\right)^{\frac{1}{1-\sigma}}\mu^{pre}$, so that off-farm activities are given by

$$n^{pre} = 1 - \left(\sigma G\right)^{\frac{1}{1-\sigma}}\mu^{pre}$$

When transition takes place with access to credit, then

$$n^{post} = 1 - \left[\left(1-\alpha^{post}\right)\gamma H\right]^{\frac{1}{1-\gamma}}\mu^{post}$$

so that off farm employment increases if and only if

$$\left(\sigma G\right)^{\frac{1}{1-\sigma}}\mu^{pre} \geq \left[\left(1-\alpha^{post}\right)\gamma H\right]^{\frac{1}{1-\gamma}}\mu^{post}.$$

In the aggregate, land area is unchanged, so that, by linearity, aggregate off-farm employment increases if and only if

$$\left(\sigma G\right)^{\frac{1}{1-\sigma}} \geq \left[\left(1-\alpha^{post}\right)\gamma H\right]^{\frac{1}{1-\gamma}}.$$

A necessary condition for this to hold is that $\sigma > \gamma$ i.e. perennials need to be comparatively less labor intensive than rice cultivation in order to save labor when shifting away from rice.

In the presence of credit constraints, off-farm employment is given by

$$n^{post} = 1 - (\sigma G)^{\frac{1}{1-\sigma}} \left[1 - \rho^{post} + \frac{\gamma}{1-\gamma}\frac{1-\sigma}{\sigma}\rho^{post}\right]\mu^{post}$$

so that an individual will increase off-farm employment if and only if

$$\left[1 - \rho^{post} + \frac{\gamma}{1-\gamma}\frac{1-\sigma}{\sigma}\rho^{post}\right]\mu^{post} \leq \mu^{pre}.$$

In the aggregate, $\sigma > \gamma$ implies that $1 - \rho^{post} + \frac{\gamma}{1-\gamma}\frac{1-\sigma}{\sigma}\rho^{post} < 1$, so that

$$\sum n^{post} \geq \sum n^{pre}.$$

Consumption choices: We have seen that transition creates the demand to borrow in order to smooth consumption over time as the newly adopted perennial crop delivers output only in period $T = 2$. The result is reinforced by the need to borrow in order to cover set-up costs (not modeled here), or purchase land. When households have access to credit, they maximize aggregate output and consumption is perfectly smoothed across periods. Thus, when $\beta^{post} = 1$,

$$C_0^{post} > C_0^{pre} \text{ and } C_1^{post} > C_1^{pre}.$$

The result might differ when credit constraints are binding. As agents trade-off the marginal utility of $T = 0$ consumption against the marginal utility of $T = 1$ consumption, they might decrease $T = 0$ consumption in order to enjoy more wealth at the second period. To see this, let's formally compare pre and post land law $T = 0$ consumption levels. Pre-reform, assuming that $\alpha = 0$, agriculture consists exclusively of rice so that

$$C_0^{pre} = 1 + \left[\frac{1-\sigma}{\sigma}(\sigma G)^{\frac{1}{1-\sigma}}\right]\mu^{pre}.$$

In the presence of credit constraints and in the absence of any land sales or purchases, $T = 0$ consumption is determined by (10) and (14) :

$$\begin{aligned} C_0^{post} &= 1 - (\sigma G)^{\frac{1}{1-\sigma}}\left[1 - \rho^{post} + \frac{\gamma}{1-\gamma}\frac{1-\sigma}{\sigma}\rho^{post}\right]\mu^{post} + \frac{1}{\sigma}\left[(\sigma G)^{\frac{1}{1-\sigma}}\right]\left(1-\rho^{post}\right)\mu^{post} \\ &= 1 + \frac{1-\sigma}{\sigma}(\sigma G)^{\frac{1}{1-\sigma}}\left[\left(1-\rho^{post}\right) - \frac{\gamma}{1-\gamma}\rho^{post}\right]\mu^{post} \end{aligned}$$

so that if $\mu^{pre} = \mu^{post}$, then

$$C_0^{post} < C_0^{pre}.$$

As farmers decide to partially move away from rice, agricultural output at $T = 0$ necessarily drops, which translates into a drop in consumption as credit market access is restricted. If we relax the assumption that $\beta^{post} = 0$, then households can borrow against $T = 1$ agricultural output, so that consumption does not necessarily drop and eventually increases along the transition path.

Land allocation: When land is entirely devoted to either rice or perennials, the agricultural production function exhibits constant returns to scale, so that land distribution is irrelevant. On the other hand, in the presence of credit constraints and crop diversification, the optimal allocation of land equalizes marginal product of land across households. The price of the marginal piece of land is such that the marginal farmer owning μ^* is indifferent between selling, purchasing or keeping his piece of land. In the presence of credit constraints, land sales and purchases trade-off the increased agricultural output against the marginal utility of $T = 0$ consumption as land purchases need to be financed out of retained earnings. Demand ($\mu^* > \mu^0$) and supply ($\mu^0 > \mu^*$) of land is then driven by

$$\mu^* = \arg\max_{\mu} \ln\left[f\left(n^*\right) - \eta\left(\mu^* - \mu^0\right) + g\left(r^*, \left(1-\rho^*\right)\mu\right)\right] + \ln\left[\left(1-\alpha\right)h\left(p^*, \rho^*\mu\right)\right]$$

where η is such that $\sum \mu^* = 1$, and equilibrium labor and crop investments are given by (10), (13), (14) and (15) and are all functions of μ. First-order conditions are such that

$$\frac{df}{d\mu}\left[n^*\left(\mu\right)\right] + \frac{dg}{d\mu}\left[r^*\left(\mu\right), \left(1-\rho^*\left(\mu\right)\right)\mu\right] + \frac{d}{d\mu}h\left[p^*\left(\mu\right), \rho^*\left(\mu\right)\mu\right]\frac{C_0^*}{C_1^*} = \eta \tag{16}$$

The left hand side of (16) captures the marginal utility gain from increasing land area, while the cost is land price η.

TABLE 1: CHARACTERISTICS OF SURVEY HOUSEHOLDS

Sample: Rural households

	1993 survey	1998 survey	
		Panel hhs	Replacement hhs
# households	3840	3375	894
Age of household head	44.85	47.47	45.63
	(14.79)	(13.81)	(14.07)
Household size	4.97	4.79	4.84
	(2.12)	(1.90)	(1.85)
Sex of household head (1=Male)	0.77	0.77	0.84
	(0.42)	(0.42)	(0.37)
Ethnicity (1=Kinh)	0.86	0.84	0.82
	(0.35)	(0.36)	(0.38)
Literate household head (1=literate)	0.88	0.88	0.86
	(0.33)	(0.33)	(0.34)
Years of education of household head	5.96	6.48	6.03
	(4.07)	(3.90)	(3.85)
Real household expenditure ('000 dong)	5541.00	10189.95	11487.02
	(3856.02)	(6426.11)	(7278.54)
Farming as main occupation	0.83	0.78	0.76
	(0.38)	(0.42)	(0.43)

Source: Vietnam Living Standards Measurement Study Surveys 1993 and 1998
All means weighted by sampling weights.

TABLE 2: MEASURES OF LAND RIGHTS

Panel A	Proportion of households registered				
	Mean	North	South	Min	Max
1994	0.237	0.246	0.227	0.001	0.914
1995	0.367	0.345	0.391	0.040	0.960
1996	0.435	0.404	0.469	0.074	0.952
1997	0.632	0.597	0.667	0.111	1.000
1998	0.713	0.687	0.740	0.119	1.000
2000	0.902	0.893	0.911	0.533	1.000

Panel B	# provinces with registration more than		
Year	25%	50%	75%
1994	21	8	4
1995	33	16	6
1996	44	25	14
1997	57	43	28
1998	60	48	38
2000	61	61	56

Panel C Correlation among registration measures and manpower measures

% hh registered 1998	1.000							
% hhs registered 1996	0.644	1.000						
% hhs registered 1994	0.376	0.595	1.000					
Years since reg> 25%	0.492	0.691	0.697	1.000				
Years since reg> 50%	0.828	0.799	0.648	0.619	1.000			
Officials/commune 1994	0.102	-0.033	-0.050	-0.016	0.072	1.000		
Officials/commune 1998	0.113	0.250	-0.087	0.136	0.111	0.062	1.000	
Officials/1000 hhs 1994	0.081	-0.118	0.077	-0.016	0.070	0.465	-0.070	1.000
Officials/1000 hhs 1998	-0.007	-0.051	0.110	0.076	0.015	-0.018	0.304	0.702

Notes: Figures computed by authors from data provided by General Department of Land Administration, Hanoi.
Proportion of households registered in Panel A refers to the number of households who possess a Land Use Certificate as a fraction of the total number of households. For 1996, 1998 and 2000, GDLA provided the total number of households. For the remaining years, total number of households is estimated by authors based on total number of agricultural households.
The entries in Panel B are the number of provinces in which the proportion of households registered exceeds the specified threshold (25%, 50%, 75%).
"Years since reg> 25%" is 2001 minus the year in which LUC issuance in the province exceeded 25%.
"Officials/commune" is the number of land department officials in the province divided by the total number of communes in the province.
"Officials/1000 hhs" is the number of land department officials in the province divided by the total number of agricultural households.

TABLE 3: WHAT DETERMINES IMPLEMENTATION OF LAND REFORM ?

Sample: Provinces

	% HHs registered 1998					Speed of registration			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(7)	(8)
Land officials/commune		0.063	0.069	0.055	0.055		0.803	0.618	0.523
(1994)		(0.072)	(0.065)	(0.052)	(0.053)		(0.720)	(0.517)	(0.524)
Population density 1993	-0.012	-0.012				-0.097	-0.089		
	(0.015)	(0.015)				(0.115)	(0.114)		
Total area of province ('000 sq km)	-0.128	-0.099				-0.135	0.333		
	(0.123)	(0.132)				(0.920)	(1.046)		
Proportion urban 1993	0.343	0.230				-0.147	-0.854		
	(0.310)	(0.318)				(2.587)	(2.537)		
Proportion under perennial crops 1993	-0.137	-0.170				-2.133	-2.732		
	(0.191)	(0.210)				(3.039)	(3.168)		
Proportion under perennial crops 1994					0.005				
					(0.154)				
Dummy for North	-0.030	-0.012	0.033	0.113	0.115	-0.723	-0.665	0.092	0.527
	(0.071)	(0.071)	(0.074)	(0.120)	(0.130)	(0.646)	(0.661)	(0.589)	(0.997)
Prop. Communes having market			0.142					1.539	
			(0.207)					(1.650)	
Prop. Communes having highway			-0.184					-2.861	
			(0.159)					(2.051)	
Prop. Communes having clinic			0.400					0.320	
			(0.368)					(2.844)	
Mean age of HH head (1993)				0.022**	0.022**				0.088
				(0.009)	(0.010)				(0.086)
Mean HH size (1993)				0.049	0.049				0.914
				(0.060)	(0.061)				(0.561)
Mean years of education (1993)				0.019	0.019				0.157
				(0.026)	(0.027)				(0.262)
Log per capita expenditure (1993)				0.204	0.204				1.672
				(0.166)	(0.166)				(1.398)
Observations	59	57	57	54	54	57	55	55	54
R-squared	0.06	0.07	0.11	0.18	0.18	0.05	0.06	0.09	0.14

Notes: Robust standard errors in parantheses. * significant at 10%; ** significant at 5%; *** significant at 1%

"%HHs registered" is the proportion of rural households in the province who have a Land Use Certificate.

"Speed of registration" is computed as 2001 minus the year when 50% of households in the province obtain LUC.

Regressions exclude Hanoi and Ho Chi Minh City, which are outliers in terms of population density and urbanization rates.

Regression (6) and (7) exclude old Song Be province, which is an outlier.

TABLE 4: LAND RIGHTS AND CROP CHOICE

Sample: Rural households
Dependent variable =Proportion of total cultivated area devoted to perennial industrial crops and fruit crops

PANEL A: Difference-in-difference estimate (discrete)

	% hhs with LUC		
	below median (<80%)	above median (>80%)	Difference
1993 Survey	0.1017	0.0870	-0.0147
			(0.0347)
1998 Survey	0.0959	0.1372	0.0413
			(0.0382)
Difference	-0.0058	0.0502	0.0560
	(0.0149)	(0.0132)***	(0.0199)***

PANEL B: Difference-in-difference estimate (continuous)

	No controls	Region FE	Panel hhs	Alternative land rights measure	Discrete measure	% perennial	% fruit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Land rights*Year=1998	0.080***	0.075***	0.053*	0.013**	0.148*	0.041**	0.034**
	(0.025)	(0.025)	(0.031)	(0.005)	(0.088)	(0.021)	(0.015)
Year=1998	-0.033	-0.033*	-0.019	-0.029*	0.025	-0.025*	-0.008
	(0.020)	(0.017)	(0.035)	(0.017)	(0.068)	(0.013)	(0.008)
Land rights	0.038	-0.011		-0.010*	-0.087	-0.003	-0.008
	(0.047)	(0.027)		(0.006)	(0.094)	(0.023)	(0.010)
Age of household head		0.002***		0.002***	0.004***	0.001***	0.001***
		(0.000)		(0.000)	(0.001)	(0.000)	(0.000)
Male household head		-0.020**		-0.021**	-0.010	-0.017**	-0.003
		(0.010)		(0.010)	(0.015)	(0.007)	(0.005)
Years of education of head		0.008***		0.008***	0.014***	0.005***	0.003***
		(0.002)		(0.002)	(0.002)	(0.001)	(0.001)
Household size		-0.002		-0.003	0.011***	-0.002	-0.000
		(0.002)		(0.002)	(0.004)	(0.002)	(0.001)
Majority ethnic group dummy		0.003		0.003	-0.039	-0.005	0.008
		(0.030)		(0.029)	(0.058)	(0.031)	(0.008)
Total area cultivated ($*10^{-5}$)		-0.208**		-0.214**	0.127	-0.056	-0.151***
		(0.090)		(0.095)	(0.104)	(0.070)	(0.046)
Region fixed effects	no	yes	no	yes	yes	yes	yes
Household fixed effects	no	no	yes	no	no	no	no
No. of observations	7469	7469	6012	7469	7469	7469	7469
No. of provinces	59	59	59	59	59	59	59
R-squared	0.01	0.22	0.81	0.22	0.07	0.22	0.06

Standard errors in parentheses, corrected for province-level clustering.* significant at 10%; ** significant at 5%; *** significant at 1%.
All regressions weighted by sampling weights.
"Land rights" is the province-level proportion of households holding a Land Use Certificate (LUC).
Regression (5) uses an alternative measure of land rights: the speed of registration measure which is 2001 minus the year in which LUC issuance crosses 50%.
"Discrete measure" equals 1 if the household reports cultivating any perennial crops and/or fruit trees, and zero otherwise.
% perennial is the proportion of total cultivated area devoted to perennial industrial crops.
% fruit is the proportion of total cultivated area devoted to fruit crops.

TABLE 5: LAND RIGHTS AND NONFARM ACTIVITIES

Sample: Rural households
Dependent variable = Number of weeks worked in nonfarm activities (per working member) in the last 12 months

PANEL A: Difference-in-difference estimate (discrete)

	% hhs with LUC		
	below median (<80%)	above median (>80%)	Difference
1993 Survey	8.016	7.227	-0.789
			(1.17)
1998 Survey	8.346	9.043	0.697
			(1.21)
Difference	0.330	1.816	1.486
	(0.586)	(0.328)***	(0.666)***

PANEL B: Difference-in-difference estimate (continuous)

	No controls	HH chars.	Region FE	Panel hhs	Alternative land rights measure	Dep. Var = Hours measure
	(1)	(2)	(3)	(4)	(5)	(6)
Land rights*Year=1998	3.272***	2.808**	2.685**	3.462**	0.299*	0.365*
	(1.194)	(1.158)	(1.146)	(1.346)	(0.157)	(0.196)
Year=1998	-1.322	-1.030	-0.941	-0.802	-0.211	-0.131
	(0.944)	(0.895)	(0.889)	(2.215)	(0.722)	(0.129)
Land rights	-1.547	-2.911	-3.306		-0.402	-0.368
	(2.354)	(2.241)	(2.360)		(0.343)	(0.312)
Age of household head		-0.029**	-0.031**		-0.032**	-0.005***
		(0.012)	(0.013)		(0.013)	(0.002)
Male household head		1.899***	1.919***		1.929***	0.185***
		(0.492)	(0.483)		(0.478)	(0.062)
Years of education of head		0.376***	0.380***		0.379***	0.042***
		(0.066)	(0.065)		(0.063)	(0.009)
Household size		-0.289***	-0.293***		-0.293***	-0.017
		(0.094)	(0.089)		(0.090)	(0.013)
Majority ethnic group dummy		3.921***	3.358**		3.303**	0.569***
		(0.912)	(1.279)		(1.247)	(0.171)
Dummy for north		-2.772**				
		(1.052)				
Region fixed effects	no	no	yes	no	yes	yes
Household fixed effects	no	no	no	yes	no	no
No. of observations	8091	8091	8091	6835	8091	8094
No. of provinces	59	59	59	59	59	59
R-squared	0.00	0.06	0.07	0.77	0.07	0.06

Standard errors in parentheses, corrected for province-level clustering.* significant at 10%; ** significant at 5%; *** significant at 1%.
All regressions weighted by sampling weights.
"Land rights" is the province-level proportion of households holding a Land Use Certificate (LUC).
Regression (5) uses an alternative measure of land rights: the speed of registration measure which is 2001 minus the year in which LUC issuance crosses 50%.
Hours measure is the number of hours worked in non-farm activities (per working member) in the previous 7 days.

TABLE 6: LAND RIGHTS, CROP CHOICE AND LABOR CHOICE IN DIFFERENT SUBCATEGORIES

Sample: Panel households

Panel A: Dependent variable =Proportion of total cultivated area devoted to perennial industrial crops and fruit crops

	Base spec	1993 income quintile		1993 land holding		distance to credit institutions		Alternative credit		Provincial Land Gini	
		<=3	>3	<7000sq.m	>7000sq.m	<=5km	>5km	yes	no	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Land rights*Year=1998	0.053*	0.051*	0.052	0.047*	0.060	0.060*	0.046	0.110*	0.034	0.030	0.117
	(0.031)	(0.029)	(0.049)	(0.029)	(0.042)	(0.032)	(0.055)	(0.058)	(0.035)	(0.026)	(0.074)
Year=1998	-0.014	-0.019	-0.003	-0.007	-0.022	-0.010	-0.015	-0.047	-0.004	-0.012	-0.036
	(0.020)	(0.017)	(0.036)	(0.016)	(0.027)	(0.020)	(0.035)	(0.044)	(0.021)	(0.019)	(0.049)
Household fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
No. of observations	6012	3620	2392	3030	2962	2700	3252	1384	4568	3482	2530
R-squared	0.80	0.77	0.83	0.81	0.80	0.81	0.79	0.75	0.82	0.78	0.80

Panel B: Dependent variable = Number of weeks worked in nonfarm actitivities in last 12 months, per working member

	Base spec	1993 income quintile		1993 land holding		distance to credit institutions		Alternative credit		Provincial Land Gini	
		<=3	>3	<7000sq.m	>7000sq.m	<=5km	>5km	yes	no	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Land rights*Year=1998	3.246**	2.900*	2.886	3.921*	2.295	2.916*	3.584*	2.863	3.422**	3.027**	3.653
	(1.294)	(1.639)	(3.589)	(2.030)	(1.558)	(1.603)	(2.005)	(4.771)	(1.694)	(1.511)	(2.445)
Year=1998	-0.824	-0.391	-0.937	-1.328	-0.045	-0.405	-1.195	-0.795	-0.838	-0.983	-0.714
	(1.132)	(1.371)	(2.771)	(1.755)	(1.235)	(1.271)	(1.786)	(4.097)	(1.429)	(1.414)	(1.901)
Household fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
No. of observations	6835	4545	2290	3307	3047	3026	3686	1647	5065	3687	3148
R-squared	0.76	0.80	0.87	0.73	0.71	0.77	0.75	0.76	0.76	0.74	0.79

Standard errors in parentheses, corrected for province-level clustering.* significant at 10%; ** significant at 5%; *** significant at 1%
All cells reflect results of regressions of the dependent variable on land rights.
"Land rights" is the province-level proportion of households holding a Land Use Certificate (LUC).
1993 income quintiles are based on household expenditure. Lower quintile imply poorer households.
"Distance to credit institutions" is the average distance to all credit institutions in the commune, measured from the People's Committee of the commune.
"Alternative credit" refers to the presence of a credit institution in the commune which is not a government bank.
All regressions are for panel households only.

TABLE 7: LAND RIGHTS AND LAND TRANSACTIONS

PANEL A: Dependent variable =1 if household reports acquiring land in last one year

	No controls	Region FE	Panel hhs	Alternative land rights	distance to credit institutions		Alternative credit	
					<=5km	>5km	yes	no
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Land rights * Year=1998	0.003	0.019	-0.023	0.001	0.0964	-0.1710	0.3970**	-0.1410
	(0.096)	(0.097)	(0.142)	(0.012)	(0.1416)	(0.2002)	(0.1540)	(0.1561)
Land rights	0.002	0.008		0.001				
	(0.012)	(0.042)		(0.006)				
Year=1998	0.221***	0.209***	0.227**	0.219***	0.1468	0.3371**	-0.1061	0.3154**
	(0.067)	(0.070)	(0.099)	(0.053)	(0.0962)	(0.1459)	(0.0985)	(0.1097)
household characteristics	no	yes	--	yes	--	--	--	--
region FE	no	yes	--	yes	--	--	--	--
household FE	no	no	yes	no	yes	yes	yes	yes
Observations	8108	8108	6848	8108	3031	3694	1649	5076
R-squared	0.10	0.15	0.57	0.15	0.57	0.57	0.58	0.57

PANEL B: Dependent variable =1 if household reports selling land in last one year

	No controls	Region FE	Panel hhs	Alternative land rights	distance to credit institutions		Alternative credit	
					<=5km	>5km	yes	no
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Land rights * Year=1998	-0.086	-0.079	-0.093	-0.011	-0.0775	-0.1482	0.0701	-0.1668*
	(0.055)	(0.057)	(0.077)	(0.008)	(0.0831)	(0.1229)	(0.0732)	(0.0949)
Land rights	0.011*	-0.002		0.001				
	(0.006)	(0.013)		(0.002)				
Year=1998	0.156***	0.149***	0.167***	0.136***	0.1680**	0.2053**	0.0562	0.2185
	(0.045)	(0.047)	(0.064)	(0.038)	(0.0655)	(0.1029)	(0.0578)	(0.0772)
household characteristics	no	yes	--	yes				
region FE	no	yes	--	yes	--	--	--	--
household FE	no	no	yes	no	yes	yes	yes	yes
Observations	8108	8108	6848	8108	3031	3694	1649	5076
R-squared	0.04	0.05	0.53	0.05	0.52	0.54	0.51	0.54

Standard errors in parentheses, corrected for province-level clustering.* significant at 10%; ** significant at 5%; *** significant at 1%.
All regressions weighted by sampling weights.
"Land rights" is the province-level proportion of households holding a Land Use Certificate (LUC).
"Distance to credit institutions" is the average distance to all credit institutions in the commune, measured from the People's Committee of the commune.
"Alternative credit" refers to the presence of a credit institution in the commune which is not a government bank.
"Household controls" include age, gender and education of household head, household size, ethnicity and a dummy for North.
Regressions (5)-(8) are for panel households only.

TABLE 8: LAND RIGHTS AND LAND INEQUALITY

Sample: Provinces

PANEL A: Province gini coefficient

	% hhs with LUC		
	below median (<80%)	above median (>80%)	Difference
1993	0.4730	0.4762	0.0033
			(0.0467)
1998	0.4439	0.4371	-0.0069
			(0.0383)
Difference	-0.0290	-0.0391	**-0.0102**
	(0.0425)	(0.0424)	**(0.0603)**

PANEL B: Proportion of landless in province

	% hhs with LUC		
	below median (<80%)	above median (>80%)	Difference
1993	0.1191	0.1159	-0.0032
			(0.0403)
1998	0.0706	0.0695	-0.0011
			(0.0277)
Difference	-0.0485	-0.0464	**0.0021**
	(0.0350)	(0.0337)	**(0.0486)**

Note: standard errors in parenthesis. * significant at 10%; ** significant at 5%; *** significant at 1%
The column Low98 is the set of provinces with a Level of Registration in 1998 is below the median, or 80% registration level.
The column High98 is the set of provinces with a Level of Registration in 1998 is above the median, or 80% registration level.
Gini coefficients are computed by the authors from household-level data on land holdings.

TABLE 9: LAND RIGHTS AND CREDIT

PANEL A: Dependent variable =1 if household has outstanding loans

	No controls	HH chars. +region FE	Panel hhs	Alternative land rights	distance to credit institutions		Alternative credit	
					<=5km	>5km	yes	no
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Land rights * Year=1998	-0.111	-0.107	-0.087	-0.013	0.047	-0.241*	0.009	-0.102
	(0.071)	(0.073)	(0.093)	(0.009)	(0.092)	(0.135)	(0.157)	(0.102)
Land rights	0.035	-0.002	-	0.018	-	-	-	-
	(0.070)	(0.061)	-	(0.009)*	-	-	-	-
Year=1998	0.110	0.125	0.091	0.106	0.003	0.198*	-0.016	0.114
	(0.054)**	(0.055)**	(0.071)	(0.041)**	(0.067)	(0.104)	(0.138)	(0.074)
household characteristics	no	yes	no	yes	no	no	no	no
household fixed effects	no	no	yes	no	yes	yes	yes	yes
Observations	8108	8108	6686	8108	2930	3688	1618	5000
R-squared	0.00	0.06	0.24	0.05	0.63	0.61	0.63	0.61

PANEL B: Dependent variable = Proportion of borrowing from formal sources

Independent variable:	No controls	HH chars. +region FE	Panel hhs	Alternative land rights	distance to credit institutions		Alternative credit	
					<=5km	>5km	yes	no
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Land rights * time	0.061	0.063	0.075	0.011	0.071	0.058	0.358	-0.023
	(0.089)	(0.090)	(0.193)	(0.015)	(0.261)	(0.257)	(0.478)	(0.155)
Land rights	0.225***	0.210***		-0.017			-0.026	0.245**
	(0.065)	(0.066)		(0.010)			(0.368)	(0.119)
Year=1998	-0.054	-0.124**	0.181	0.210***	0.130	0.239		
	(0.073)	(0.057)	(0.138)	(0.063)	(0.191)	(0.193)		
household controls	no	yes	--	yes	--	--	--	--
region fixed effects	no	yes	--	yes	--	--	--	--
household fixed effects	no	no	yes	no	yes	yes	yes	yes
Observations	4315	4315	3570	4315	1579	1980	971	2588
R-squared	0.09	0.11	0.75	0.11	0.74	0.76	0.72	0.76

Standard errors in parentheses, corrected for province-level clustering.* significant at 10%; ** significant at 5%; *** significant at 1%.
All regressions weighted by sampling weights.
"Land rights" is the province-level proportion of households holding a Land Use Certificate (LUC).
"Distance to credit institutions" is the average distance to all credit institutions in the commune, measured from the People's Committee of the commune.
"Alternative credit" refers to the presence of a credit institution in the commune which is not a government bank.
"Household controls" include age, gender and education of household head, household size, ethnicity and a dummy for North.
Regressions (5)-(8) are for panel households only.

TABLE 10: ARE CROP AND LABOR CHANGES WITHIN OR ACROSS HOUSEHOLDS?

Sample: Panel households

	Category 01 (Δcrop choice <=0, Δlabor choice>0)	Category 10 (Δcrop choice >0, Δlabor choice<=0)	Category 11 (Δcrop choice >0, Δlabor choice >0)
Land Rights	1.1935*	1.749	3.169**
	(0.6928)	(0.8240)	(1.523)

Table shows relative risk ratios obtained from multinomial logit regressions of the dependent variable on the land rights measure.
Dependent variable is categorical with 4 categories: category 00 (Δcrop choice<=0, Δlabor choice<=0),
category 01 (Δcrop choice<=0, Δlabor choice>0), category 10 (Δcrop choice>0, Δlabor choice<=0) and
category 11 (Δcrop choice>0, Δlabor choice>0), where
Δcrop choice = change in proportion of household cultivated area devoted to perennial industrial crops and fruit crops, between 1993 and 1998.
Δlabor choice = change in number of weeks worked (per household member) in nonfarm activities, between 1993 and 1998.
The base category is category 00 (Δcrop choice<=0, Δlabor choice<=0).
"Land rights" is the province-level proportion of households holding a Land Use Certificate (LUC).
Standard errors in parentheses, corrected for province-level clustering.* significant at 10%; ** significant at 5%; *** significant at 1%.
All regressions weighted by sampling weights.

TABLE 11: IMPACT OF LAND RIGHTS ON EXPENDITURE, INCOME AND PRODUCTIVITY

Sample: Rural households

Dependent variable	Real household expenditure		Value of agr. output / cultivated area	
Units	1998 dongs ('000)		1998 dongs ('000)/ sq m cultivated	
Mean (s.d.) in 1993	5414.04 (3480.40)		0.7985 (2.342)	
Mean (s.d.) in 1998	10293.81 (5885.25)		1.659 (6.728)	
Land rights*Year=1998	495.222	490.478	0.691	0.723
	(625.744)	(599.934)	(0.470)	(0.470)
Year=1998	4,486.901***	4,511.802***	0.323	0.302
	(490.666)	(473.702)	(0.227)	(0.233)
Land rights	37.810	336.781	0.221	0.338
	(323.907)	(322.540)	(0.203)	(0.223)
HH controls	yes	yes	yes	yes
Region fixed effects	no	yes	no	yes
Observations	7501	7501	7466	7466
R-squared	0.44	0.46	0.01	0.02

Standard errors in parentheses, corrected for province-level clustering.* significant at 10%; ** significant at 5%; *** significant at 1%.
All regressions weighted by sampling weights.
"Land rights" is the province-level proportion of households holding a Land Use Certificate (LUC).
"Household controls" include age, gender and education of household head, household size, ethnicity and a dummy for North.

APPENDIX TABLE 1: LAND RIGHTS AND CROP CHOICE (ROBUSTNESS CHECKS)

	Base specification (1)	% State farm area (2)	Controlling for % State farm agricultural area (3)	Provincial Competitiveness Index (4)
Land rights*Year=1998	**0.075*** **	**0.087*** **	**0.078*** **	**0.095*** **
	(0.025)	**(0.028)**	**(0.025)**	**(0.030)**
Year=1998	-0.033*	-0.060**	-0.046**	0.139**
	(0.017)	(0.023)	(0.019)	(0.065)
Land rights	-0.011	-0.019	-0.016	-0.025
	(0.027)	(0.033)	(0.027)	(0.037)
Age of household head	0.002***	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)	(0.000)
Male household head	-0.020**	-0.019	-0.017*	-0.020**
	(0.010)	(0.011)	(0.010)	(0.010)
Years of education of head	0.008***	0.008***	0.008***	0.008***
	(0.002)	(0.002)	(0.002)	(0.002)
Household size	-0.002	-0.002	-0.002	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)
Majority ethnic group dumm	0.003	-0.000	0.004	0.000
	(0.030)	(0.028)	(0.031)	(0.030)
Total area cultivated ($*10^{-5}$)	-0.208**	-0.265***	-0.212**	-0.205**
	(0.090)	(0.083)	(0.082)	(0.090)
% state farm area 1994		**2.783**		
		(1.889)		
% state farm area 1994 * Year=1998		**1.445**		
		(1.085)		
% state farm agricultural area			**0.745****	
			(0.366)	
% state farm agricultural area			**0.274**	
*Year=1998			**(0.196)**	
PCI				**0.003**
				(0.002)
PCI * Year=1998				**-0.004****
				(0.001)
Region fixed effects	yes	yes	yes	yes
Household fixed effects	no	no	no	no
No. of observations	7469	6253	7469	7469
No. of provinces	59	56	59	59
R-squared	0.22	0.21	0.25	0.22

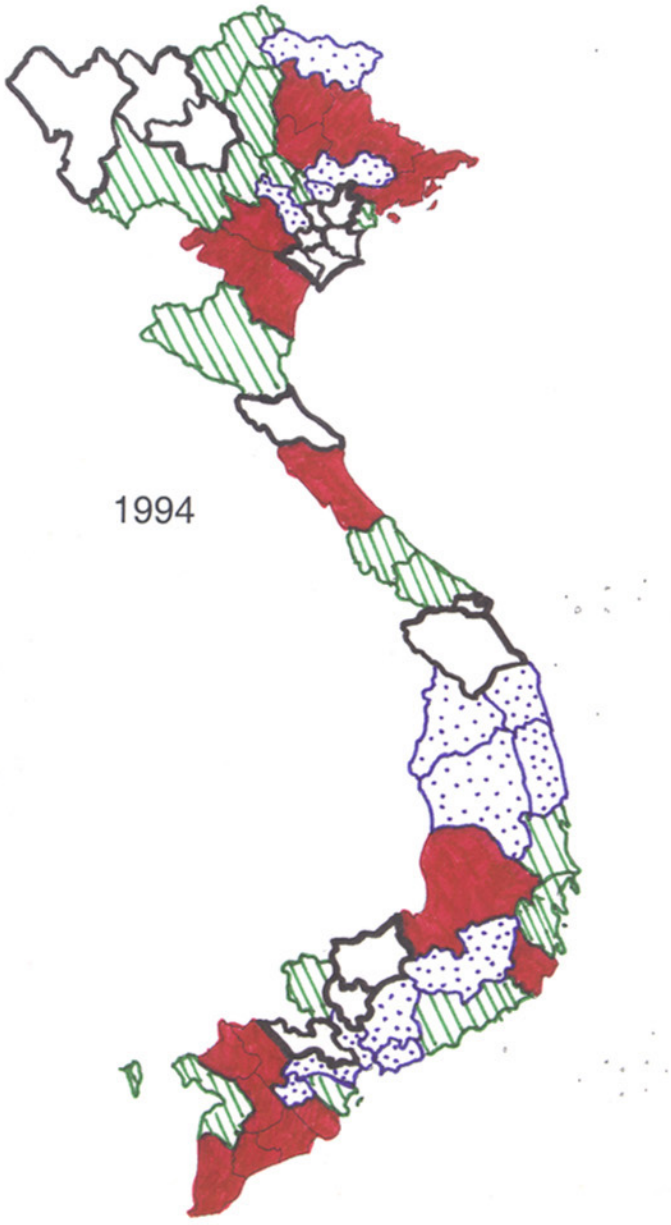
Standard errors in parentheses, corrected for province-level clustering.
* significant at 10%; ** significant at 5%; *** significant at 1%.
All regressions weighted by sampling weights.
"Land rights" is the province-level proportion of households holding a Land Use Certificate (LUC).
All state farm variables computed from the 1994 Agricultural Census.
% State farm area is the
"% State farm agricultural area" is the ratio of state farm agricultural area to total province agricultural area.
PCI is the Provincial Competitiveness Index 2006.

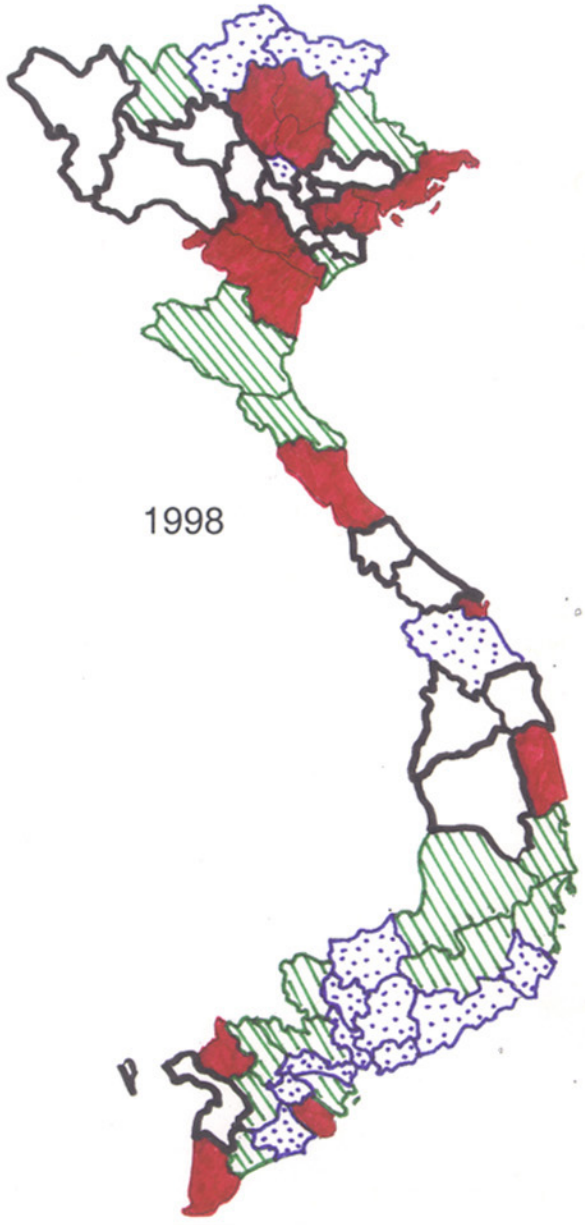
APPENDIX TABLE 2: LAND RIGHTS AND NONFARM ACTIVITIES (ROBUSTNESS CHECKS)

Dependent variable = Number of weeks worked in nonfarm activities (per working member) in the last 12 months

		Controlling for	
	Base specification	Labor employed in state farms	Provincial Competitiveness Index
	(1)	(2)	(3)
Land rights*Year=1998	**2.685****	**2.831****	**2.880****
	(1.146)	**(1.142)**	**(1.301)**
Year=1998	-0.941	-3.455	0.739
	(0.889)	(2.365)	(2.398)
Land rights	-3.306	-1.331	-3.099
	(2.360)	(0.916)	(2.430)
Age of household head	-0.031**	-0.031**	-0.031**
	(0.013)	(0.013)	(0.013)
Male household head	1.919***	1.920***	1.921***
	(0.483)	(0.483)	(0.485)
Years of education of head	0.380***	0.381***	0.381***
	(0.065)	(0.065)	(0.066)
Household size	-0.293***	-0.296***	-0.291***
	(0.089)	(0.089)	(0.089)
Majority ethnic group dumn	3.358**	3.342**	3.474**
	(1.279)	(1.286)	(1.325)
Labor employed in state farms 1994		**0.010**	
		(0.007)	
Labor employed in state farms 1994		**-0.014**	
* Year=1998		**(0.009)**	
PCI			**-0.032**
			(0.073)
PCI * Year=1998			**-0.035**
			(0.052)
Region fixed effects	yes	yes	yes
Household fixed effects	no	no	no
No. of observations	8091	8091	8091
No. of provinces	59	59	59
R-squared	0.07	0.07	0.07

Standard errors in parentheses, corrected for province-level clustering.
* significant at 10%; ** significant at 5%; *** significant at 1%.
All regressions weighted by sampling weights.
"Land rights" is the province-level proportion of households holding a Land Use Certificate (LUC).
All state farm variables computed from the 1994 Agricultural Census.
"Labor employed in state farms" is the ratio of the number of workers employed in state farms to the number of agricultural households in province.
PCI is the Provincial Competitiveness Index 2006.





Geographical Distribution of Registration Levels (1994 - 1998)

1ST QUARTILE (0% - 6%)
2ND QUARTILE (6% - 19%)
3RD QUARTILE (19% - 39%)
4TH QUARTILE (39% - 91%)

1ST QUARTILE (11% - 50%)
2ND QUARTILE (50% - 80%)
3RD QUARTILE (80% - 91%)
4TH QUARTILE (91% - 100%)