

ESSAYS IN DEVELOPMENT ECONOMICS

THE ROLE OF PROPERTY RIGHTS ON LABOUR SUPPLY AND LAND MARKETS

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Declaration

I declare that this thesis has not been submitted as an exercise for a degree at this or any other university and it is entirely my own work.

Chapter 2 is based on joint work. Details are given in the acknowledgements.

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Summary

This thesis examines the role of land property rights in the allocation of household labour, the functioning of rental markets, and gender equality. It consists of three empirical research chapters using rural household panel data from Vietnam and Mexico.

Chapter two explores the role of land use certificates in the functioning of rental markets in Vietnam, paying close attention to the impact of certification when the owner is a woman. Our analysis is conducted using the bi-annual Vietnam Access to Resources Household Survey (VARHS) for the years 2008-2016. Specifically, this chapter sheds light on the role land use certificates play on the agreed compensation of rental agreements when landlords, particularly those with weaker ex-ante tenure security (i.e. women), rent out land to their relatives in Vietnam. We find that female-headed households who lease their plots to relatives are less likely to receive any type of payment, unless they possess a title for the plot they leased. A regional decomposition of our results shows that this effect is more predominant in the Northern regions.

Chapter three analyses the role of land tenure security on household labour supply. In Vietnam, all land belongs to the State and authorities grant usufruct rights to individuals. The Land Law of 1993 set the duration of annual land at 20 years, and 50 years for perennial land. In 2013, when the usage rights of annual plots were set to expire, the government passed the 2013 Land Law where usage rights for all land was set at 50 years. Using this unanticipated policy change, we compare the outcomes of households whose usage rights were about to expire in 2013 (i.e. farms with annual plots) with households whose usage rights still had years before their expiration (i.e. farms with perennial plots). Results show that the tenure security improvement caused by the 2013 Land Law led to a reduction of household labour supply in agriculture, particularly from female adults. Moreover, the chapter finds that the law increased the capital intensity of agriculture and reduced landholdings. This chapter is also based on the VARHS (2008-2016).

The fourth chapter uses a panel dataset of rural households and the roll-out of a nationwide land titling program in Mexico to explore the impact of tenure security on household labour supply. The results of this chapter suggest that land titling decreased the number of hours in wage employment and increased cultivated land. We do not find evidence of land certification affecting labour supply in own-farm agriculture. However, results show that households participating in the certification program reduced the number of children working on their own farms.

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Dedication

For Yuri and Damian.

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Chapter 1: **Introduction**

The process of economic development requires that an economy moves from an agriculture-intensive setting to a more industrialized situation. It is then essential that agricultural productivity increases and shifts to a more capital-intensive production system, hence allowing labour to be transferred from agriculture to other sectors of the economy (Gollin et al, 2002). Property rights are a key part of this process for several reasons. First, tenure security enhances incentives for investment and therefore increases agricultural productivity. Second, households with financial constraints are able to use their assets as collaterals, increasing their credit access to undertake entrepreneurial activities. Third, property rights enable the functioning of land markets without significant transaction costs. This allows for land to be transfer to the best-suited candidates, improving overall efficiency. Also, land markets allow households with a comparative advantage in the non-farm economy to gradually move out of agriculture.

This thesis provides empirical evidence on the role of land institutions on household labour supply, land rental markets, gender equality and agricultural production. In the second chapter, we explore the effects of land certificates in women's participation in rental markets in Vietnam. Our results suggest women are less likely to receive any type of compensation (monetary or in-kind) when renting land out to their relatives. The third chapter analyses the impact of the Vietnamese Land Law of 2013, which increased the duration of usage rights for annual land from 20 to 50 years, in household labour supply and agricultural production. The policy change led to a reduction in own-farm labour supply, and an increase in the capital usage. The fourth chapter explores the effect of nation-wide land certification program in Mexico. The results suggest that households participating in the program reduced their hours of wage employment and increase their cultivated land. Although we did not find evidence of an increase in own-farm labour, the evidence suggests that households in the certification program reduce the number of children working in their farms.

1.1 Rental markets, gender, and land certificates: evidence from Vietnam

In developing countries, a significant share of land transactions occurs among closely related parties and often does not entail any specific compensation (in-kind or monetary). This is the consequence of high transaction costs in rental markets, and poorly enforced ownership rights. Informal transactions can be detrimental to overall efficiency, as land is being transferred to household closely related instead of the best-suited farmers (Chen et al, 2017). Moreover, the gender gap in access and control over land is one of the most important factors in improving women's empowerment in Southeast Asia (Agarwal, 1994). This chapter argues that the prevalence of a high level of informal transactions raises concerns because it could be a reflection of property rights imbalances among households, as those with weaker claims over land (i.e. women) may fail to receive adequate and fair compensation

Specifically, this chapter analyses the gender-specific impact of land titles in rental market participation. We focus primarily on the compensation female-headed households obtained when leasing land to their relatives. Female landlords tend to engage in land transactions with closely related parties to reduce the risk of expropriation and improve contract enforce, though it may come at the cost of a lower compensation for the land transacted. Our results suggest that women are less likely to receive any type of compensation when they rent out land to their relatives, but having a land use certificate for the plot completely eliminates this effect. A regional decomposition of our analysis shows that these results are mostly driven by the market dynamics in the Northern regions.

This chapter contributes to the literature in two ways. First, as far as we know, this is the only study showing the relationship between property rights and agreed compensation in rental markets, particularly in the case of groups with weaker *ex-ante* tenure security (i.e. women). Second, this is the first study of land rental markets in Viet Nam that explicitly distinguishes between formal and informal transactions.

1.2 The effect of tenure security on household labour supply and agricultural production: evidence from Vietnam

An essential part of the economic development process is structural transformation from low productivity agriculture to higher value-added sectors. To undergo this transformation agricultural productivity must increase to allow labour to be transferred from agriculture to the non-farm sector of the economy (Gollin et al, 2002; Duarte and Restuccia, 2010). Land institutions play a key role in this process, as they can enhance investment and allow individuals better-suited for the non-farming sector to pursue opportunities outside agriculture.

However, in developing countries property rights tend to be weak. Moreover, in many cases land ownership is tightly connected to land usage. Hence, even if risk of expropriation is low, allocated labour is not efficient because farmers are forced to work on the land to maintain its tenancy. If labour input is indeed an effective way to strengthen your rights and households are spending labour with “guarding” purposes, then removing this need should reallocate land into other activities. Nonetheless, land rights also increase investment and induce land transfers. This can in turn increase the returns to labour in agriculture, and increase access to land.

This chapter analyses the effect of an increase in the usage rights of annual land in Vietnam to assess the impact of tenure security on labour supply and agricultural production. In 1993, the Vietnamese government passed a law where it granted individual usufruct rights to rural households. The duration of these rights was set at 20 years for annual crops, and 50 years for perennial crops. When the rights of annual plots were set to expire, the Vietnamese government passed the 2013 Land Law in which, among other things, extended the usage rights period of annual crops from 20 to 50 years. This unanticipated change in policy improved all landowners’ property rights, but it was particularly beneficial for annual crop growers, whose rights were set to expire soon.

The results in this chapter suggest that improvements in tenure security reduced household labour supply in own-farm agriculture; however we find no evidence of an increase in non-agricultural labour. We shed light on this outcome by exploring two possible, and complementary, explanations. First, tenure security may have increased access to capital (via

credit) and shifted the input share in agriculture to a more capital-intensive setting. Second, land markets also allow households to adjust their operational size, hence reducing labour inputs may not affect productivity. Results suggest that after the enactment of the 2013 Land Law, annual crop growers increase their capital intensity relative to labour and decrease their landholdings.

The chapter contributes to the literature of property rights in three ways. First, it uses a difference-in-difference approach to examine the distortions of tenure insecurity in labour allocation, and it sheds light on the intra-household allocation of labour by examining labour supply by age and gender. Second, it explores the possibility of a shift in the structure of input shares by suggesting improvements in tenure security can increase capital intensity in agricultural production. Finally, results can be useful for policy makers as they show farmers devote resources to maintain their usufruct rights. Arguably, removing the need to renew your rights as owner every given time period can have significant benefits for landowners.

1.3 Land titling and household labour supply: evidence from Mexico

In a context of weak property rights, farmers use labour to strengthen their ownership of agricultural land. This results in an inefficient allocation of labour as households are forced to over-invest labour inputs into agriculture. Improvements in property rights can potentially reduce farm labour as households are no longer obliged to work on their land to secure tenancy of their property. Nonetheless, better land rights encourage investment which may increase the returns to labour in agriculture. Moreover, land titling enhances the functioning of land markets, allowing farmers to increase their operation scales.

This chapter explores the effects of a nation-wide land certification program in Mexico to assess the role of tenure security on household labour supply. Making use of the staggered implementation across time and space of the land titling program, we find that households that participated in the program decreased their hours in wage-employment activities and increased their cultivated land. However, the number of household members devoted to own-farm agriculture did not seem to be affected by certification, with the exception of children. Our results suggest that PROCEDE reduced the number of children working in the family farm.

De Janvry et al (2015) thoroughly explore the impact of PROCEDE on labour and land allocation. They find that the certification increased migration out of rural areas, yet cultivated land was not severely affected by this reduction in labour supply. The authors argue that lifting restrictions on land transfers led to the consolidation of larger farming units. This chapter adds to their contribution in two ways. First, it explores the effect of land titling in local labour markets and the implications for the household members remaining in the community. Second, it sheds light on a possible impact of land titling that is normally overlooked: its effect on intra-household labour allocation.

Chapter 2: **Rental markets, gender, and land certificates: evidence from Vietnam**

2.1 Introduction

Weak enforcement of property rights has long been considered one of the key determinants of low agricultural productivity in developing countries. While many studies have focused on the tenure security channel (i.e. certainty of reaping the fruits of your work will incentivize long-term investment) another important mechanism through which property rights foster productivity is by allowing landholdings to be transferred to those better equipped to make productive use of them (e.g. via sales or rental markets). Several studies have documented the importance of well-functioning land markets for efficiency and equity in the rural sector (Skoufias 1995; Benarjee et al 2002; Holden et al. 2010; de Janvry et al 2015; Chari et al 2017; Chen et al. 2017).

Moreover, the literature has widely discussed the implications of gender differentials on property rights for agricultural productivity (Udry 1996; Goldstein and Udry 2008). Indeed, Agarwal (1994) argues that the single most important economic factor affecting women's situation in Southeast Asia is the gender gap in control and ownership of land. This inequality has crucial effects in the functioning of rental markets. In Ethiopia for example, Ghebru and Holden (2014) find that female landlords have lower yields in the plots they sharecrop with same-kin tenants. The authors suggest this is driven by opportunistic behaviour from tenants who, when kin is close, put less effort and inputs on sharecropped plots from women because the risk of eviction is lower.

In this chapter we use the biennial Vietnam Access to Resources Household Survey (VARHS) for the period 2008-2016 to explore the gender-specific impact of Land Use Rights Certificates (LUCs) on the choice of tenant and the compensation obtained by landlords in the rental market. Our results show that female-headed households that lease land to relatives are 25 per cent less likely to receive any type of compensation, unless they have a LUC for such plot. Our findings

are robust to the endogeneity of plots getting titled within a household, and landlord's selection bias of tenant choice. One concern with informal land transfers is that compensation may not be directly stated, but it is implied and received through other channels (e.g. gifts or transfers). We corroborate this is not the case by showing that households renting their plots out for free do not receive more gifts or transfers from their relatives, even when affected by a negative shock. Moreover, we present a regional decomposition of our empirical analysis and we find that our results are being mostly driven by the dynamics of rental markets in the North of Vietnam.

Furthermore, we explore the impact of these non-market land rentals on agricultural productivity and household income. Our findings show that farmers who receive land for free are systematically less productive than those who pay for it. This suggests that non-compensated land transactions might be less efficiency enhancing than those that are market based. Moreover, households engaging in non-market transactions give up on average 5 percent of their income due to these informal transactions.

This chapter contributes to the literature in two ways. First, as far as we know, this is the only study showing the relationship between property rights and agreed compensation in rental markets, particularly in the case of groups with weaker *ex-ante* tenure security (i.e. women). Second, this is the first study of land rental markets in Vietnam that explicitly distinguishes between formal and informal transactions.¹ This is surprising given that informal transactions represent more than half of the land rentals in the country. Additionally, our regional analysis provides insights on how policy changes in land tenure are likely to have a more significant impact in the Northern provinces of Vietnam, where social institutions and attitudes towards market-oriented policies are considerably different than in the South.

The structure of the chapter is as follows: in section 2.2 we outline our conceptual framework, in section 2.3 we describe the land reforms undertaken in Vietnam and their implications for women's land rights. The data and some descriptive statistics are presented in section 2.4. In section 2.5 we discuss the estimation strategy we employ to test our hypotheses and in Section 2.6 we present our results. In section 2.7 we conclude with some final remarks.

¹ Khai et al (2013) show that generally land obtained through rental or sale markets is operated by more productive farmers than plots allocated by local authorities in Vietnam, but they do not study the difference between formal and informal temporary land transfers.

2.2 Conceptual framework

The literature discusses two main reasons a landlord may decide to participate in land rental markets. First, as an economy advances in the process of economic development, opportunities in the non-agricultural sector will improve. This will trigger a process of structural transformation where rural households with a comparative advantage in non-farming activities will leave agriculture to pursue more attractive opportunities in other industries (Duarte and Restuccia 2010).² Second, a low endowment of non-land agricultural factors of production (e.g. labour) drives landowners to lease out their property for income generation. We think the latter framework is what best describes the behaviour of female landlords. Though in theory women could just hire workers until they reach their optimal farm scale, agricultural labour markets have high costs of monitoring and enforcing effort (Feder 1985). Moreover, these costs are likely to be higher for women since tradition in Vietnam dictates farming decision should be taken by men (Tran 2001).³

Despite the potential benefits of land markets, participation in land rentals faces considerable challenges. Weak enforcement of property rights increases the risk of losing your land when it is rented out, discouraging potential landlords from participating in rental markets (Besley and Ghatak 2010). Also, tenure insecurity can influence landlord's choice of tenant and rental arrangement in the market. In Madagascar, Bellemare (2012) finds that landlords with a lower perceived tenure security were more likely to engage in sharecropping contracts instead of fixed rents because participating in the production process increases the landlord's claims to the land (land-to-the-tiller agricultural system). In the Dominican Republic, Macours et al (2004) find

² Estimations from the 2009 population census in Vietnam reveal that the annual rate of migration within provinces, mostly from the countryside to cities, increased from 0.6 percent in 1999 to 4.2 percent in 2009 (Narciso 2017). Moreover, rural households with higher welfare tend to substitute agricultural activities with wage labour and entrepreneurial activities (Kingham and Newman 2017).

³ Also male-headed households who lease out land are better off than male-headed households that do not; their income levels are 42 percent higher than other male-headed households that do not rent out land. The opposite is true for female landlords, as they have 6 percent less income than other female-headed households. This suggests that the factors determining rental market participation differ crucially depending on the gender of the household head. While men decide to participate in rental markets because it allows them to pursue opportunities outside agriculture and improve their incomes, female landlords tend to rent out land because they are too old to farm it and lack the resources to do it properly (female-headed households have fewer household members, less capital and are considerably older).

that tenure insecurity and weak contract enforcement leads landlords to operate along similar socio-economic lines, which comes with significant detrimental effects on efficiency and equity.

The imperfections in rental markets are more likely to disproportionately affect female landowners, since they normally have weaker property rights (Agarwal 1996; Menon et al 2017). Evidence from Ethiopia shows that female landlords have lower productivity in the plots they sharecrop, compared to male landlords. Holden and Bezabih (2008) suggest the reason for this gender differential could be that women may be forced to rent land to in-laws as opposed to the best (and presumably most productive) bidder. This results not only in an overall efficiency and productivity loss, but potentially also in a worse outcome for the landlord that might not be able to receive fair compensation. Land titles can be an efficient mechanism to correct this kind of distortions. In Ethiopia, Holden et al (2011) find that a low-cost land certification program had a relatively larger effect on women's participation in rental markets.

In this chapter we want to understand the relationship between property rights and landlord's choice of tenant and agreed *ex-ante* compensation for the land transaction. If land certificates strengthen landlord's property rights, we would expect that households who have their plots titled—especially those with weaker *ex-ante* tenure security—would obtain better compensations in the rental market. This is because with the improvement in property rights, landlords no longer fear expropriation when renting out to non-related parties, so they can choose from a wider pool of possible tenants. Consequently, their bargaining power increases, so even if they ultimately decide to lease to a relative, such rental agreement would be conducted under better circumstances for the landlord. If women have weaker *ex-ante* tenure security, then the effect of land certification on the probability to obtain compensation for the land rented out to relatives should be larger for female landowners.

2.3 Background: land tenure and gender in Vietnam

During the 1980s Vietnam started a de-collectivization process in its agricultural sector to form a production system based on household initiative. Before the reforms took place, agricultural production was carried out collectively and farmers were compensated by the hours they worked. However, after facing severe food shortages at the beginning of the 1980s, the government implemented a new policy in which farmers were responsible for delivering a quota

to the commune and allowed them to keep or sell any surplus.⁴ With the implementation of the Doi Moi reforms in 1988, the government addressed some concerns regarding tenancy security and started the privatization and decentralization of output and input markets (but land market transactions remained illegal).

In 1993, a new land law was enacted to transfer private usage rights to rural households. Though the land remains the property of the State, households received land use certificates (LUCs) that allow them to transfer, lease, mortgage and bequest the usage rights of their land.⁵ The land certification program was one of the most extensive in the world: by the year 2000 the Vietnamese government had issued more than 11 million certificates, granting land titles to more than 90 percent of rural households (Do and Iyer 2008). However, the implementation of the land reform had important regional differences and land certification has failed to increase in the last decade (Markussen 2017).

Do and Iyer (2008) argue that the General Department of Land Administration (GDLA) faced two main challenges in the implementation of the reform: lack of manpower in commune land registry offices and the time taken to resolve disputes related to land ownership. The heterogeneity of administrative capacity of provinces resulted in very different speeds of land certification. For example, the authors see that the proportion of households with LUCs in 1998 varied from 12 percent to 100 percent across different provinces, and that in 2000 five provinces have failed to achieve coverage in more than 75 percent of the households in the province.

More recent data suggests land certification still faces challenges in some regions; according to our sample, in the Mekong River Delta almost all plots have a LUC, while in the Central Highlands titling is least prevalent. Even among the Northern provinces we observe significant differences; in Phu Tho, a relatively rich province in the north, more than 90 percent of plots have titles while the highland provinces of Dien Bien and Lai Chau have less than 40 percent of their plots titled. Markussen (2017) says that one of the reasons why land titling has stayed constant in the last decade could be informal fees or corruption in the land administration

⁴ These reforms had a positive and significant effect on rice production (Pingali and Xuan 1992).

⁵ The duration of use rights was set at 20 years for annual crops and 50 years for perennial crops. However an amendment to the Land Law in 2013 set the duration of use rights to 50 years for all types of crops.

system.⁶ Also, the Governance module of the 2008 Vietnam Household Living Standards Survey (VHLSS) reports that 55 percent of rural households perceive that the process of LUC issuance is affected by corruption in local governments (World Bank 2009, ch. 3).

The 1993 Land Law increased agricultural investment and allowed households to pursue non-farming activities (Do and Iyer 2008). According to Deininger and Jin (2008) the legalization of land usage transfers increased efficiency and allowed poor households to access land as the non-agricultural sector of the economy evolved.⁷ Moreover, the prevalence of State allocations has been gradually substituted by transfers among individual households, resulting in sizeable productivity gains (Khai et al 2013).⁸ Despite the apparent consensus on the benefits of Vietnam's land reforms, others have argued that the land laws aggravated inequality and created a growing class of landless citizens (e.g. Akramlodhi 2005). Such claims have also been made from the perspective of gender inequality in access to land.

Menon et al. (2017) argue that some features of the 1993 land reform in Vietnam exacerbated gender disparities in property rights. For example, the law allowed for only one name to be in the certificate as the sole owner of the land; in most cases the man—being the head of the household—had his name registered in the title. Also, the certification was granted at the farm level instead of the plot level (which could have allowed for some differentiation in asset ownership between husbands and wives). Finally, the authors mention that some of the guidelines in the land redistribution process favoured men over women, and this inequality was worsened by social norms and cultural traditions in which farm production decisions were made primarily by men (Tran 2001).⁹ Between 2000 and 2003 a series of legislative changes were conducted to address this gender disparity. The Marriage and Family Law of 2000 declares that

⁶ We would expect this kind of restrictions to be more binding for vulnerable households. Indeed, Markussen and Tarp (2014) show that political connections are positively related to increase land tenure security and investment.

⁷ A proper functioning of land markets is essential for a smooth readjustment of labour from agriculture to other industries (Adamopoulos et al 2017). This process is particularly important in Vietnam since the share of the labour force devoted to agriculture decreased from 70 per cent in 1996 to 44 per cent in 2015 (ILOSTAT 2017).

⁸ Vietnam and other post-socialist economies have traditionally relied on administrative reallocation of land instead of markets. However, evidence from China suggests that though reallocations assign land to households with low land endowments and numerous families, markets are a better mechanism since they ultimately assign the land to farmers with higher ability (Deininger and Jin, 2005; Kimura et al 2011).

⁹ For example, the age of the household head and the number of household members in working age were considered for the amount of land allocated, given that the legal retirement age for women is 55 and for men 60 and female-headed households tend to have fewer working-age members, women tend to receive less land than men.

any LUC obtained during the course of the marriage should be counted as common property (i.e. have both names in the title).¹⁰ Moreover, an amendment to the Land Law in 2003 indicates that certification has to be carried out at the plot level, which allows a legal differentiation in asset ownership for both husband and wife.¹¹ Nonetheless, some have argued that the implementation of these changes has not been properly enforced because of lack of administrative capacities in rural agencies (Ravallion and van de Walle 2008; World Bank 2002).

The land tenure system in Vietnam —unlike China and other African countries— is not characterized by extensive land reallocations or expropriations, and the land reforms undertaken in the past decades have come a long way in improving tenure security.¹² Nonetheless, it is still possible that gender differences in land rights affect the functioning of rental markets, particularly when the transactions happen among relatives. In our sample, more than half of the plots that were rented out did not lead to any compensation for the landlord (monetary or in-kind) and more than two thirds of the rentals occurred among relatives.¹³ The prevalence of such a high level of informal transactions raises concerns because it could be a reflection of property rights imbalances among households, as those with weaker claims over land may fail to receive adequate and fair compensation.

2.4 Data and descriptive statistics

The empirical analysis will be based on the Vietnam Access to Resources Household Survey (VARHS), covering the period 2008–2016. The VARHS is conducted every two years and is a

¹⁰ According to Article 66 of the Marriage and Family Law plots that have two names automatically transfer to the spouse when one of the owners die. When the plot has a LUC with only the husband name, the surviving spouse gets priority, although the deceased could have designated someone else as the recipient. Smith (1997) finds that even for certificates with only one name, land is inherited almost automatically by the surviving spouse.

¹¹ Newman et al. (2015) say that, conditional on the plot having a certificate, registering the plot under two names as opposed to one does not affect productivity. They argue that including both names in the certificate could be a useful policy to increase women's bargaining power within the household, since there is no trade-off between productivity and including two names in the certificate instead of one. Menon et al. (2017) find that land-use rights held exclusively by women or jointly by couples result in higher household expenditures, more women's self-employment and lower household vulnerability to poverty.

¹² In our data, only around two percent of the plots were expropriated by commune authorities in a given year.

¹³ Virtually all of the contracts contemplating some sort of compensation have the form of fixed rent. Therefore, we will now only distinguish between rental contracts with and without compensation, regardless of the type of payment arrangement (fixed rent or sharecropping).

representative sample of the rural population in Vietnam. We rely on the balanced panel sample which consists of 2,131 rural households that were surveyed in all the five waves collected in the period under analysis. The surveyed households are located in 476 communes across 12 different provinces. The dataset contains precise information on household demographics, economic activities, land use and agricultural production. Crucially, the survey contains detailed plot-level characteristics and information on land rental agreements (e.g. relationship to the tenant, type of contract and agreed payment).

In Table 2.1, we provide descriptive statistics of the main variables used in the analysis by gender of the household head. Drawing from the entire five-wave sample, we observe that female household heads tend to be less educated and older; they also have fewer members, are considerably less likely to be married (67 percent are widowed), and in particular fewer men and women in working age. As far as agricultural inputs are concerned, they also own less land and draft animals. In light of that, it is hardly surprising that male-headed households have higher levels of income and assets per capita. However, such differences are not statistically significant at any conventional level.

These simple figures highlight some interesting facts about land rental behaviour. First of all, despite having significantly lower land endowments, women are more likely to rent some agricultural plots out: 21 percent of female-headed households rent out land compared to 16 percent of male-headed households.¹⁴ When women lease out land, they tend to rent a higher proportion of their total holdings. There are also some significant differences in the choice of tenants and type of rental agreement: female landlords are more likely to rent their land to relatives and not to receive any compensation when they do. However, at an unconditional level, male landlords tend to give a higher proportion of their leased land for free.¹⁵ Moreover, female-headed households have a higher fractions of their land certified. The main objective of the empirical analysis will be to assess how these certificates affect their decisions concerning the rental market.

¹⁴ This is possibly because women also possess fewer resources to conduct agricultural production (i.e. household members of working age and draft animals).

¹⁵ The data we have tells us the monetary value of the rental agreement, whether the tenant pays cash or in some other way (part of the harvest for example). In the case of an in-kind payment, landlords give an estimated value of the compensation they receive. Hence, if landlords report they received zero compensation for the rental transaction, this means they did not receive money or anything else in exchange for leasing the land.

Table 2.1: Household level characteristics (means) by gender of the household head

Variable	Female-headed	Male-headed	p-value difference
Education of household head (years)	7.68	8.37	0.00
Household head is married (percentage)	26.38	95.9	0.00
Age of household head (years)	61.27	52.58	0.00
No. of household members	3.49	4.52	0.00
No. of men in working age	0.93	1.62	0.00
No. of women in working age	1.12	1.40	0.00
No. of draft animals	0.33	0.70	0.00
Land owned (thousand sqm)	3.43	7.04	0.00
Land Farmed (thousand sqm)	3.38	7.20	0.00
No. of non-farm activities	0.24	0.33	0.00
Income per capita (thousand VND)	21.27	22.14	0.14
Assets per capita (thousand VND)	7.00	13.26	0.28
Proportion of land with LUC	0.78	0.73	0.00
Proportion of households renting out land	0.21	0.16	0.00
Percentage of land rented out*	0.76	0.68	0.00
<i>Percentage of land rented out to relatives*</i>	0.70	0.65	0.04
<i>Percentage of land rented out for free*</i>	0.44	0.54	0.00
<i>Percentage of land rented for free conditional on being rented out to relatives*</i>	0.85	0.79	0.04
N	2,388	8,267	-

Source: Authors' computation from VAHRS data.

The mean statistics are computed using the 5 waves (one every two years) of the balanced household panel. This includes 2,131 observations across 5 time periods.

* This proportion is calculated conditional on the household renting out some land. There are 1,824 observations in this sub-sample (approximately 17 per cent of the full sample). From 2008 to 2016, the number of households renting land out has increased from 13 to 20 percent. More than 76 percent of these temporary land transfers have occurred among relatives and/or without any type of compensation (monetary or in-kind).

As mentioned above, our dataset contains several plot level characteristics which we will include in our empirical analysis to control for factors that might affect both the decision to obtain a certificate and the compensation received when the plot is rented out. Some descriptive statistics for these variables are presented in Table 2.2 for the full sample of plots, as well as for those that were rented out.

Table 2.2: Plot level characteristics by certification status

	No LUC (mean)	LUC (mean)	p-value difference
<i>Full Sample</i>			
Area (log sqm)	6.77	6.29	0.00
Restrictions	0.34	0.51	0.00
Fertility (1 = low 3 = high)	1.94	1.95	0.00
Irrigation	0.65	0.84	0.00
Annual crops	0.86	0.90	0.00
Slope (1= flat 4= very steep)	1.66	1.30	0.00
Bordering another plot (1 = yes)	0.10	0.14	0.00
Distance from home (log m)	6.68	6.09	0.00
N	9,355	28,517	
<i>Plots Rented out</i>			
Area (log sqm)	5.95	5.92	0.56
Restrictions	0.61	0.53	0.00
Fertility (1 = low 3 = high)	1.98	1.99	0.69
Irrigation	0.87	0.87	0.69
Annual crops	0.97	0.96	0.24
Slope (1= flat 4= very hilly)	1.20	1.16	0.01
Bordering another plot	0.08	0.11	0.01
Distance from home (log m)	6.38	6.37	0.93
Rent out to relative	0.66	0.66	0.71
Rent out for free	0.60	0.50	0.00
N	3,399	980	

Source: Authors' computation from VAHRS data.

According to the full sample, certified plots appear to be on average of better quality than non-certified ones. More specifically, they have higher (self-reported) fertility, are more likely to be irrigated, flatter and closer to the farmers' homestead. They are also more likely to be restricted to rice production and this would explain why are also more likely to be cultivated with annual crops. It is important to stress that since the majority of households have either all or none of their plots certified (only in 10 percent of the household observations we see titled and un-titled land), these differences most likely represent variations in land characteristics across households rather than plot-level differences within households.

These differences are however less pronounced in the subsample of plots rented out. In this case, plots with and without certification have on average the same fertility and irrigation levels, and are equally distant from the farmers' dwellings (although certified plots are more likely to be sharing a border with another household plot). The sole measure of land quality that presents a

statistically significant difference in mean is the slope, as certified plots are shown to be on average flatter. In terms of the choice of tenant, we were not able to identify any significant difference: certified and non-certified plots are equally likely to be rented out to relatives. However, certified plots are less likely to be leased out for free.

2.5 Estimation strategy

The goal of this chapter is to assess whether land certificates increase the probability of receiving some compensation when a plot is rented to relatives and if the impact is stronger for female-headed households. We focus on the landowners that rent land to their relatives—which represent almost two thirds of all temporary land transfers—because these contracts are more likely to be influenced by social norms and the relative bargaining power between landlords and tenants. If certificates strengthen landlord's property rights, we would expect that households who have their land titled—especially those with weaker *ex-ante* tenure security—are more likely to receive compensation for the land they rent because they can choose from a wider pool of possible tenants and have a stronger position in the negotiation process of the contracts. The first specification we estimate takes the following form:

$$\Pr(Free_{pht}) = \beta_1 Female_{ht} + \beta_2 LUC_{pht} + \beta_3 Female_{ht} * LUC_{pht} + X_{ht} + Z_{pht} + \tau_t + \zeta_c + \varepsilon_{pht} \quad (2.1)$$

Where the probability of a plot being rented out for free (conditional on being rented out to a relative) is modelled as a linear function of the gender of the household head, whether the owner has a land use certificate for the plot, their interaction term, a set of household (X) and plot (Z) level characteristics, and time and commune fixed effects.¹⁶ The estimate of β_1 would indicate whether female-headed households are less likely to receive compensation for the plots they rent out, the sign of β_2 would tell us if the LUC plays a role in the probability of renting land for free (regardless of the landlord's gender) and a negative and significant estimate of β_3 would

¹⁶ The household level variables included in the regression are: age and years of education of the household head, number of individuals in working age, number of draft animals owned, total value of the durable goods (log), a dummy indicating whether the head of the household belongs to an ethnic minority, another dummy taking value 1 when the household has experienced a natural shock, and finally household's income decile. The plot level characteristics are the area (in logs), whether the land is planted with annual or permanent crops, if there is an irrigation system and whether there are restrictions on the crops that have to be grown. Finally, we include some self-reported indexes of land quality (1 = below average 2 = average 3 = better than average) and terrain roughness (1 = flat to 4 = very steep).

corroborate the hypothesis that LUCs have a gender-differential impact, increasing the probability of female-headed households to obtain some payment when leasing out land to their relatives.¹⁷

In the specification described so far, the outcome of receiving or not compensation for the land transferred is observed within a restricted sample: the landlords that decided to transfer land to a relative.¹⁸ Hence, we are excluding all the transactions between non-relatives, which ignore landlord's first level decision—renting to a relative versus renting to someone else. Such restriction can lead to problems of selection bias if there are some unobservable factors that are affecting both the choice of tenant and whether any compensation is received. We address this concern following the two-step procedure suggested by Ahn and Powell (1993).¹⁹ The first step consists in estimating non parametrically the conditional mean of the probability of each rented out plot to be given to a relative, while in the second step this index is added non parametrically as a control in the regression of interest, otherwise identical to equation (2.1).²⁰

The decision to rent out to a relative, rather than any other household or institution, is likely to be a function of the household's family connections and the level of trust in other community members. More specifically, landlords that were born in the village and have a lower level of trust in their neighbours are more likely to lease land to their relatives. Since these variables

¹⁷ The data we have tells us the monetary value of the rental agreement, whether the tenant pays cash or in some other way (part of the harvest for example). In the case of an in-kind payment, landlords give an estimated value of the compensation they receive. Hence, if landlords report they received zero compensation for the rental transaction, this means they did not receive money or anything else in exchange for leasing the land. Unfortunately we cannot distinguish between cash and in-kind payments.

¹⁸ Unfortunately, our data does not allow us to know the kind of relationship between landlords and tenants (if it is their children, siblings, cousins, and so on).

¹⁹ For some (Dubois 2002), another important potential source of endogeneity comes from the decision of landowners to become landlords instead of cultivating their land. This chapter does not model the decision to rent out land, and instead focuses on the relationship between rental payments and property rights, conditional on the farmer having decided to become a landlord. Consequently, our findings are only valid for the subsample of the landowner population that selects themselves into landownership. However, if non-observed factors that drive the decision to become a landlord are also correlated with the probability of receiving rent when leasing out to a relative, our estimates could be biased. This is a problem which we cannot address directly, so our results are meant to be taken as illustrative of the importance that LUCs have for female-headed households who participate in land rental markets, and not an implication of the causal relationship between property rights and rental market participation.

²⁰ In particular, the expected probability of renting each plot to relatives (conditional mean) is estimated in the first step using the kernel estimator. The second step is a semi-parametric regression where we do not impose any functional form to the impact of the conditional mean estimated in the first step on the probability of receiving some compensation.

should not affect households' decision/capability to receive a compensation for the plots rented out (at least once other household and plot characteristic are controlled for), they satisfy the exclusion restrictions. Therefore, the estimation of the selection model is achieved by adding to the first stage a binary variable taking value 1 if the head was born in the commune and a dummy indicating whether the head would rather receive 3 acres of land to farm along with a neighbour he/she is not related to (signalling good level of trust) or 1 acre to farm alone.

Another important challenge for the identification is that plot certification is not exogenous. As long as we do not capture some unobservable characteristics that might affect both the decision to obtain a red book for a given plot and the likelihood to receive some rent when the holding is leased out, our estimates are biased. To address this concern we control for community level time-invariant factors through commune fixed effects, as well as several household and plot level characteristics listed above. Nonetheless, there is still the possibility that we are failing to account for some relevant yet unobservable dimensions. Ideally, we would like these unobservable factors to not be correlated with the probability of receiving compensation when leasing out land to a relative, however it is not possible for us to rule out this possibility. Hence, our estimates may suffer from omitted variable bias.

2.6 Results

In this section we present and comment on the empirical results based on the specifications described above. Furthermore, we present some insightful region-specific estimates. Because of historical reasons, the evolution of social institutions and attitudes towards private property rights differ significantly between the North and the South of Vietnam. Hence, an aggregate analysis might be overlooking relevant heterogeneity in the impact of land certification. We also discuss the implications of our findings for agricultural production and household income.

2.6.1 Land use certificates and rental compensation

Table 2.3 displays a number of different estimates of the simple linear probability model. Whenever the interaction term is not added (columns 1 and 2), the estimate of β_1 is negative but not statistically significant, suggesting that female-headed households are not more likely to rent land out for free to their relatives. However, the coefficient turns positive and significant when

the interaction term is included in column 3. This indicates that when female landlords lease untitled plots to their relatives, they are less likely to receive any type of compensation.

Table 2.3: Plot level linear probability model (plots rented out to relatives)

Dep variable: Plot rented out for free conditional on being rented out to relatives								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Female	-0.024 (0.04)	-0.024 (0.04)	0.130* (0.07)	0.167** (0.08)	0.158** (0.08)	0.164* (0.09)	0.182** (0.08)	0.191* (0.09)
LUC		0.000 (0.04)	0.044 (0.04)	0.049 (0.04)	0.042 (0.04)	0.024 (0.04)	0.037 (0.04)	0.027 (0.04)
LUC*Female			- 0.194** (0.08)	- 0.199** (0.08)	- 0.193** (0.08)	- 0.206** (0.09)	- 0.237*** (0.09)	- 0.257** (0.10)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Commune FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HH controls	No	No	No	Yes	Yes	Yes	Yes	Yes
Plot controls	No	No	No	No	Yes	Yes	Yes	Yes
p-value $\beta_1 = -\beta_3$	-	-	0.15	0.67	0.69	0.59	0.47	0.45
Mean y	0.64	0.64	0.64	0.64	0.64	0.65	0.63	0.65
N	2,930	2,930	2,930	2,930	2,930	2,596	2,677	2,359
Clusters	556	556	556	556	556	484	507	438
adj. R^2	0.381	0.381	0.381	0.385	0.387	0.370	0.391	0.407

Notes: Standard errors clustered at the household level in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Column 6 presents the results for the subset of households whose gender head has not changed throughout the period under analysis, column 7 for the subset of households with only titled or untitled plots, and for column 8 the intersection between these two sets.

Source: Authors' computation based on VAHRS data.

Our results suggest land certification makes up for female-headed household's weaker tenure security. We can infer this because β_3 is always negative and statistically significant, and the magnitude of its point estimate is never statistically different from β_1 .²¹ Moreover, LUCs are shown to have no impact on the probability that male-headed households rent out their land for free to their relatives, as β_2 is never statistically significant. This suggests that men's decision to rent plots for free to their relatives is not related to the possession of a LUC. Adding household

²¹ Although the point estimates for β_3 are always larger than β_1 , the difference (in magnitude) between the two coefficients is never statistically significant as indicated by the results of the formal tests presented in Table 3, that always fail to reject the null hypothesis $\beta_1 = -\beta_3$.

(column 4) and plot (column 5) characteristics does not affect these conclusions and if anything improves the significance levels.

In the remaining columns, we re-estimate the same regression on some sub-samples of the population as a robustness check. In order to rule out the possibility that the results are driven by shocks leading to a change in the household head, in column 6 we restrict the sample to those households whose gender of the head has remained the same throughout the 5 waves. In column 7, we only include households who have all or none of their plots titled (around 90 percent of the observations), to address some concerns related to unobservable heterogeneity in land quality at the plot level. Finally, in column 8 we include only households whose gender of the head never change and that have either all or none of their land titled. The results are consistent across all the specifications and corroborate our initial findings.

In terms of economic significance, the estimates of the gap are definitely relevant. In particular, since the unconditional probability of a plot being rented out for free when the tenant is a relative is 0.64 and the point estimates of β_l range between 0.13 and 0.19, female-headed households are 25 per cent less likely to receive any monetary or in-kind compensation. This significant unbalance is entirely offset by the possession of land use certificates.

There are substantial regional differences that may have shaped the way land markets evolved in Vietnam and their current functioning. While the Northern regions of Vietnam had a collectivized agricultural production system since the 1950s, in the South this system was not introduced until the late 1970s. Even after the country's reunification, many farmers in the South resisted collectivization: as late as 1986—when collectivization was starting to be reversed in all the country—less than 10 per cent of the rural households in the Mekong Delta region had been organized into cooperatives (Pingali and Xuan 1992).

Another important difference between the Northern and Southern provinces that is relevant for the compensation in land rental markets is the performance of local institutions (formal or informal) that deal with risk.²² Due to the longer prevalence of collective farming, many agree that communal risk-coping institutions work better in the North. Smith (1997) says that in the

²² Tanaka and Nguyen (2010) describes important regional differences in a very common informal institution for risk-sharing: rotating savings and credit associations (ROSCA). The authors find that in the north ROSCA participants are more trustworthy and default less than in the south. Moreover, the average size of the pot in northern ROSCAs is about 50 percent of their annual income, compared to only 16 percent in the south.

North households that are negatively affected by illness or crop damage rarely need to sell their land to cope with the negative shock. Prompsopha (2015) also shows land sales are less common in the North of Viet Nam due to their better social risk-sharing institutions. These regional differences are also present in the context of our analysis. As we can see in Table 4, the prevalence of informal land transactions is higher in the Northern region. Landlords in the North do not receive any compensation for 57 percent of the plots they rent out, compared to 33 percent in the South. Similarly, the fraction of plots that are leased out to relatives is also higher. The same pattern can be seen for plots rented in, although the difference is less noticeable. For this reason, we believe the role of LUCs in land rental market behaviour may be considerable different between North and South Vietnam.

Table 2.4: Type of landlords, tenants and rental agreement by region

	North	South	p-value difference
Plots rented out to relatives	0.67	0.60	0.00
Plots rented out for free	0.57	0.33	0.00
N	2,100	1,022	-
Plots rented in from relatives	0.50	0.42	0.00
Plots rented in for free	0.38	0.26	0.00
N	3,454	924	-

Source: Authors' computation based on VAHRS data

The figures shown in Table 2.4 provide an overall description of the differences between North and South Vietnam in terms of land rentals. In the North, landlords are more likely to rent out their plots for free and/or to relatives. This tendency is more pronounced among plots that are rented out in our sample, but it is statistically significant also among the ones that are leased in. In table 2.5, we provide some information about female-headed households between regions. It is interesting to see that female-headed households in the North are younger and more educated, but they also have fewer household members. They are equally likely to be married (in both regions around two thirds of female-headed households are widowed). Female households are more likely to have their land titled in the South, this is not surprising given the problems land certification has in the North, as discussed in section 2.3. Female landlords in the North are far

more likely to rent their land for free, though in both regions women are as likely to rent land to their relatives.

Table 2.5: Female households and their characteristics by region

	North	South	p-value difference
Age	59.5	61.8	0.00
Education	8.2	7.1	0.00
HH members	3.68	3.83	0.00
Married (%)	0.25	0.26	0.28
LUC (%)	0.89	0.92	0.00
Rent land for free*	0.49	0.32	0.00
Rent land to relatives*	0.67	0.70	0.29
N	6,317	3,875	-

Source: Authors' computation based on VAHRS data

* This percentage is computed using the households that rented land. These are 823 observations in the North and 322 observations in the South.

As outlined in the section 2.5, one potential concern related to the simple linear probability model presented in Table 2.3 is that it fails to take into account for potential sample selection. Indeed, the analysis involves only the plots that are rented out to relatives, which might differ from the other plots in the rental market along some unobserved dimensions.²³ As long as these characteristics affect also the likelihood of receiving rent, our estimates would be biased. For this reason, we also present the results obtain applying the two-step procedure proposed by Ahn and Powell (1993) to correct for the potential sample selection bias.

Table 2.6 shows the estimates for both the simple linear probability model (columns 1 to 3) and the model with adjustments for sample selection (columns from 4 to 6).²⁴ In order to check whether there is any appreciable regional difference, the regressions are estimated for the subsample of plots in the North (columns 2 and 5) and in the South (columns 3 and 6) only.²⁵

²³ Similarly, we cannot rule out the possibility that households leasing land out for free differ from the others in ways that are not captured by the household level controls included.

²⁴ Columns 4 to 6 present the coefficients from the second step. Since it is a linear probability model, they can be interpreted as marginal effects and be directly compared to the estimates in columns 1 to 3.

²⁵ Provinces in the Northern Lowlands (Ha Tay, Phu To and Nghe An) and Northern Highlands (Lao Cai, Lai Chau and Dien Bien) areas are included in the Northern region, while the Southern region contains provinces located

As far as the sample selection models are concerned, it is clear that they deliver results which are entirely in line with the simple linear models. In fact, magnitude, signs and significance of the coefficients of interest are virtually indistinguishable. As for the regional decomposition, the findings seem to indicate that the aggregate results were mostly driven by households located in the Northern region (which represents more than three quarters of the whole sample). In fact, none of the coefficients under analysis is statistically significant for the Southern region subsample. This indicates that in the South, female-headed households are as likely as the others to receive rent for the plots rented out and that the possession of a LUC does not increase the likelihood to receive any compensation.

Table 2.6: Sample selection model estimates, by region.

	No sample selection correction			Sample selection correction		
	All (1)	North (2)	South (3)	All (4)	North (5)	South (6)
Female	0.158** (0.08)	0.191** (0.08)	-0.039 (0.22)	0.165** (0.08)	0.171** (0.08)	-0.009 (0.22)
LUC	0.042 (0.04)	0.067 (0.04)	-0.110 (0.13)	0.052 (0.04)	0.067 (0.04)	-0.090 (0.12)
LUC*Female	-0.193** (0.08)	-0.240*** (0.09)	0.098 (0.21)	-0.208** (0.08)	-0.206** (0.09)	0.019 (0.21)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Commune FE	Yes	Yes	Yes	Yes	Yes	Yes
HH controls	Yes	Yes	Yes	Yes	Yes	Yes
Plot controls	Yes	Yes	Yes	Yes	Yes	Yes
p-value $\beta_1 = -\beta_3$	0.69	0.40	0.40	0.39	0.58	0.88
Mean y	0.64	0.70	0.41	0.64	0.70	0.41
Clusters	556	379	177	556	379	177
N	2,930	2,370	560	2,930	2,370	560
adj. R^2	0.387	0.343	0.424	0.385	0.346	0.433

Notes: Standard errors clustered at the household level in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Source: Authors' computation based on VAHRS data.

The results are crucially different for the Northern region. Namely, female-headed households without LUCs are 27 percent more likely to rent out plots for free (24 percent according to the selection model). This gap is entirely eliminated by the possession of LUCs for the plots, which

in the Southern Lowlands (Quang Nam, Khan Hoa and Long an) and in the Southern Highlands (Dak Lak, Dak Nong and Lam Dong).

has a significant impact only on female-headed households. These findings indicate that land use certificates improve the bargaining power of female-headed households, who otherwise seem to be disadvantaged by the existing norms governing land practices. In particular, once they have a formal certification, they become as likely as men to receive some compensation for the plots rented out to relatives.

2.6.2 Productivity losses

We expect market-based transactions (those with an agreed compensation) to improve efficiency more than non-market land transfers. This is because they are the manifestation of gains from trade that occur when land is transferred from less to more productive producers. Empirical evidence from Ethiopia shows that informal land transactions, unlike market-based rentals, do not lead to an improvement in agricultural productivity and factor allocation (Chen et al 2017).

Unfortunately, a direct comparison of the productivity of tenants and owners cannot be performed as we do not have data about the production undertaken on plots that have been rented out by the households in the sample. However, we can still obtain some insights by comparing the yields of farmers who rent land in.²⁶ Specifically, we want to test whether households that rent in plots with an agreed compensation (monetary or in-kind) are actually more productive than those that rent in land for free. We focus on rice production to operate with a consistent measure of productivity across time and regions. This still gives us a representative picture of agricultural activity as rice is by far the most important crop in Vietnam.

Table 2.7: Average rice yields (t/ha) of plots rented in by year and type of contract

	All sample	Renting in for free	Renting in for compensation	p-value difference
2008	4.54	4.69	4.93	0.04
2010	4.56	4.73	4.94	0.08
2012	4.72	4.86	5.02	0.09
2014	4.85	4.79	5.09	0.02

²⁶ Even though these households are not exactly the ones we are observing when analysing the effects of LUCs on landlord's tenant choice and rental agreement, we think that they will capture the overall effects of land rental market behaviour on agricultural production since it refers to the demand side of the rental market.

2016	4.87	4.92	5.29	0.00
Overall	4.71	4.81	5.03	0.00

Source: Authors' computation based on VAHRS data.

Some suggestive evidence in this sense can be derived simply by estimating the rice yields of all plots rented in and testing whether they differ significantly depending on the type of contract (free rental or not). The results of this exercise are displayed in Table 2.7. The first column shows the average for the entire sample, the second column shows the average of plots that were rented in for free, and the third column gives us the average yields of plots that were rented in with some agreed compensation. The first interesting fact we can observe is that rice productivity has increased by more than 7 percent between 2008 and 2016. Moreover, rice productivity on plots rented in (both market and non-market) is higher than that of the entire sample in every period. However, in line with our hypothesis, we also see that, for each year, the yields were significantly higher in plots rented in for a fixed compensation than for those rented in for free (p-values are indicated in the fourth column). The difference between market and non-market transfers is also economically significant, ranging from 3 percent in 2012 to 7.5 percent in 2016.

However, it is possible that these findings are driven by other factors than systematic differences in productivity between tenants renting in for free and those who pay for the land. In particular, they might reflect differences in plot specific characteristics (e.g. land quality and irrigation facilities) or other variables such as input intensity in rice production. In order to address these concerns, we move the analysis to the household level, and estimate the following regression:

$$\log(\text{yield})_{it} = \beta_1 \text{Renting in}_{it} + \beta_2 \text{Renting in}_{it} * \text{No rent paid}_{it} + X'_{it}\gamma + \tau_t + \varsigma_z + \varepsilon_{it} \quad (2.2)$$

The dependent variable is the logarithm of the rice yield of farmer i in time t and is computed aggregating the production (and land input) across all the plots cultivated by the household, including both owned and rent-in plots. “Renting in” is a dummy variable taking value one when the household i is renting at least one plot in period t (regardless of whether they are paying for it or not), while “No rent paid” is a dummy variable that takes value 1 when households do not pay rent for any of the plots rented in.²⁷ X is a vector of controls which captures input intensity

²⁷ 95% of households renting land in either rent all the plots for free or pay for all of them. We remove the households that have both plots rented in for free and for compensation to maintain a consistent comparison among household productivity.

and land quality, τ is a set of year fixed effects, ς represents the province or commune fixed effects, and ε is the error term.²⁸

Table 2.8: OLS results on the effect of market and non-market rentals on rice productivity

Dependent variable: rice yields (log)				
	(1)	(2)	(3)	(4)
Rent land in	0.044*** (0.01)	0.061*** (0.01)	0.050*** (0.01)	0.031*** (0.01)
Rent land in * Rent land for free	-0.050*** (0.02)	-0.062*** (0.02)	-0.047*** (0.01)	-0.024* (0.01)
Land farmed (log)		-0.087*** (0.01)	-0.092*** (0.01)	-0.114*** (0.01)
Labour days (log)		0.051*** (0.01)	0.051*** (0.01)	0.065*** (0.01)
Irrigation (1 = yes)			0.122*** (0.01)	0.062*** (0.01)
<i>Fertility (base = low)</i>				
Medium			0.109*** (0.01)	0.103*** (0.01)
High			0.132*** (0.02)	0.109*** (0.02)
<i>Slope (base = flat)</i>				
Slight Slope			-0.103*** (0.01)	-0.039*** (0.01)
Steep			-0.177*** (0.02)	-0.064*** (0.02)
Very steep			-0.382*** (0.11)	-0.222** (0.09)
Year FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	No
Commune FE	No	No	No	Yes
p-value $\beta_1=\beta_2$	0.76	0.87	0.70	0.41
N	8,197	8,197	8,197	8,197
adj. R^2	0.149	0.171	0.229	0.367

²⁸ Land quality measures are fertility, slope and irrigation. As they are originally ordered categorical variables defined at the plot level, they are aggregated at the holding level with a two steps procedure. First of all, a weighted average is computed using the plots' area as weights. Then, the variables obtained are rounded to the closest integer to be assigned to each category. Although household head characteristics are also likely to affect productivity, we do not control for them. The reason is that we want to understand the production implications of land rental markets, particularly the differences between market and non-market transactions. Hence, if a farmer obtains land through the market because she is better educated or younger (observable features that are positively related to ability), this does not concern us as it is still efficiency enhancing that younger and more educated farmers obtain more agricultural factors.

Notes: Robust standard errors in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Source: Author's calculation based on VARHS data

The coefficients of interest are β_1 and β_2 representing respectively the productivity gap between households who rent land in and those who do not, and the difference between the yield obtained by tenants who pay for the plots they lease in and those who do not.²⁹ As shown in Table 2.7, β_2 is negative and significant across all specifications, indicating that farmers who rent in land for free obtain lower yields than those who pay for it, even after controlling for differences in land quality and input intensity. Likewise, β_1 is always positive and statistically significant which suggests households that rent land in are more productive than those that do not. However, this positive impact of land rentals on productivity is likely just driven by market transactions because $\beta_1 + \beta_2$ is never statistically different from zero, suggesting that farmers renting in land for free are not more productive than those that do not rent in any land.

These estimates are also economically significant. Depending on the specifications, farmers who rent in land for a price tend to reach from 3 to 6 percent higher yields than those who rent in for free. This represents about half the impact of possessing an irrigation system according to our estimates. As possessing a land use certificate increases the likelihood of female-headed households to engage in market-based transactions, they are also expected to increase agricultural productivity through a better allocation of resources.

2.6.3 Income losses

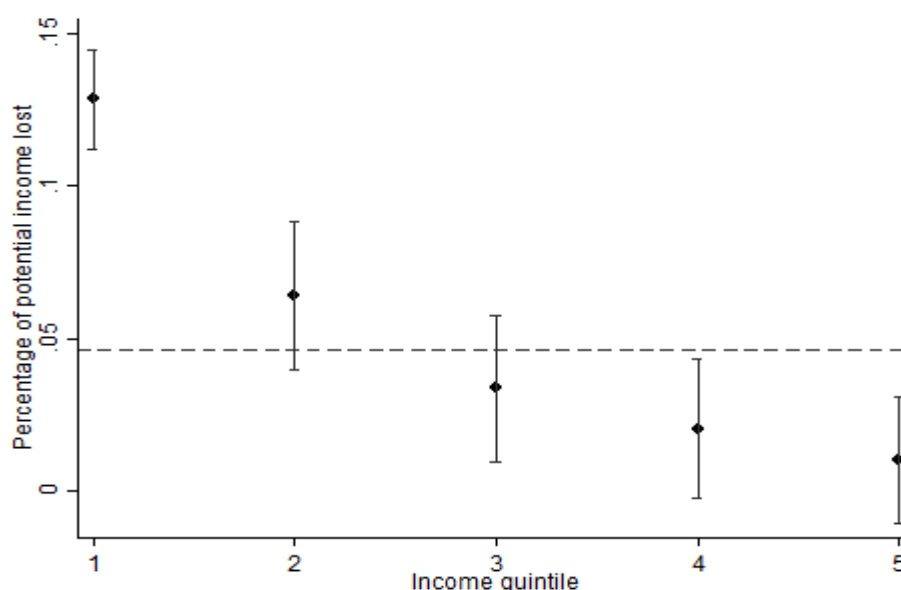
By renting out land for free, households are potentially giving up a relevant source of income. In order to quantify the magnitude of this phenomenon, we estimate a time-province average rental rate using the value households report to pay (in the case of land rented in) or receive (in the case of land rented out). We then use this rental rate to compute the income loss for households that rent out land for free. Specifically, we estimate the rental rate by running an OLS regression where the dependent variable is the household rent per square meter paid/received for plots rented in/out controlling for province and time fixed-effects, as well as a

²⁹ Note that by construction the dummy variable “No rent paid” can only take value 1 when “Renting in” is equal to 1 as well, therefore the same results would have been obtained by entering the two dummies separately as opposed to the interaction term.

number of plot characteristics.³⁰ According to our estimates, households who rent out land for free are renouncing, on average, to receive a rent that represents around 5 percent of their total income.

As we mention before, the subsample of landlords is quite heterogeneous. On one side, some farmers rent out land because they are leaving agriculture for more profitable activities (rich landlords). On the other, farmers with limited non-land agricultural factors are no longer able to cultivate all of their landholdings so they lease out their property (poor landlords). Therefore, we provide a more disaggregated analysis based on income to better understand the implications of non-market rentals for income dynamics.

Figure 2.1: Average and standard deviations of potential income losses by income quintiles



Note: The horizontal dotted line represents the sample average, the points are the means for each quintile and the vertical lines the standard deviation of the quintile specific averages.

Source: Authors' calculation based on VAHRS data.

In Figure 2.1, we present the mean and standard deviation of the potential income lost faced by each landlord that leases land for free, by income quintiles.³¹ From the corresponding results, it is clear that the impact on poorer households is quite remarkable. For households in the lowest income quintile, the income loss represents on average almost 12 percent of their annual income.

³⁰ Namely, we control for plot size, self-reported fertility, slope, irrigation, crop-choice restrictions and whether is devoted to annual or perennial crops.

³¹ The income quintiles are computed using the entire household sample. The richest quintile has the higher proportion of households renting out land for free. Indeed, 30 percent of landlords leasing out for free belong to the highest quintile.

This is a particularly relevant for female-headed households as they are over represented in the lowest quintiles. In the case of landlords leasing land out for free, 54 percent of the female-headed households belong to the two bottom quintiles (35 percent to the bottom one) as opposed to only 27 percent for men (13 percent to the bottom one).

2.7 Conclusions

In the period under analysis, Vietnam has witnessed a remarkable growth in land rental market activity, with a nearly 50 percent increase in the share of agricultural plots that were rented in or out by rural households. Interestingly, a considerable number of these temporary land transfers occurred among relatives and did not contemplate any type of compensation to the landowner. Understanding the implications of these non-market transactions is very important, particularly in Vietnam where, despite rapid growth in productivity and land transfers, agricultural factor misallocation has increased in the last 10 years (Ayerst et al 2018).

In this chapter we provide evidence that some of these informal transactions are the result of differences in power between female and male-headed households. According to our results, female-headed households are less likely to receive any rent payment when they lease out their plots to relatives, unless they have a certificate for the plot. This suggests that they might have weaker rights over the land, but legal documents strengthen their claims over their assets and increase their bargaining power in the negotiation of the rental terms. Additionally, we quantify the impact of these transactions for agricultural production and household income.

There are significant differences between the Northern and Southern provinces in terms of their social institutions and attitudes towards market-oriented policies, particularly in agrarian issues. We show that our results are being driven mostly by the dynamics of the land rental markets in the North. In this region, where land transactions among relatives are common both for male and female landlords, female-headed households are more likely to receive compensation when they have a LUC for plots they lease out. In the South, the possession of a land title does not affect women's probability of receiving a payment when leasing out to relatives.

Our results suggest that clear and enforceable property rights have a positive impact on female-headed households' ability to obtain a more convenient agreement when renting land to members of their family. By improving the bargaining power of groups with weaker *ex-ante*

property rights, land use certificates might not just guarantee a fair compensation to vulnerable households but also contribute to allocate land to farmers willing to pay for it (and arguably more productive) rather than to individuals obtaining it by virtue of their relative strength in the extended family.

Appendix

2.A Unilateral transfers from relatives

As pointed out in the previous sections, one of the main concerns related to the increasing share of informal transactions in the land rental markets, beside the arguments related to the potential resulting inefficiencies, is that landlords might fail to receive an adequate compensation for their land. The issue is particularly crucial as a large fraction of the landlords in our sample is constituted by poor female-headed households.

However, there is the possibility that households renting their agricultural plots for free might receive some sort of indirect compensation in the form of unilateral cash or in-kind transfers not directly included in the contract.³² We are not directly able to rule out this possibility as we do not have any further information on the contract terms and on the identity of the relatives acting as tenants, but we can study whether renting out plots to relatives for free is correlated with an increase in the probability of receiving unilateral transfers from relatives (not necessarily the same) or in their total amount.

In order to check whether it is the case, the following household regression is estimated:

$$\begin{aligned} Transfers_{ht} &= \beta_1 landforfree_{ht} + \beta_2 shock_{ht} + \beta_3 landforfree_{ht} * shock_{ht} + X'_{ht}\gamma \\ &+ \varepsilon_{ht} \end{aligned} \quad (2.3)$$

and the resulting estimates are displayed in Table 2.A.³³

In particular, the dependent variable is either a dummy taking value 1 when the household receives unitary monetary transfers from its relatives (panel A) or the logarithm of the value of these transfers (panel B). We are prevalently interested in assessing whether having some plots of land rented out to relatives for free increases the probability and/or the amount of the transfers received, captured by the coefficient β_1 . In the first two columns, the main explanatory variable

³² From the questionnaire, we only know whether any form of direct compensation (in cash or kind) was contemplated by the rental agreement.

³³ Note that the dependent variable refers only unilateral transfers. Therefore, the cash inflows for land rented out or other transactions are not included.

is a dummy that indicating whether the household is renting at least one plot for free, while in columns 3 and 4 the log of the area of land rented out for free is considered.

Another possibility that needs to be taken into account is that leasing land for free to relatives might be conceived as a way to ensure a safety net in case of unexpected negative shocks (Promsopha 2015). If that was the case, this behaviour would not necessarily give rise to an increase in the unilateral transfers, but rather to an increased support from relatives in case of negative shocks. The occurrences as well as the gravity of household level shocks are captured by the percentage of person days lost due to adverse circumstances in the previous year, computed as the fraction of days working age individuals were not able to work due to illness or injuries. This variable is also interacted with either the dummy indicating whether land is rented out for free (columns 1 and 2) or to the acreage of plots given out for no compensation in order to assess whether these transfers actually lead to a more substantial support in case of unforeseen detrimental shocks.

According to our estimates, neither renting at least one plot to relatives for free nor the total area of land rented out to relatives without receiving any direct compensation has any impact on the probability of receiving some transfers (Panel A) or on the amount of the transfers received (Panel B). Moreover, although households suffering shocks are more likely to receive transfers, we find no evidence of a higher amounts being transferred to those who have some land leased out for free to relatives.³⁴ These findings seem to exclude these free rental contracts have any indirect benefit to the landlords.

Table 2.A: Transfers from relatives outside households

³⁴ The regressions presented include household level covariates (columns 1 and 3) or fixed effects (columns 2 and 4), but the results are robust to a wide range of specifications.

Panel A

Dependent Variable: Household receives transfers from relatives (Yes = 1)				
	(1)	(2)	(3)	(4)
Renting out for free (yes = 1)	-0.015 (0.02)	-0.006 (0.03)	-	-
Area rented for free (log)	-	-	-0.002 (0.01)	-0.011 (0.02)
% Person days lost (shocks)	0.405*** (0.06)	0.343*** (0.09)	0.407*** (0.06)	0.346*** (0.09)
Interaction	0.004 (0.12)	-0.010 (0.17)	-0.002 (0.02)	-0.017 (0.02)
Year FE	Yes	Yes	Yes	Yes
Commune FE	Yes	Yes	Yes	Yes
Household covariates	Yes	No	Yes	No
Household FE	No	Yes	No	Yes
N	10,655	10,655	10,655	10,655
Adj-R ²	0.122	0.102	0.122	0.102

Notes: Standard errors clustered at the commune level in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Household controls: gender, education and age of the household head, number of components in working age, log of assets' value, whether the household has experienced an agricultural shock and if the household is renting out any plot.

Panel B

Dependent Variable: Value of transfers received from relatives (log)				
	(1)	(2)	(3)	(4)
Renting out for free	-0.037 (0.22)	0.081 (0.28)	-	-
Area rented for free (log)	-	-	-0.000 (0.04)	0.011 (0.04)
% Person days lost (shocks)	3.742*** (0.58)	3.515*** (0.83)	3.773*** (0.58)	3.540*** (0.84)
Interaction	0.877 (1.23)	0.040 (1.58)	-0.092 (0.17)	-0.024 (0.22)
Year FE	Yes	Yes	Yes	Yes
Commune FE	Yes	Yes	Yes	Yes
Household covariates	Yes	No	Yes	No
Household FE	No	Yes	No	Yes
N	10,655	10,655	10,655	10,655
Adj-R ²	0.149	0.151	0.149	0.151

Notes: Standard errors clustered at the commune level in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Household controls: gender, education and age of the household head, number of components in working age, log of assets' value, whether the household has experienced an agricultural shock and if the household is renting out any plot.

Source: Authors' computation based on VAHRS data.

Chapter 3: **The effect of tenure security on household labour supply and agricultural production: evidence from Vietnam**

3.1 Introduction

Clear and properly enforced property rights are a key driver of agricultural productivity and economic development. Increased tenure security incentivizes long-term investment (Demsetz, 1967; Alchian and Demsetz, 1973; Besley 1995)³⁵ and can lead to a more efficient allocation of factors of production (i.e. land and labour).³⁶ In particular, as an economy grows and more opportunities in the non-agricultural sector of the economy emerge, households with a comparative advantage in non-farming activities will leave agriculture to pursue opportunities in other industries (Duarte and Restuccia, 2010).³⁷ It is then imperative that factors of production can be traded without significant transaction costs to ensure a smooth shift of labour from agriculture to the higher value-added secondary and tertiary sectors of the economy. In developing countries, where property rights tend to be weak, this will not be the case. The lack of properly enforced property rights means that land is not easy to trade and the tenancy of the land is often maintained through continuous use of it. Moreover, farmers are reluctant to make investments in land due to the risk of appropriation. This leads to an inefficient allocation of

³⁵ See Deininger and Feder (2009) for a review of the literature on land titling and economic development.

³⁶ For example, in China, the legalization of land leasing rights led to a redistribution of land towards more effective farmers (Chari et al, 2017). Also in China, Adamopoulos et al (2015) find land institutions restrain aggregate productivity by affecting not only the allocation of agricultural factors among farmers (misallocation) but also the allocation of workers between the agriculture and non-agriculture sectors.

³⁷ This is something really important to consider in the Vietnamese context since the share of the labour force went from 70 percent in 1996 to 40 percent in 2018 (ILOSTAT, 2018)

labour and capital, and lower productivity. This has implications important implications for the process of economic development and structural transformation.³⁸

In 1993, the Vietnamese government passed a law where it granted individual usufruct rights to rural households. The duration of these rights was set at 20 years for annual crops, and 50 years for perennial crops. When the rights of annual plots were set to expire, the Vietnamese government passed the 2013 Land Law in which, among other things, extended the usage rights period of annual crops from 20 to 50 years. This unanticipated change in policy improved all landowners' property rights, but it was particularly beneficial for annual crop growers, whose rights were set to expire soon. This chapter explores the effect of land tenure security caused by this policy change on annual farmer's household labour supply.

There are a number of ways that more secure property rights can impact on household labour supply. In a context of unclear ownership rights, labour effort in agriculture has two purposes: 1) agricultural production and 2) protection of property (Besley and Ghatak, 2010). Increased tenure security could encourage farmers to exert more effort into agricultural production. On the other hand, empirical evidence shows improvements in land tenure rights remove the need of "guard" labour, and ultimately free those resources to pursue other activities, either on or off-farm (De Janvry et al, 2015; Valsecchi, 2014; Field, 2007; Do and Iyer, 2008). Moreover, the creation of a market for land can lead farmers to sell or rent out their land, thereby reducing the amount of labour invested. Labour supply could also be affected through increased capital intensity of land. Empirical evidence suggests that tenure security has a positive impact on agricultural investment (Besley 1995; Goldstein and Udry, 2008; Markussen and Tarp, 2014; Bellemare et al, 2018). Higher levels of land investment could encourage farmers to work harder and exert more effort. It may also allow farmers to reduce labour inputs without affecting productivity. Ultimately, what the overall effect will be is an empirical question which will depend on which of these channels is most at play.

We use panel data on a sample of over 2,000 farming households in rural Vietnam for the period 2008 to 2016. Results show that the increase in tenure security resulting from the Land Law of 2013 reduced labour devoted to agricultural activities of annual crop growers, particularly for

³⁸ For instance, in Ghana where one of the main forms of land investment is to leave it fallow for a period of time, Goldstein and Udry (2008) find individuals with stronger land rights (e.g. higher political hierarchy) undertake this type of investment more often and for longer periods, resulting in higher levels of productivity.

female adults. These findings are robust to several specifications and support the parallel trends assumption. We do not find evidence to support that the Land Law of 2013 increased participation in off-farm activities. We explore two possible explanations for this. First, we consider the level of capital used in agricultural production. If land rights enhance investment, households may shift their input share structure to a more capital-intensive setting, reducing their total labour supply in farming. Second, with increased tenure security, households are now more likely to participate in land markets, reducing their operational scale and the amount of labour needed. Results suggest that after the enactment of the 2013 Land Law, annual crop growers increase their capital intensity relative to labour and decrease their landholdings.

The chapter contributes to the literature of property rights in three ways. First, it uses a difference-in-difference approach to examine the distortions of tenure insecurity in labour allocation, and it sheds light on the intra-household allocation of labour by examining labour supply by age and gender. Second, it explores the possibility of a shift in the structure of input shares by suggesting improvements in tenure security can increase capital intensity in agricultural production. Finally, results can be useful for policy makers as they show farmers devote resources to maintain their usufruct rights. Arguably, removing the need to renew your rights as owner every given time period can have significant benefits for landowners.

The chapter is structured as follows: Section 3.2 describes the context of land tenancy in Vietnam. Section 3.2 provides a brief literature review and conceptual framework to analyse property rights and labour supply. In section 3.4 we present the empirical strategy. Section 3.5 describes the data used in the analysis and presents some descriptive statistics. Section 3.6 discusses the empirical findings and we conclude in section 3.7.

3.2 Background: Land Reform in Vietnam

In the 1980s the Vietnamese government enacted a series of reforms to transform its agricultural sector from a collective production system to one based on household initiative. As part of these efforts, the Doi Moi reforms of 1988 sought to increase rural household's land tenure security and began a process of privatization and decentralization of output and input markets. However, many restrictions on land usage and transfers remained until the enactment of the 1993 Land Law. This law contemplated the issuance of farm-level Land Use Rights Certificates (LUC), and the duration of those rights was set at 20 years for plots with annual crops and 50 years for

plots with perennial crops. Moreover, the Land Law of 1993 allowed households to transfer, lease, mortgage and bequest the usage rights of their property.³⁹

The formalization of private usage rights paved the way for the development of an active land market and the transformation of the rural economy. The land reform of 1993 increased agricultural investment and efficiency, it also granted better access to land for the poor and allowed rural households to pursue opportunities outside of agriculture (Do and Iyer, 2008; Deininger and Jin, 2008). Also, Khai et al (2013) show that in recent years land transfers among individuals have been gradually substituting State allocations as a mean of land acquisition.

The Land Law of 1993 has had two revisions since it was issued. The first was in 2003 to include two names in the LUC where land was jointly owned (for example, in the case of husband and wife) and allowed for certification to be conducted at the plot level, instead of the farm-level as the 1993 law stipulated. The second was more recently in 2013 when, among other things, the usage rights of all land –annual and perennial– was extended to 50 years. Because plots devoted to annual crops were originally given 20 years of usufruct rights, we expect this change in the law to increase tenure security for annual growers while perennial crop growers must be relatively unaffected by the law since they had at least 30 more years of usufruct rights.

According to these laws, any plot of agricultural land assigned to a household before or in 1993 would start its usufruct rights on October of 1993. Land obtained after this date would start its usufruct rights on the date it was acquired. Moreover, when farmers transfer the usufruct rights of their land (via sales or rentals) such rights are not updated. For example, if a household “sells” a plot of annual land acquired in 1993 in the year 2010, such property will only have 3 years left of usufruct rights for the new owner. The law states it is possible for farmers to renew their usufruct rights after they expire, as long as they have not conducted any illegal activities on the property. However, Article 38 of the 2003 Land Law stipulated that land can be recovered if used for the wrong purposes or *inefficiently*. The law also says users are responsible to give land back to the State if their usage rights ended without an extension.

Based on these laws, this chapter argues that the duration of usufruct rights properly characterizes land tenure security because the legal protection against land-grabbing or

³⁹ The land certification program was one of the most extensive in the world: by the year 2000 more than 11 million certificates had been issued, and in 2004 three quarters of all cultivated land had been titled (Brandt et al., 2006).

administrative reallocations only protects landowners within the period of their usufruct rights.⁴⁰ This suggests that annual crop growers faced considerable tenure insecurity as they approached the expiration of their usufruct rights, regardless of whether they had a LUC for the plot or not. Particularly for those who obtained their land in 1993 (75 percent of annual crop growers possess some land that was acquired in 1993 or before), the extension of usage rights from 20 to 50 years in the 2013 Land Law represented an unexpected improvement in their property rights. Since perennial crop growers still had time before their expiration, it is reasonable to think this policy change had a relatively smaller effect on them. This chapter will make use of this differential impact of the 2013 Land Law between annual and perennial farmers to analyze the effects of tenure security on household labour supply.

3.3 Conceptual Framework

Why would we expect property rights to affect households' labour supply? Besley and Ghatak (2010) explain how in a context of weak property rights, labour effort can be used to maintain ownership of your property. We can think of tenure insecurity as a random tax on production, which discourages labour effort. However, if labour effort reduces the risk of expropriation, farmers have an incentive to work on the land –possibly more than the optimal level– to maintain claims over their property.

Empirical evidence has found that tenure security affects household's allocation of labour. In the context of Peru, Field (2007) shows that granting title deeds for urban squatters increased their labour outside their home, and allowed families to substitute child labour for adult labour. She argues that the certification increased tenure security, which eliminated the need to spend human resources to maintain ownership of their home. In the case of agricultural land in developing countries, ownership is often tightly attached to usage. A land reform in Mexico formally de-linked land rights from land use by issuing household-level certificates and legalizing land transfers among community members. The certification program led to a considerable increase in migration because owners no longer fear expropriation if they resided outside their community (De Janvry et al, 2015; Valsechi, 2014).

⁴⁰ This does not mean that a plot that is still within its usufruct rights time frame cannot be expropriated. However, being inside such time-span provides certain legal assurance against wrong-full land grabbing or reallocation. In a given year, less than 2 percent of plots are reallocated by commune authorities.

Another important aspect of tenure security is its positive impact on agricultural investment (Besley 1995; Goldstein and Udry, 2008; Markussen and Tarp, 2014). Bellemare et al (2018) find that annual plots in Vietnam were more likely to undergone investments in irrigation and soil conservation in response to the 2013 Land Law. How are those improvements expected to affect labour decisions? On one hand, better infrastructure may increase the return to labour in own-farm cropping activities, incentivizing more effort in agriculture. On the other hand, investments may shift the share of inputs in agriculture to a more capital-intensive setting, allowing for labour to be reduced without significant effects on productivity. Nakasone (2011) finds that improvements in tenure security caused by a land certification program in rural Peru decreased off-farm.

Property rights affect a broad array of inter-linked household decisions. If the Land Law of 2013 effectively enhances ownership rights of annual crop growers, its impact on labour supply remains ambiguous. More investment in annual land may allow farmers to devote time to other activities, but it can also increase the returns to labour in such land ultimately increasing labour effort. If labour intensity is an effective way of avoiding land expropriation (or in the Vietnamese context, an effective way of guarantying the renewal of your usufruct rights), enhancing the *de jure* tenure rights of annual farmers may allow them to allocate their labour more efficiently as they no longer need to spend resources with guarding purposes. In the end, the impact of an improvement in property rights in household labour supply is an empirical question, and its results will depend on which of the underlying mechanisms is more dominant.

3.4 Empirical Specification

As discussed in section 3.2, the 1993 Land Law set the duration of usage rights for annual land at 20 years and perennial land at 50 years. In 2013, when annual land usage rights were set to expire, the Vietnamese government passed the 2013 Land Law which, among other things, extended the usage rights period of annual crops from 20 to 50 years. This unanticipated change in policy improved all landowners' property rights, but it was particularly beneficial for annual crop growers.⁴¹ To investigate the effect of this policy change on household's labour supply, we

⁴¹ 75 percent of households growing annual crops obtained land in 1993 or before. This means that a considerable proportion of annual farmers faced uncertainty regarding the continuation of their usufruct rights as they approached the expiration date of their rights. While more than 80 percent of households report to have a LUC

compare the difference in household's labour decisions for annual crop growers with perennial crop growers.⁴² The following linear household fixed-effect specification is estimated:

$$Y_{ht} = \beta_0 + \beta_1 ANNUAL_{ht} + \beta_2 Law13_t + \beta_3 (ANNUAL_{ht} * Law13_t) + \gamma_{rt} + \theta_h + \epsilon_{ht} \quad (3.1)$$

Where Y_{ht} represents the number of days per capita in own-farm cropping activities of household h at time t , $ANNUAL$ is a dummy variable that takes value 1 if household h had annual crops at time t , and zero otherwise. $Law13$ is a dummy variable that takes value 1 if year is greater or equal to 2014, γ is a province-year fixed-effect, θ is a household fixed effect and ϵ is the error term. The household fixed-effects specification allows us to control for unobserved time-invariant characteristics that could be related to labour supply. The province-year fixed effects accounts for any macroeconomic shocks (e.g. off-farm labour demand, crop prices, etc.) that affect household's labour allocation. We are mostly interested in coefficient β_3 because it will capture the effect of the Land Law of 2013 on household labour decisions of annual crop growers (our treatment group).

As discussed in Section 3.3, the theory predicts two possible (and countering) effects of property rights on household labour supply. Tenure security enhances incentives to conduct long-term investment, and with improved property rights, households may finance such investment using their assets as collateral (Feder et al, 1988). This channel may increase the returns to labour in agriculture, making it more appealing to work on your land. Moreover, the credit used to finance investment may also push households to put more effort into own-farming to meet the obligations of debt repayment. It is also the case, however, that the capital investment leads to less labour resources being required. It is also the case that weak property rights may force households to devote labour to farming with the purpose of protecting the property.⁴³ In this case, improvements in tenure security remove the need for guard labour and allow households to allocate time into other activities, reducing the labour put into own-farm agriculture. Another important effect of property rights is that it allows land to be transferred without significant

for their land, without the enactment of the 2013 Land Law such titles did not guarantee continuation as the certificates provide certainty only within the time rights are stipulated.

⁴² Households with no agricultural production are excluded from the analysis. Approximately 30 percent of the sample grows both annual and perennial crops.

⁴³ In the Vietnamese context, it is useful to think of this effort as a way to show local authorities that you are an "efficient" farmer and hence you should be granted an extension of your usufruct rights.

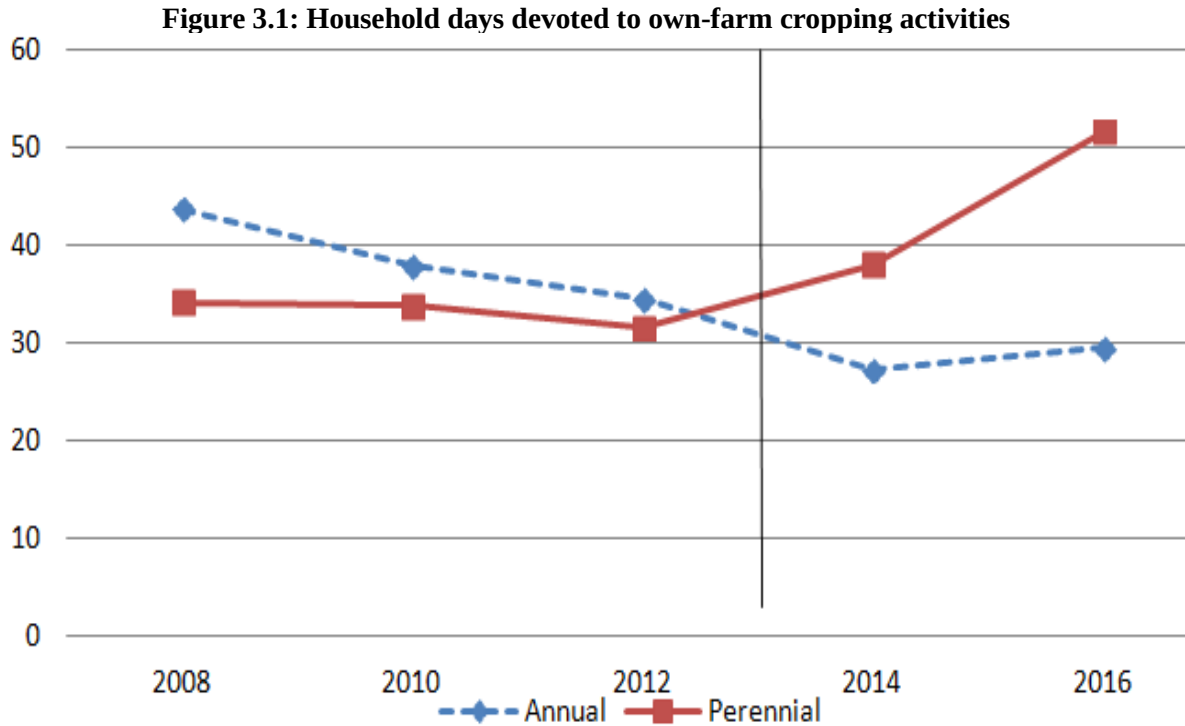
transaction cost. This effect is expected to increase overall agricultural efficiency, as the most efficient farmers are able to increase their operational size. However, allowing for land transfers to be conducted more efficiently may also decrease farming time for some, as they reduce their operational scale.

We exclude households that are not involved in agriculture. Also, farmers that cultivate exclusively on rented land are excluded. Because the effect of the law is expected to affect ownership rights, the effect on rented-in land is less clear. There are also other threats to our identification strategy. First, households may switch the crops that they grow in anticipation to the expiration of usufruct rights. Even if a household decides to change one of their plots from annual to perennial crops with the purpose of enhancing ownership rights, they will still receive the tenure security treatment from the 2013 Land Law as long as they keep some land with annual crops. According to our plot-level sample, only 4 percent of annual plots switch the type of crop to perennials. Hence, it is reasonable to think that this is not an important source of endogeneity in our results. Nonetheless, this concern is addressed by re-estimating equation (3.1) restricting the sample to those households that grew exclusively annual or perennial crops in the entire 8-year period.

Second, in Vietnam a proportion of land has government restrictions regarding crop choice. In our sample, approximately 38 percent of households growing annual crops have some land under these restrictions while 9 percent of the households growing perennial crops have restricted land. According to Markussen et al (2011) households with restrictions receive favourable treatment from authorities in terms of access to inputs and extension services. The authors also find that these farmers then to work harder, hence it is possible that their reaction to the Land Law of 2013 can be different to other households. To address this concern we re-estimate equation (3.1) including only households that do not have restricted land.

Bellemare et al (2018) use our same dataset to analyse the impact of this law on plot-level investment of annual land. Their results show that up to 2014, investment behaviour on annual and perennial plots had similar trends. However, after the enactment of the 2013 Land Law, ownership rights of annual land were strengthened, resulting in positive outcomes for irrigation and soil conservation investment in that land. We use the same difference-in-differences approach as Bellemare et al (2018). As such, our identification strategy requires that the trend in household labour supply for annual and perennial crop growers would have followed a similar

pattern if it was not for the improvement in tenure security for annual plots brought by the 2013 Land Law.



Notes: Number of days households devoted to own-farm cropping activities divided by household size across time. Households with no cropping activities are excluded from the sample. There are 8,068 annual observations and 867 perennial observations in the sample

To verify this in Figure 3.1 we show the number of days per capita devoted to own-farm cropping activities of annual and perennial growers across time. We can see that labour supply to own-farm agriculture is very similar until 2012, before the new land law came into effect. We corroborate the parallel trends assumption by estimating equation (3.1) using only pre-treatment data (i.e. before 2014) and using 2012 as the treatment period (see section 3.7 for more details on robustness checks).

3.5 Data and Descriptive Statistics

Our data come from the Vietnam Access to Resources Household Survey (VARHS), covering the period 2008–2016.⁴⁴ The VARHS is conducted every two years and is a representative sample of the rural population in Vietnam. We rely on the balanced panel sample which consists of 2,131 rural households that were surveyed in all the five waves collected in the period under analysis. The surveyed households are located in 476 communes across 12 different provinces. The dataset contains precise information on household demographics, economic activities, land use and agricultural production.

Table 3.1 presents descriptive statistics of households growing annual and perennial crops, before and after the change in the land law. The number of households involved in the production of annual crops is significantly larger than those in perennial crops. Annual crop growers have on average larger households, lower incomes and more land per household member. Before the 2013 Land Law annual and perennial growers were equally likely to have their land titled, however after the change in the law perennial crop growers increased their certified land relatively more than annual farmers.⁴⁵

It is important for our identification strategy to consider that households may decide to stop growing annual crops to grow perennial crops and vice-versa. We document the households that grow exclusively annual or perennial crops. The figures show that growing annual crops exclusively is far more common than growing only perennial crops: more than two thirds of farmers growing annual crops do not grow any perennial crops, while only 21 percent of farmers who grow perennials do so exclusively. Moreover, after the change in policy we see that more households are specializing in either of the two types of crops. It is also important to mention that some of the plots face government restrictions regarding the type of crop. In our sample, approximately 38 percent of households growing annual crops have some land under these

⁴⁴ The survey was developed in collaboration between the Development Economics Research Group (DERG), Department of Economics, University of Copenhagen, and the Central Institute of Economic Management (CIEM), the Institute for Labour Studies and Social Affairs (ILSSA), and the Institute of Policy and Strategy for Agriculture and Rural Development (IPSARD), Hanoi, Viet Nam. The provinces included are, by region: Red River Delta: Ha Tay; North East: Lao Cai, Phu Tho; North West: Lai Chau, Dien Bien; North Central Coast: Nghe Anh; South Central Coast: Quang Nam, Khanh Hoa; Central Highlands: Dak Lak, Dak Nong, Lam Dong; and Mekong River Delta: Long An.

⁴⁵ Most households would have either all of their land titled or none. Only 12 percent of the observations report to have some of their plots titled and others untitled. Markussen (2017) says that plots often ceased to be titled if they change owners and the documents were not updated. He also shows that plots that were obtained through forest clearing are seldom certified.

restrictions while 9 percent of the households growing perennial crops have restricted land. This proportion goes down after the land policy for both annual and perennial growers.

Table 3.1: Household characteristics by type of crop, before and after 2014 (means)

	Before policy change		After policy change	
	Perennial	Annual	Perennial	Annual
Household size	4.27	4.54	4.14	4.31
HH is male	0.77	0.80	0.75	0.79
Age of HH	52.19	52.51	55.87	55.54
Education level of HH	2.95	2.73	2.90	2.89
Income (log)	11.47	10.95	11.60	11.18
Landholdings per capita (log)	7.01	6.84	7.08	6.45
LUC (1/0)	0.86	0.86	0.94	0.90
Irrigated land (%)	0.57	0.64	0.69	0.66
Restrictions (1/0)	0.12	0.45	0.05	0.26
Only grows annual crops (1/0)	-	0.63	-	0.75
Only grows perennial crops (1/0)	0.19	-	0.35	-
Observations	470	5,534	397	3,401

Notes: we consider the pre-reform period to be between 2008 and 2012, and the post-reform period 2014 and 2016.

In table 3.2 we explore the differences in household days devoted to agriculture (own-farm). In the first and second row we can see the average number of days per year devoted to cropping activities from all household members for the pre-reform period (years 2008, 2010 and 2012), for annual and perennial farmers. Before the 2013 Land Law, we notice that annual crop growers (households with at least one plot devoted to annual crops) spend more days in farming compared to perennial growers. However, after the policy change, annual crop growers reduced their average number of days in own-farm cropping activities, while perennial crop growers increased it.

When looking at labour supply disaggregated between male, female and children some interesting patterns appear. In the pre-reform period, the difference in male adult's labour days between annual and perennial is small and not statistically significant. After the 2013 Land Law this changes drastically, as we now see a higher number of days for perennial farmers and less days devoted to own-farm cropping for annual farmers. In the case of own-farm labour days from female household members, annual farmers spend on average 25 more days per year than perennial farmers in the pre-reform period. Nonetheless, just as in the case of men, this changes considerably after the land reform as women in annual growing households reduced their time

in farming and women in perennial growing households increase it. In the case of child labour, both types of growers reduce the number of days in farming. However, the decrease is even larger for annual crop growers.

Table 3.2: Household labour supply in own-farm agriculture by type of crop (means)

Agriculture days, own-farm:	Before policy change			After policy change			Dif-in- Dif
	Perennia l	Annual	Δ	Perennial	Annual	Δ	
All members	136.4	165.5	29.1 [†]	171.5	113.8	-57.7 [†]	-86.8
Adult males	69.7	73.5	3.8	93.0	52.4	-40.6 [†]	-44.4
Adult females	61.3	86.3	25.0 [†]	76.0	59.6	-16.4 [†]	-41.4
Children	5.3	5.6	0.3	2.6	1.8	-0.8	-1.04
Observations	470	5,534	-	397	3,401	-	-

Notes: Total number of days per year. [†] Significant at 1%. We consider the pre-reform period to be between 2008 and 2012, and the post-reform period 2014 and 2016.

There are two possible explanations for the reduction in own-farm labour supply. On the one hand it suggests that the “guard” effect of improved tenure security out-weights the “productivity” effect. The fact that women and childrens’ labour decreased after the Land Law suggests these households were devoting these labour resources to maintain usufruct right on their land.⁴⁶ On the other hand, it could be that the increase in capital investments as found by Bellemare et al (2018) leads to less labour resources being required to maintain productivity. We explore these channels in section 3.6.

3.6 Results

3.6.1 The effect of tenure security on household labour supply

Table 3.3 presents the results from equation (3.1) where the dependent variable is the number of days per capita devoted to own-farm cropping activities. We also present the results disaggregated by the gender and age of the worker.⁴⁷ In the first column, only province-year FE

⁴⁶ This is in contrast to Field (2007) who finds evidence from Peru showing that families substitute child labour for adult labour when they obtain title deeds due to the fact that adults have a comparative advantage when protecting their homes.

⁴⁷ Household members age 15 and younger are considered in the children’s specification.

are included, the second column adds household demographics, and column adds relevant land characteristics.⁴⁸ As discussed in section 3.4, we address two potential threats to our identification strategy: crop-switching and government restrictions on crop choice. Column 4 estimates equation (3.1) only for households that do not have any restricted land. Column 5 estimates the model using only households that were devoted to annual or perennial crops exclusively during the entire 8-year period. Finally, Column 6 includes non-restricted households that grew exclusively annual or perennial crops for the entire time-span of analysis.

In columns 1 to 4 the coefficients on the indicator for annual land (Annual) and the indicator for being in the period after the implementation of Land Law (Law2013) are statistically significant and positive. This suggests that days spent working the land are higher for annual farmers and are higher after the enactment of the 2013 Land Law for all farmers (annual and perennial growers). However, once we restrict the sample to farmers that did not switch between crops these coefficients are no longer statistically significant. For our purposes, we are most interested in the interaction term between these two variables (Annual*Law2013) because it captures the differential effect caused by the tenure security given to annual crop after the Land Law of 2013 was implemented. This coefficient is negative and statistically significant in all 6 specifications. Moreover, the effect is considerably larger in columns 5 and 6, where we restrict the sample to non-switch and non-restricted farmers. This suggests that the tenure security improvement caused by the 2013 Land Law in annual land resulted in a reduction of labour supply in own-farm cropping activities. The magnitude of the coefficient varies between 26.4 and 7.1. Given that the unconditional mean of own-farm cropping days per capita is 35 per year, the effect of the policy represents an average reduction of 20 percent in labour supply of annual crop growers.

When we analyse the results separated by gender, we notice that the labour supply of both men and women follow the same pattern as that of the aggregate supply. In the case of male adults, the sign and significance is the same as that of all members. In the female adults specification we have the same results as in the all members specification, although the interaction term Annual*Law2013 is not-significant in columns 2 and 4. However, in the specifications that are

⁴⁸ Household demographic controls are: size, gender of HH, age of HH, education of HH, log of total real income. Household controls related to land characteristics are: the proportion of land with LUC, the proportion of land acquired in 1993 or before, the proportion of irrigated land, and the proportion of land devoted to annual crops. Appendix A shows the estimated coefficients for all the controls in our specifications related to household labour supply.

more likely to capture the effect of tenure security caused by the policy change –columns 5 and 6, where the sample is restricted to non-switching and non-restricted farmers– the effect is large and significant, suggesting the improvement in tenure security decreased labour supply of both male and female adults.

Table 3.3: The effect of the 2013 Land Law in own-farm labour days per capita

	(1)	(2)	(3)	(4)	(5)	(6)
All members						
Annual	15.65*** (2.076)	11.03*** (2.169)	8.132*** (2.206)	8.205** (3.689)	7.970 (9.917)	11.72 (15.57)
Law2013	8.741** (3.979)	9.911** (4.339)	9.110** (4.274)	21.29*** (6.570)	17.38 (11.12)	15.53 (13.05)
Annual*Law2013	-12.38*** (2.678)	-7.090*** (2.699)	-7.832*** (2.709)	-7.764* (4.278)	-25.07*** (6.500)	-26.40*** (8.442)
Male Adults						
Annual	6.474*** (1.428)	4.422*** (1.268)	2.969** (1.271)	3.534 (2.200)	3.272 (5.445)	9.167 (9.853)
Law2013	11.31*** (2.300)	4.896* (2.657)	4.821* (2.622)	12.40*** (3.931)	10.63 (6.916)	10.07 (8.599)
Annual*Law2013	-6.113*** (1.675)	-4.025** (1.729)	-4.505*** (1.742)	-5.100* (2.797)	-14.10*** (4.640)	-16.13*** (6.039)
Female Adults						
Annual	8.592*** (1.162)	6.094*** (1.458)	4.607*** (1.450)	3.843* (2.334)	5.338 (6.627)	5.992 (8.735)
Law2013	-2.400 (2.370)	4.642* (2.473)	3.701 (2.440)	8.007** (3.859)	6.509 (5.187)	6.398 (6.819)
Annual*Law2013	-5.745*** (1.644)	-2.671 (1.658)	-2.847* (1.642)	-2.210 (2.523)	-10.62*** (3.373)	-11.04** (4.392)
Children						
Annual	0.584*** (0.215)	0.513* (0.275)	0.557** (0.279)	0.828 (0.537)	-0.639 (1.095)	-3.437** (1.361)
Law2013	-0.172 (0.278)	0.374 (0.249)	0.588** (0.260)	0.880* (0.489)	0.234 (0.611)	-0.939 (0.786)
Annual*Law2013	-0.522** (0.233)	-0.394 (0.268)	-0.481* (0.274)	-0.454 (0.479)	-0.347 (0.738)	0.769 (0.871)
Observations	8935	8935	8904	4800	2281	1224
No. of households	2018	2018	2017	1763	457	428
Province-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	No	Yes	Yes	Yes	Yes	Yes
Household controls	No	No	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses clustered at the household level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The results for child labour are less robust as only columns 1 and 3 have significant results on the interaction term. This is not surprising since only 11 percent of farmers in our sample have members 15 years old or younger working on their farm. Moreover, improvements in women's land rights caused by the 2003 Land Law (this law granted the possibility of including both husband and wife's name in the LUC) may have increased women's bargaining power resulting in reduction of child labour and increased household welfare (Menon et al, 2017; Matz et al, 2013).

Table 3.4: The effect of the 2013 Land Law in Non-Farming Days per Capita

	(1)	(2)	(3)	(4)	(5)	(6)
Wage employment						
Annual	-2.474 (3.289)	-1.610 (3.169)	-0.707 (3.043)	-1.051 (4.262)	-17.79 (13.17)	-5.920 (18.06)
Law2013	20.50*** (6.898)	20.68*** (5.790)	12.05** (5.742)	1.089 (8.572)	19.39 (13.48)	32.63* (18.36)
Annual*Law2013	-0.642 (4.370)	-1.994 (3.680)	-1.388 (3.659)	2.490 (4.893)	-19.73** (8.233)	-18.81 (11.93)
Off-farm self-employment						
Annual	-9.004*** (2.532)	-0.808 (2.132)	0.231 (2.191)	0.491 (2.717)	16.90** (8.169)	6.506 (7.220)
Law2013	-27.46*** (4.253)	-0.0103 (3.202)	-2.127 (3.308)	-1.356 (4.374)	4.603 (5.830)	-3.280 (12.26)
Annual*Law2013	3.539 (2.754)	-0.0271 (2.200)	0.136 (2.211)	-0.325 (2.819)	-3.075 (5.555)	-0.579 (6.922)
Observations	8935	8935	8904	4800	2281	1224
No. of households	2018	2018	2017	1763	457	428
Province-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	No	Yes	Yes	Yes	Yes	Yes
Household controls	No	No	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses clustered at the household level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

As discussed in section 3.3, improvements in land property rights may in turn have a positive effect on off-farm labour supply. We expect that as tenure security is strengthened can release human resources previously engaged in farming with “guarding” purposes. This may allow households to allocate labour supply to off-farm activities. We explore this effect of the 2013

Land Law on annual crop growers by estimating equation (3.1) where the dependent variable is the number of days per capita in wage employment and off-farm self-employment (e.g. trading services).

Table 3.4 shows the results of this specification. In the case of wage employment, the coefficient on the Land Law indicator is positive and significant in some of the specifications; this suggests that after 2013 farmers in general increased their labour supply in wage employment. However, the interaction term is statistically insignificant in all but one of the specifications (it also has the opposite sign that we would expect). For off-farm self-employment the results are also not statistically significant. Overall, it seems that the Land Law of 2013 reduced own-farm agricultural labour, but this did not lead to an increase in labour supply outside agriculture suggesting that the labour that was released from farming went into other non-income generating activities.

3.6.2 The effect of tenure security on household's agricultural production

The evidence presented in the previous subsection suggests that the 2013 Land Law decreased the amount of labour devoted to own-farm cropping activities. At first glance this is consistent with the theory that weak land rights require households to invest in guard labour. With the introduction of the Land Law and the extension of usufruct rights effectively increasing tenure security, we see a reduction in the days per capita devoted to own-farm cropping activities. There are, however, two alternative explanations for these findings that we consider here. First, given that Bellemare et al (2018) found that the increase in tenure security led to an increase in investment in irrigation and soil conservation, it is possible that these investments led to a restructuring of agricultural inputs to make production relatively more capital intensive, hence reducing labour inputs.

In table 3.5 we show the results of the estimations using the same specification as in equation (3.1) but with the level of capital as the dependent variable. Capital assets represent ownership of machinery (e.g. tractors, thrillers, etc.) valued at a set of common prices.⁴⁹ Expenditure on

⁴⁹ The VARHS asks household about ownership of agricultural assets and their self-reported value. The survey includes ownership of tractors, grinding machines, rice milling machines, grain harvesting machines, pesticide sprayers, ploughs and carts. The price of each type of equipment is the average of the yearly median price between 2008 and 2016. The use of this common price index removes variations in prices related to regional and

capital services is the amount in VND spent per square meter in services such as rentals of machinery or cattle for ploughing.⁵⁰ The dependent variables are the real value of owned capital assets and the real value of expenditure on capital services (per square meter) divided by the totals days in own-farm agriculture, and the capital expenditure divided by the total number of days in own-farm agriculture.

In the case of ownership of capital assets per worker, the coefficient on the interaction term is positive and significant in columns 5 and 6 (sample restricted to non-restricted and non-switching farmers). When looking at the expenditure on capital services ratio we observe the coefficient is positive and significant in all but the last column. This is suggestive evidence that enhanced tenure security may have created a more capital intensive process of production, explaining at least in part the reduction in labour.

Table 3.5: The effect of the 2013 Land Law in capital ownership and expenditure

	(1)	(2)	(3)	(4)	(5)	(6)
Ownership of capital per worker (value)						
Annual	-1.528 (7.836)	-11.75 (8.189)	-9.849 (8.349)	-10.66 (9.804)	1.063 (6.889)	-4.285 (15.32)
Law2013	-5.631 (9.689)	-114.1 (95.20)	-106.6 (94.57)	-182.9 (168.7)	-13.22 (8.969)	-9.950 (9.069)
Annual*Law2013	1.839 (9.130)	3.570 (9.173)	2.909 (10.93)	0.211 (14.44)	20.03** (7.860)	19.46** (8.680)
Expenditure on capital services per worker (value)						
Annual	0.0016*** (0.0005)	0.0024*** (0.0007)	0.0025*** (0.0007)	0.0016** (0.0007)	0.0264*** (0.0066)	0.0271*** (0.0099)
Law2013	0.0050*** (0.0014)	0.0011 (0.0046)	0.0018 (0.0047)	-0.0007 (0.0074)	0.0029 (0.0066)	0.0090 (0.0076)
Annual*Law2013	0.0029*** (0.0007)	0.0018** (0.0008)	0.0031*** (0.0008)	0.00154* (0.0008)	0.0088*** (0.0025)	0.0035 (0.0029)
Observations	8590	8590	8562	4738	2205	1214
No. of households	2005	2005	2003	1749	457	427
Province-Year FE	Yes	Yes	Yes	Yes	Yes	Yes

time factors, giving us a measure of capital that effectively captures actual differences in physical capital across farms.

⁵⁰ Specifically, it includes the monetary expenditure of small non-durable tools (e.g. sickles, shovels, etc.), minor repairs and maintenance, rental of agricultural assets or transports, rental of cattle for ploughing.

Household FE	No	Yes	Yes	Yes	Yes	Yes
Household controls	No	No	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses clustered at household level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Second, property rights lower transaction costs in land markets (Banerjee et al, 2002; Deininger and Jin, 2008; Holden et al, 2011) which allows farmers to readjust their operational scales. If households reduce their agricultural landholdings, they will require less labour resources.⁵¹ We explore the effect of tenure security on landholdings in table 3.6. Results show that in general, annual crop growers possess more land per capita than perennial growers. In all but one of the specifications the coefficient of Law2013 is negative; this reflects the fact that all households in our sample have reduced their landholdings across time. Our main coefficient of interest, the interaction term, is negative and statistically significant in columns 1 to 4. This suggests that annual farmers reduced their landholdings in response to the extension of their usage rights. It should be noted, however, that the coefficients are not statistically significant when we restrict the sample to non-switching crop growers, although the sign remains unchanged.

Table 3.6: The effect of the 2013 Land Law on landholdings per capita (log)

	(1)	(2)	(3)	(4)	(5)	(6)
Annual	0.530*** (0.0852)	0.227*** (0.0487)	0.277*** (0.0473)	0.125** (0.0502)	0.220* (0.118)	0.282 (0.195)
Law2013	1.495*** (0.121)	-0.167** (0.0679)	-0.131** (0.0649)	-0.235*** (0.0752)	-0.119 (0.128)	-0.00409 (0.207)
Annual*Law2013	-0.445*** (0.0809)	-0.254*** (0.0519)	-0.246*** (0.0502)	-0.149** (0.0583)	-0.0218 (0.100)	-0.115 (0.131)
Observations	8935	8935	8904	4800	2281	1224
No. of households	2005	2017	2017	1763	457	428
Province-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	No	Yes	Yes	Yes	Yes	Yes
Household controls	No	No	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses clustered at household level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Overall, while we cannot rule out ‘guard labour’ as one of the reasons for reduced labour supply due to the increase in tenure security, we can say that it is not the only reason. Increased investment in capital is likely to lead to more capital-intensive production and the need for fewer

⁵¹ In Vietnam land is owned by the State and households possess usufruct rights to the land. When farmers sell or lease land, the time of their usufruct rights does not renew. Hence, households with land close to their expiration date are probably less likely to participate in land markets

labour resources. Moreover, the ability to rent out and sell land reduced land holdings and consequently fewer labour resources.

3.7 Robustness checks

To test the parallel trends assumption we conduct a placebo test using only data from before the enactment of the 2013 Land Law (VARHS waves 2008-2012). The placebo treatment effect is a dummy variable taking a value one in 2012. If the reduction in agricultural labour is indeed driven by an improvement of tenure security caused by the 2013 Land Law, then we expect the coefficient on the interaction term in the placebo test to be statistically insignificant. Table 3.7 shows the results of the placebo test for own-farm cropping days per capita, separated by gender and age. The coefficient of the interaction term is statistically significant in only two of the specifications. However, the more interesting patterns are observed when looking at the test for male and female adults.

In all of the 6 specifications for male farming labour the interaction term is negative and statistically significant. This suggests that male labour in own-farm cropping activities was falling since before the 2013 Land Law. The negative effect observed in section 3.6 on male labour may be driven by other drivers that were not related to the tenure security increase caused by the new law.⁵² On the other hand, the interaction term in the specifications for female adult labour supply are statistically insignificant in all but one of the specifications where the coefficient positive. As such, we can rule out non-parallel trends for the case of women's agricultural labour.⁵³

Table 3.8 shows the results for the placebo test for capital and land. In the case of capital ownership only the specification in column 1 has a significant and negative interaction term. In the case of expenditure on capital services none of the coefficients on the interaction terms are statistically significant. This corroborates the evidence presented in section 3.6 regarding capital intensity in agriculture was driven by improved tenure security. Likewise, for the case of

⁵² It is possible that the main explanatory variable of the previous section (Land Law 2013) and the placebo effect are picking other factors related to labour supply which are not caused by the Land Law of 2013 (increased off-farm labour, for example).

⁵³ Child labour has a negative and significant effect in columns 1 to 3. Given that the results for child labour are not statistically significant in section 6 we are not as concerned about a violation of the parallel trends assumption of this variable.

landholdings, none of the coefficients on the interaction term are statistically significant. This suggests that the policy change was the main driver of the reduction in landholdings of annual crop growers.

Table 3.7: Placebo test using pre-treatment data for Own-Farm Labour Days per Capita

	(1)	(2)	(3)	(4)	(5)	(6)
All members						
Annual	17.53*** (2.389)	8.739*** (2.771)	6.269** (2.854)	6.456 (4.888)	27.66** (12.16)	48.55 (32.57)
Placebo	-2.564 (3.956)	10.72*** (3.953)	12.63*** (3.894)	13.04** (5.706)	15.01 (10.02)	13.17 (14.76)
Annual*Placebo	-5.490* (3.025)	0.0105 (3.353)	-1.486 (3.250)	-8.057* (4.712)	-9.225 (7.319)	-10.71 (10.67)
Male Adults						
Annual	8.143*** (1.501)	4.039*** (1.565)	2.625 (1.624)	4.836* (2.837)	11.36 (6.915)	34.73 (23.75)
Placebo	8.042*** (2.541)	10.59*** (2.459)	10.41*** (2.414)	13.26*** (3.742)	13.59** (6.003)	15.15* (8.303)
Annual*Placebo	-4.881* (2.007)	-3.781* (2.189)	-3.553* (2.133)	-8.789*** (3.296)	-11.06** (5.200)	-13.05** (6.040)
Female Adults						
Annual	8.518*** (1.459)	3.974** (1.884)	2.986 (1.909)	0.607 (3.315)	15.28** (6.620)	18.55* (10.47)
Placebo	-10.72*** (2.477)	-0.828 (2.561)	1.105 (2.521)	-1.098 (3.595)	0.445 (7.156)	-0.798 (11.57)
Annual*Placebo	0.215 (1.794)	4.844** (2.216)	3.181 (2.134)	1.559 (2.979)	3.185 (5.374)	3.299 (9.908)
Children						
Annual	0.866*** (0.298)	0.726* (0.415)	0.647 (0.436)	1.039 (0.856)	0.966 (2.353)	-4.057** (1.577)
Placebo	0.116 (0.392)	0.958** (0.439)	1.028** (0.439)	0.963 (0.729)	1.337 (0.890)	0.523 (1.619)
Annual*Placebo	-0.823** (0.368)	-1.052** (0.470)	-1.123** (0.464)	-0.842 (0.739)	-1.410 (0.948)	-1.190 (1.654)
Observations	5534	5534	5515	2561	1369	565
No. of households	1989	1989	1987	1387	457	287
Province-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	No	Yes	Yes	Yes	Yes	Yes
Household controls	No	No	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses clustered at household level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3.8: Placebo test in capital and land

	(1)	(2)	(3)	(4)	(5)	(6)
Capital ownership per worker (value)						
Annual	0.869 (6.767)	-19.33 (13.76)	-15.59 (14.08)	-14.51 (14.68)	5.099 (6.516)	-6.034 (23.72)
Placebo	113.5 (85.69)	66.70 (92.70)	61.78 (86.23)	128.9 (129.5)	-14.95** (7.162)	-9.637 (10.90)
Annual*Placebo	-7.158 (20.38)	5.298 (16.73)	4.166 (16.59)	-9.620 (22.61)	10.45 (9.004)	5.852 (8.416)
Expenditure on capital services per worker (value)						
Annual	4.566*** (1.171)	0.687 (1.233)	-0.638 (1.561)	-1.469 (2.020)	6.435 (6.634)	1.593 (18.15)
Placebo	34.79*** (7.737)	-2.514 (12.58)	-2.254 (12.26)	7.335 (18.27)	-4.415 (11.39)	-1.698 (14.83)
Annual*Placebo	8.916*** (2.444)	7.634*** (2.193)	7.323*** (2.316)	7.759** (3.173)	3.586 (3.044)	3.561 (3.132)
Observations	5274	5274	5256	2518	1309	559
Landholdings per capita (log)						
Annual	0.575*** (0.0930)	0.187*** (0.0613)	0.188*** (0.0586)	0.0645 (0.0656)	0.220 (0.187)	0.270 (0.359)
Placebo	1.479*** (0.148)	-0.114 (0.0693)	-0.0598 (0.0638)	-0.0105 (0.0837)	0.183 (0.118)	0.0408 (0.141)
Annual*Placebo	-0.133 (0.115)	0.0522 (0.0640)	0.00514 (0.0591)	-0.0510 (0.0708)	-0.201 (0.130)	-0.0460 (0.154)
Observations	5524 1988	5524 1988	5513 1987	2559 1387	1368 457	564 287
Province-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Household FE	No	Yes	Yes	Yes	Yes	Yes
Household controls	No	No	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses clustered at household level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

3.8 Conclusions

Weak enforcement of property rights distorts household allocation of labour supply, as farmers need to devote resources to maintain ownership of their land. This feature of land rights puts households in a constrained optimum where too much labour is devoted to farming. This chapter shows that Vietnamese farmers facing uncertainty regarding the continuation of their usufruct rights faced such restriction. The Land Law of 2013 effectively increased tenure security of annual crop growers, eliminating the need to use labour for guarding purposes.

Using detailed panel data from Vietnam, we find that increased in tenure security reduced days devoted to own-farm cropping activities, particularly for female adults. The policy change however, did not rise time spent on off-farm labour. This is consistent with a reduction in guard labour. The chapter explores two other possible channels. First, the positive effect of tenure security in investment may have shifted input shares in agriculture. The law increased the capital intensity of annual crop growers could explain the reduction in labour supply. Second, the improvement in land rights allowed households to transfer land and adjust their operational scale. The Land Law of 2013 reduced total landholdings of annual crop growers. This also helps explain the reduction in own-farm agricultural labour supply.

This chapter highlights the importance of clear and enforceable property rights for an efficient allocation of labour. Its results contribute to the literature by showing that farmers that received the tenure security treatment reduced their days in farming and landholdings. Moreover, the chapter sheds light on the role of tenure security for the shift towards a more capital-intensive agricultural productions system.

Appendix

3.A Coefficients of household characteristics

This appendix describes the relationship between our dependent variables related to household labour supply and several demographic and land characteristics. Table 3.A presents the results of the estimated coefficients for the days of all members in own-crop farming activities (per capita). It is interesting to see that household size and farming days are negatively related, this could be because with more members households are able to diversify their activities a little more. Other household characteristics do not seem to be relevant for our dependent variable. In the case of land characteristics, we observe farmers with more irrigated land spend more time in farming. Interestingly, the percentage of land acquired in 1993 is not statistically significant.

Table 3.A: Total days in own-farm cropping activities per capita (controls)

	(1)	(2)	(3)	(4)	(5)	(6)
Household size			-3.635*** (0.346)	-3.907*** (0.509)	-4.292*** (0.779)	-5.144*** (1.099)
HH is female			1.227 (1.844)	3.416 (3.113)	0.681 (3.455)	-2.078 (5.584)
Age of HH			0.0792 (0.0598)	0.125 (0.0891)	0.0312 (0.0995)	-0.147 (0.124)
Education of HH			0.129 (0.431)	0.930 (0.632)	-0.353 (0.606)	0.546 (0.873)
Annual income (log)			-0.222 (0.550)	0.239 (0.852)	0.137 (1.009)	0.897 (1.611)
Landholdings (log)			8.694*** (0.922)	10.18*** (1.459)	4.265 (3.034)	6.378 (3.935)
Irrigated land (%)			4.668*** (1.231)	7.174*** (1.745)	5.725** (2.673)	9.248** (3.588)
LUC (%)			3.245*** (0.933)	2.658* (1.377)	1.104 (1.527)	0.959 (2.363)
Land acquired in 1993 (%)			-0.110 (1.094)	0.483 (1.598)	0.0895 (2.030)	-0.367 (3.221)
Annual land (%)			4.733*** (1.310)	0.587 (1.919)	6.373** (3.056)	4.359 (5.204)
N	8935	8935	8904	4800	2281	1224

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Chapter 4: **Land titling and household labour supply: evidence from Mexico**

4.1 Introduction

Property rights are essential to ensure economic development, agricultural productivity and poverty reduction⁵⁴ Land tenure security enhances incentives for long-term agricultural investment, consequently increasing agricultural productivity (Alchian and Demsetz, 1973; Udry 1996; Besley 1995; Goldstein and Udry, 2008). They can also increase access to credit, allowing households to use their assets to finance investment (Feder et al, 1988; De Soto, 2000). A key part of the development process is structural transformation from low productivity agriculture to higher productivity sectors. A key component of this transformation is increased efficiency in the agricultural sector allowing labour be transferred from agriculture to the other sectors of the economy (Gollin et al, 2002; Duarte and Restuccia, 2010). Land rights play a key role in this process because they allow households to transfer land as they gradually leave farming activities (Kai-Sing Kun, 2002; Do and Iyer, 2008; Jin and Deininger, 2009; Chari et al, 2017)

However, property rights in developing countries tend to be weak and incomplete. Tenure insecurity decreases investment because farmers are not guaranteed that they will reap the fruits of their work. Moreover, land institutions in developing countries tend to establish ownership through a continuous use of the land. This setting implies that even if households do not face high tenure insecurity (conditional on them continuing to farm the land), and investments can actually increase your security (Besley, 1995), the allocation of factors is not as efficient as that

⁵⁴ See Deininger and Feder (2009) for a review of the literature on land titling and economic development.

in a complete property rights context.⁵⁵ Adamopoulos et al (2015) find land institutions restrain aggregate productivity by affecting not only the allocation of agricultural factors among farmers (misallocation) but also the allocation of workers between the agriculture and non-agriculture sectors.

This chapter explores the effects of property rights in household's allocation of labour using data from a nation-wide rural land titling program in Mexico. The *Programa de Certificación de Derechos Ejidales y Titulación de Solares* (PROCEDE) was carried out between 1993 and 2006 and its mission was to provide certificates for all members of agrarian communities in the country. Making use of the staggered implementation of PROCEDE, we find that households that participated in the land certification program decreased their hours in wage-employment activities and increased their cultivated land. However, the number of household members devoted to own-farm agriculture did not seem to be affected by certification, with the exception of children. Our results suggest that PROCEDE reduced the number of children working in the family farm. Our estimates are robust to several specifications and support the parallel trends assumption

Improving property rights can affect labour supply in two ways. First, the certification of land and legalization of land transfers reduces the need for households to devote resources for “guarding” purposes, hence agents reduce labour in agriculture to pursue other activities (Besley and Ghatak, 2010; De Janvry et al, 2015; Valsecchi, 2014; Field, 2007; Do and Iyer, 2008). Second, increasing tenure security enhances investment in agricultural land and allows farmers to increase their operational scale, hence increasing the returns to labour in agriculture and reducing non-farm labour (Nakasone, 2011). Higher levels of land investment could encourage farmers to work harder and exert more effort. It may also allow farmers to reduce labour inputs without affecting productivity. Ultimately, what the overall effect will be is an empirical question which will depend on which of these channels is most at play.

De Janvry et al (2015) thoroughly explore the impact of PROCEDE on labour and land allocation. They find that the certification increased migration out of rural areas, yet cultivated land was not severely affected by this reduction in labour supply. The authors argue that lifting

⁵⁵ We define complete property rights as: 1) secure legal ownership, 2) the right to transfer, and 3) the right to use as collateral.

restrictions on land transfers led to the consolidation of larger farming units. This chapter adds to their contribution in two ways. First, it explores the effect of land titling in local labour markets and the implications for the household members remaining in the community. Second, it sheds light on a possible impact of land titling that is normally overlooked: its effect on intra-household labour allocation.

The chapter is structured as follows. Section 2 describes the land reforms undertaken in Mexico. Section 3 provides a brief literature review and conceptual framework to analyse property rights and labour supply. In section 4 we present the identification strategy. Section 5 describes the data used in the analysis and presents some descriptive statistics. Section 6 discusses the empirical findings and we conclude in section 7.

4.2 Background

This section describes the land tenure system in Mexico and discusses the two main land reforms the country has undertaken. The first reform was the product of the Mexican civil war (1910-1917), where extensive landholdings were gradually disintegrated to form an agricultural social sector composed of agrarian communities. The second reform changed the structure of property rights in these communities, removing restrictions on land use, increasing tenure security and legalizing land transfers.

4.2.1 The first Land Reform (1917-1992)

From the end of the revolution (1917) until 1992 the Mexican government carried out one of the most extensive land reforms in the world (Cordova, 1973). The purpose of this policy was the reallocation of land from large private landholders to groups of landless peasants organized in agrarian communes called *ejidos*. The members of the ejido (*ejidatarios*) were given usufruct rights over an individual plot, access to communal land (e.g. for animal grazing, forestry, etc.), and a plot for housing. Restrictions on land use were harsh, ejidatarios had to work the land directly with their families (hired labour was forbidden). If the usufruct rights' holder was absent for more than two years, their land was subject to reallocation to other members of the community. Land transfers and sharecropping were not allowed. Moreover, restrictions on land transfers and inheritance led to a situation where old ejidatarios could not farm the land

efficiently and households in the same community lacked access to land and faced tenure insecurity (Deininger and Bresciani, 2001).

Members of the ejido were also tightly politically controlled. All internal affairs decided in the ejido's collective decision-making body (the ejido assembly) had to be countersigned by state authorities. Larreguy (2012) finds that ejido political leaders were expected to deliver the community's vote in block for the autocratic ruling party, PRI (*Partido Revolucionario Institucional*), in exchange for economic support from public institutions. The constraints in farmer's decisions along with this clientelistic relationship sunk the ejido into a spiral of low agricultural productivity, state dependence and poverty (De Janvry et al, 1998).⁵⁶ A series of fiscal reforms after the 1980s debt crisis disturbed the political balance between State and ejidos. Guaranteed prices for major crops were eliminated in the early 1990s; input subsidies for seeds, fertilizer, pesticide, machinery and diesel fuel were also gradually dismantled (Yunez-Naude, 2003).

In the midst of the negotiation of the North American Free Trade Agreement (NAFTA), where it was suggested tariffs for all crops should disappear within 15 years, Mexican authorities deemed it necessary to promote agricultural efficiency and prepare the rural sector for international competition. To serve such purpose, it was imperative to reform the property rights system in the ejido sector to one that promoted efficiency and investment (even if it meant losing political control over ejidos).⁵⁷ Hence, in 1992 congress amended the Constitution to put an end to the land redistribution mandate that had been active for most of the 20th century. The constitutional change was accompanied by a series of legal reforms that made fundamental changes in the property rights system of ejidos.

⁵⁶ The political science literature suggests high restrictions in land usage and incomplete property rights are purposely imposed by autocratic regimes to hold discretionary control over assets and use such power as threat to suppress political support of the regime's opponents (Magaloni 2006; Castañeda-Dower and Pfutze 2015; Albertus et al, 2016).

⁵⁷ The administration of president Carlos Salinas de Gortari (1988-1994) was characterized by extensive market-friendly economic reforms. In the agricultural sector, subsidies and guaranteed prices were eliminated with the closing of CONASUPO (the Mexican government agricultural trader). To fill the institutional vacuum left by these structural changes, and compensate farmers for the drop in crop prices caused by NAFTA, the government launched PROCAMPO. This was a de-coupled program that gave direct income transfers to farmers growing certain basic crops. The payment was per hectare and independent of the level of production (Yunez-Naude and Berceñas Paredes, 2004).

4.2.2 The second Land Reform (1992)

The amendment to Article 27 of the Constitution put an end to the presidential mandate (or obligation) to assign farm land to groups of landless petitioners. The legislative change paved the way to transform the land tenure system in the ejido sector. The main aspects of the second land reform are: 1) the certification of land for all rights holders in the ejido; 2) the legalization of land transfers (sales can only be done among other community members and rentals with any party); 3) the elimination of restrictions on hired labour; 4) a mechanism in which ejido members can vote to turn their certificates into full private property (*dominio pleno*); thereby allowing sales to non-members and the mortgaging of land; 5) the creation of an institutional framework to provide a decentralized and accessible system of agrarian justice, an independent land registry, and a de-concentrated entity to provide ejidatarios with legal support.⁵⁸

All legal changes and institutional arrangements of the second land reform were delivered in a program of voluntary land titling (PROCEDE) for ejidos and indigenous communities.⁵⁹ This program was a multiagency effort using resources from several government institutions: the National Institute of Statistics and Geography (INEGI), the National Agrarian Registry (RAN), the Agrarian Attorney's Office (PA) and the Land Reform Secretariat (SRA), a subsidiary of the Ministry of Agriculture. Each state opened an office to implement the program using resources from the aforementioned institutions. In the first step of the certification program, officials from the PA approached members of the ejido's ruling body (the commissariat) with information regarding PROCEDE. An assembly was called in the ejido to decide whether to participate in the program; a simple majority was required to continue with the implementation. If the ejido decided to participate, officials from INEGI elaborated the documents demarcating the boundaries of the ejido, and identifying each individual plot, the share of communal land

⁵⁸ The government created a system of 42 Agrarian Tribunals and 1 Appeals Superior Agrarian Tribunal. From 1992 to 1999 these courts addressed over 300 thousand cases. The National Agrarian Registry (RAN) is in charge of issuing documents for the ownership of individual parcels, communal land access and residential plots. Finally, the *Procuraduria Agraria* (PA) was created to provide legal assistance to ejidatarios, performing the role of ombudsman (Deininger and Bresciani, 2001).

⁵⁹ There is also another type of agrarian commune referred to as "indigenous community". These are groups of native Mexicans that were granted usufruct rights during the first land reform on the basis of restitution from colonial land expropriation (however legislation regarding land use and transfers is the same as in ejidos). They account for approximately 10% of all agrarian communities in Mexico. In this chapter, when we refer to ejidos we will also be referring to these indigenous communities.

and the residential plots of all members in the community. The documents were posted in public areas of the ejido for a month; if no disagreements occurred, the blueprints were registered by the RAN office. The final stage of the process resulted in the simultaneous issuance of land certificates for individual parcels, shares of communal land and residential plots to all rights holders in the ejido.⁶⁰

Unlike other titling programs where demand for titles is essential, PROCEDE was implemented with a top-to-bottom approach, leaving virtually no space for ejidatarios' discretion.⁶¹ In most of the Mexican territory the program was carried out quite smoothly; it ran from 1993 to 2006, issuing land certificates for more than 3.6 million rural households and covering more than 90 percent (of the almost 30 thousand) agrarian communes in the country. This chapter uses the staggered implementation of PROCEDE across time and space to analyse the effects of land titling on household's allocation of labour.

4.3 Conceptual Framework

The literature on property rights has found evidence of the effects of tenure security on household labour supply. Field (2007) finds that certification of urban dwellers in Peru reduced the need to devote human resources to protect property, allowing households to increase their labour outside the home. De Moura et al (2014) obtained similar results in the case of Brazil, where a property certification program increased the hours worked per week of adult members in the household.

The case of tenure security on a productive asset such as agricultural land has, however, different implications than those of residential houses. Besley and Ghatak (2010) provide a framework to analyse the role of agricultural labour in a context of land tenure insecurity. The authors define the risk of expropriation as an exogenous tax on production, which discourages labour effort. Nonetheless, if labour input increases tenure security, households have an incentive to work on

⁶⁰ There are three types of ejido members: 1) ejidatarios are people who possess rights over individual plots and shares of communal land (they are normally the direct descendants of founding members of the ejido); 2) *posesionarios* are members of the community that have rights over individual parcels, but no access to communal property, they are also normally excluded from voting rights in the ejido assembly; and 3) *avecindados* are people who live in the ejido but that do not own any plots nor have access to communal land (landless peasants normally working in farm and non-farm wage employment).

⁶¹ See Appendini (2002) for a description of the land certification program.

the land to maintain ownership of their assets (even if the allocation of labour is less efficient than in the case of perfect enforcement of property rights).

The empirical evidence suggests that decreasing the need for guard labour in agricultural land has positive effects on off-farm labour supply and migration (De Janvry et al, 2015; Valsechi, 2014; Do and Iyer, 2008). However, the improvement in property rights also affects investment decisions; if the institutional framework provides assurance that one will be collecting the fruits of their work, households have incentives to undertake long-term agricultural investments (Alchian and Demsetz, 1973; Besley 1995; Goldstein and Udry, 2008). Investments in agricultural land may increase the returns to labour in own-farm cropping activities, incentivizing more effort in agriculture. Nakasone (2011) finds that improvements in tenure security caused by a land certification program in rural Peru decreased off-farm labour supply to substitute it with own-farm labour.

Property rights also improve the functioning of land markets, allowing landholdings to be transferred to agents with a comparative advantage in agriculture, improving overall efficiency (Benarjee et al 2002; Holden et al. 2011; Chari et al 2017; Chen et al. 2017). Moreover, land certification program can reduce rural inequality by granting access to land for poor landless peasants.⁶² In Vietnam, Deininger and Jin (2008) explore the effect of Vietnam's land reform on land markets. The authors find that markets allocate land with more efficient farmers, and that access to land for poor farmers increased because better-endowed households gradually left agriculture to engage in the non-agricultural sector of the economy.

4.4 Identification Strategy

The main purpose of this chapter is to explore the impact of land titling in the allocation of household labour supply. We use an OLS model with household fixed-effects to empirically test

⁶² If other markets work imperfectly (e.g. insurance and credit) the liberalization of land markets can also have detrimental effects on equity and efficiency because they may lead to distress land sales and wealth concentration towards the rural elite. In Nicaragua, Deininger, et al (2003) find that land sales markets contributed to land concentration, presumably because of failures in credit markets. In Honduras and Nicaragua, Boucher et al (2005) find that market failures and institutional gaps that affect smallholders have a more detrimental effect on their participation on land sales than land rentals.

the impact of land certification in household labour decisions. The specification estimated is as follows:

$$Y_{ijt} = \delta Cert_{jt} + \theta_i + \pi_j * T_t + \beta X_{ijt} + \varepsilon_{ijt} \quad (4.1)$$

Where Y_{ijt} refers to our dependant variable of interest (i.e. either the number of hours of wage employment per month or the number of household members working in the family farm) of household i , in ejido j at time t ; $Cert_{jt}$ is a dummy variable that indicates if the ejido j was certified by time t ; θ_i are unobserved household fixed-effects; π_j are ejido level characteristics; T_t is a time trend; X_{ijt} is a vector of household level covariates and ε_{ijt} is the error term. We are mainly concern with the magnitude and significance of δ .

As discussed in section 4.2, PROCEDE granted land certificates to all members of the ejido simultaneously. This feature of the program reduces endogeneity concerns regarding unobserved time-varying household characteristics that can be correlated with the timing of PROCEDE. However, a threat to our identification is that features of the ejido itself that can be related to the timing of certification. Although the program started simultaneously in all states, the implementation within the boundaries of the state vary according to several supply and demand aspects.

De Janvry et al (2014) show that the date of PROCEDE (this is the date in which government officials initially approach ejido authorities with information about the program) is correlated to three main factors. First, certification difficulty. Authorities initially target smaller ejidos with a higher proportion of land under private usage (parceled versus communal), fewer posesionarios (landed non-members farmers), and less conflicts over boundaries (both with other ejidos and within ejido members). Second, higher demand. Ejidos with more private usage parcels, that were closer to cities and whose members engaged more often in non-farming activities and more educated stand to gain more from PROCEDE. This resulted in a clear bias against poorer ejidos in terms of the timing of the program. Third, political forces. Party alignment between the municipality and state government made the land titling program occur smoother.⁶³

⁶³ According to the authors party alignment between State and Municipalities happen in 87% of the ejidos.

To address these concerns we include interaction terms between ejido characteristics and time dummies that allow us to control for ejido features that may be correlated with the timing of PROCEDE.⁶⁴ Our results can also be biased if household labour supply trends (i.e. wage employment and own-farm labour) are correlated with the timing of PROCEDE. We estimate identification tests showing that changes in labour supply prior to the program are uncorrelated with the timing of PROCEDE.⁶⁵

4.5 Data and Descriptive Statistics

The database for this chapter was constructed using two sources of information. First, we obtained information regarding the timing of land certification for each ejido (approximately 30 thousand) from the *Padrón e Historial de Núcleos Agrarios* (PHINA) on the RAN website, along with several descriptive characteristics of these ejidos. Second, we use the 1997-2000 *Encuesta de Evaluación de los Hogares* (ENCEL) surveys from Mexico's anti-poverty program PROGRESA.⁶⁶ The ENCEL surveys are a panel of approximately 25,000 rural households from 506 poor localities that were eligible for the program in seven states of Mexico.⁶⁷ The surveys contain vast information on household demographics, labour supply, time use and cultivated land.

Figure 4.1 shows the roll-out of PROCEDE across time and space; the shaded polygons are ejidos that have completed the program by that year, states with bold borders are the ones where ENCEL surveys were carried out. Between 1993 and 2006 PROCEDE was implemented in more than 28 thousand ejidos, covering more than 90% of them. The implementation of the

⁶⁴ De Janvy et al (2015) use this same identification strategy to control for ejido-level characteristics that may be correlated with the timing of PROCEDE.

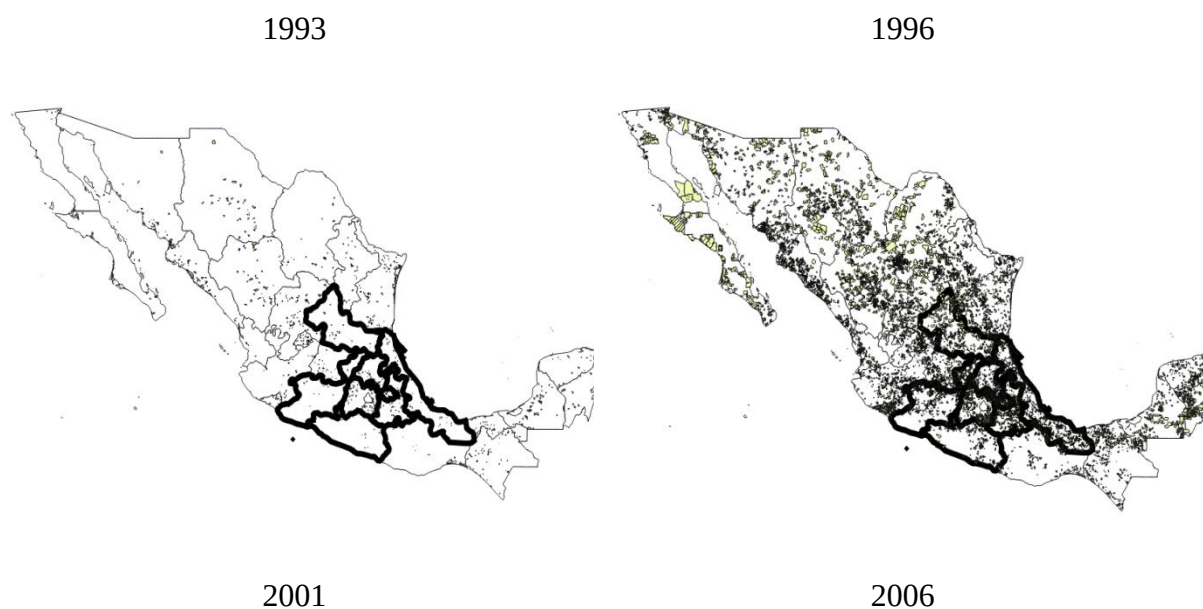
⁶⁵ Section provides details of the robustness checks conducted to support the parallel trends assumption needed for our identification strategy.

⁶⁶ The program is now referred to as OPORTUNIDADES or PROSPERA and is a conditional cash transfer (CCT) program for households in extreme poverty that transfers a monthly subsidy directly to women's debit accounts in condition of children's school enrolment and periodic medical check-ups. To evaluate the program they randomly selected 506 eligible localities (from 6,396) to collect household information; in 320 of them the program is implemented in 1997 (treatment) while in the remaining 186 localities the program starts after the survey's final round in 2000 (control). Only households classified as extremely poor in treatment localities received the cash transfer.

⁶⁷ One of the conditions for PROGRESA eligibility is that your village has a clinic and primary and secondary school; this addresses some concerns regarding heterogeneity of access to health and education that could be affecting household decisions regarding labour allocation of younger members in the household.

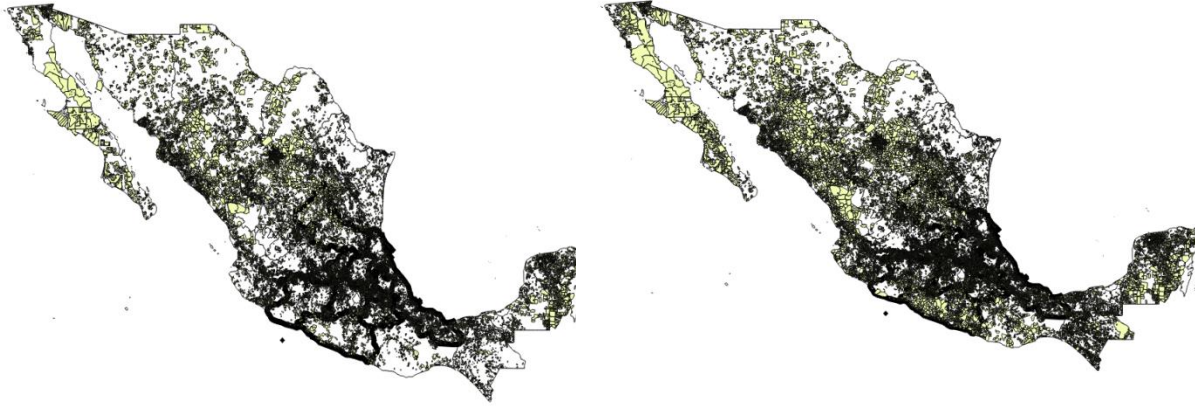
program was quite rapid; by 2000 almost half of the ejidos had been certified. For the purpose of this analysis, we exclude ejidos that were certified between 1993 and 1996 due to the lack of pre-treatment data. Households residing inside the boundaries of an ejido are considered to be certified when PROCEDURE was carried out in the ejido between 1997 and 1999 (treatment) and untitled if PROCEDURE was carried out in 2000 or afterwards (control).⁶⁸ The final dataset was constructed merging the roll-out of PROCEDURE with the ENCEL (1997-2000) surveys from PROGRESA, and consists of a four-round unbalanced panel of approximately 7,500 rural households located inside ejidos.⁶⁹

Figure 4.1: Rollout of PROCEDURE across time and space



⁶⁸ Because the ENCEL surveys collect information retrospectively, we allow one year before the certification to consider a household has been treated. For example, if PROCEDURE was carried out in 1997, the household receives the land certification treatment in 1998 and onwards.

⁶⁹ In this analysis I will use the 1997 baseline survey, and the 1998 October, 1999 November and 2000 November ENCEL rounds. We restrict the sample of ejidos to those that were certified by PROCEDURE. In 2006 this program closed and the remaining 2,500 ejidos and indigenous communities were left to be taken care of by other programs. More details on the matching of PROCEDURE roll-out and household data can be found in the appendix.



Note: Shaded ejidos are those that completed PROCEDURE during or before the listed year. States with bold lines are the seven PROGRESA states for which I have household data (Guerrero, Hidalgo, Michoacán, Puebla, Querétaro, San Luis Potosí and Veracruz).

Table 4.1 presents descriptive statistics divided by households in early-certified ejidos (1997-1999) and late-certified ejidos (2000-2006). In terms of socio-demographic characteristics we can see that titled households have fewer members, and the household head tends to be older. There are no differences in terms of the gender of the household head or the number of household members between 8 and 15 years old. More than two thirds of both types of households report having cultivated some crops. Titled households have slightly more cultivated land, however the difference is not statistically significant.

In terms of the variables related to household labour supply, the hours of wage employment per month are lower for households in certified ejidos (more than 60 percent of wage workers work in agriculture). Non-farm self-employment (e.g. trading services, elaboration of crafts, etc.) is not a very common activity in our sample, approximately 10 percent of households report having members working in these enterprises. However, untitled farmers report spending more time in this activity. Child labour hours in non-farming self-employed activities are also higher in untitled households. Unfortunately, our data does not provide detailed labour inputs in own-farm agricultural activities; hence, we shed light on this aspect of labour supply by examining the number of household members devoted to this activity. Titled households have fewer members in own-farming agriculture, both adults and children. Additionally, households in certified ejidos are more likely to have a migrant member.

These differences in household characteristics bring concerns regarding our identification strategy. For example, if the differences in household size or age of household head are correlated with the timing of PROCEDE our results may be biased if we do not control for these features. Our specification controls for unobserved fixed household characteristics and a set of household features that vary across time. Moreover, since the implementation of PROCEDE is conducted through a democratic local ejido process, the timing of certification is likely to be correlated with ejido-level characteristics. We address this endogeneity concern by interacting time dummies with a set of ejido-level characteristics.⁷⁰ Our identification strategy requires that the trend in household labour supply of both titled and untitled households would have followed a similar pattern if it was not for the implementation of PROCEDE. In section 7 we provide evidence to support the parallel trends assumption.

Table 4.1: Household characteristics in early-certified and late-certified ejidos

	Untitled	Titled	Difference
Age HH head	46.84	47.85	1.01***
HH head is female (1/0)	0.13	0.13	-0.00
HH members	5.38	5.11	-0.28***
HH members between 8 and 15 years old	1.28	1.30	0.02
HH cultivated land (1/0)	0.68	0.68	-0.01
Cultivated land (Has)	2.07	2.10	0.03
Hours in wage employment	197.74	191.38	-6.35**
Hours in wage employment (children)	7.77	6.78	-1.00
Hours in non-farm self-employment	3.57	0.87	-2.70***
Hours in non-farm self employment (children)	0.04	0.02	-0.01
HH members in own-farm activities	0.42	0.25	-0.16***
HH members in own-farm activities (children)	0.04	0.02	-0.02***
HH has migrant members (1/0)	0.05	0.08	0.04***
No. of Observations	21314	5376	

Notes: Households located in ejidos that were certified between 1997 and 1999 are considered titled, households in ejidos certified after 1999 are considered untitled. Hours in wage employment and non-farm self-employment represent the total number of house in this activity in the last month. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.6 Results

⁷⁰ Ejido characteristics include the size of the ejido, the number of ejidatarios, the number of avecinados, the number of posecionarios, total land in individual parcels and distant to city.

4.6.1 The effect of PROCEDE in household labour supply

In table 4.2 we present our results related to hours of wage employment per month. In the first column the specification only controls for time and ejido fixed-effects. The second column includes household characteristics. The third column controls for household fixed effects, and the fourth column included household covariates to the household fixed-effect specification. In column 5 we control for household fixed-effects and add interaction terms between time dummies and ejido characteristics. Finally, column 6 adds household controls to the previous specification. All six specifications suggest that PROCEDE reduced the hours of wage employment per household member. The theory predicts that increases in tenure security can reduce the need for guard labour, allowing households to increase their activities in other areas if they wish to do so. However, the effect of land certification in investment incentives and land market functioning can also make own-farm agriculture more appealing, especially if non-farming opportunities are still scarce (only around 15 percent of wage workers report having a job outside agriculture, in sectors such as construction, trading, etc.). The magnitude of the title coefficient is between 1.629 and 3.384; this represents a reduction of approximately 5 percent in the hours of per capita wage employment.

Table 4.2: The effect of PROCEDE on hours of wage employment per capita

	(1)	(2)	(3)	(4)	(5)	(6)
Title	-1.629** (0.799)	-1.907** (0.797)	-1.791** (0.791)	-1.769** (0.797)	-3.384*** (1.105)	-3.160*** (1.111)
Time FE	YES	YES	YES	YES	YES	YES
Ejido FE	YES	YES	NO	NO	NO	NO
Household FE	NO	NO	YES	YES	YES	YES
Ejido Characteristics*Time FE	NO	NO	NO	NO	YES	YES
<i>No. of observations</i>	26690	26564	26690	26564	26690	26564
<i>No. of households</i>	7576	7576	7576	7576	7576	7576

The household controls are: age of the HH head, HH head is female, HH size, cultivated land and whether the HH has a migrant. Ejido characteristics include the size of the ejido, the number of ejidatarios, the number of avecinados, the number of posecionarios, total land in individual parcels and distant to city. Standard errors in parentheses clustered at the household level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

If households are reducing their time in wage employment we would expect them to engage in other activities. In table 4.3 we present the results related to own-farm labour supply. Unfortunately, the ENCEL surveys do not report days or hours spend in agricultural activities.

Instead, we focus on the number of household members that declared their main activity to be farming in their own land. Table 4.3 shows the effect of PROCEDE on the number of household members devoted to own-farm cropping activities. Our results suggest that land titling did not have a significant effect on the number of household members in own-farm agriculture.

Thus far we analysed the effect of PROCEDE on wage employment hours and members working in own-farming. The results suggest that land certification affected the allocation of wage labour, although we do not find evidence of increases in own-farm activities.⁷¹ This result does not contradict De Janvry et al (2015) in which they find PROCEDE increased the probability of a household having a migrant member. Indeed, land titling can reallocate part of the household labour outside of the local labour market (via migration), but there are still other implications for the remaining household members. If certification increases land availability and the returns to labour in agriculture, as well as migration, there is the possibility that PROCEDE encourages the youngest members of the household to engage in own-farm agriculture.

Table 4.3: The effect of PROCEDE on HH members in own-farm agriculture

	(1)	(2)	(3)	(4)	(5)	(6)
Title	0.0227 (0.0178)	0.0261 (0.0177)	0.0247 (0.0182)	0.0297 (0.0181)	-0.0308 (0.0255)	-0.0365 (0.0255)
Time FE	YES	YES	YES	YES	YES	YES
Ejido FE	YES	YES	NO	NO	NO	NO
Household FE	NO	NO	YES	YES	YES	YES
Ejido Characteristics*Time FE	NO	NO	NO	NO	YES	YES
<i>No. of observations</i>	26690	26564	26690	26564	26690	26564
<i>No. of households</i>	7576	7576	7576	7576	7576	7576

The household controls are: age of the HH head, HH head is female, HH size, cultivated land and whether the HH has a migrant. Ejido characteristics include the size of the ejido, the number of ejidatarios, the number of vecinados, the number of posecionarios, total land in individual parcels and distant to city. Standard errors in parentheses clustered at the household level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

How does the certification of an asset owned by one of the household heads could affect intra-household allocation of labour? In China, Wang (2013) examines the impact of a house titling reform where individual rights were granted to one of the household heads. She finds that

⁷¹ We also estimate the same specification using the number of hours in non-farm self-employment. Results suggest that land certification did not affect this activity either (not reported).

property rights transferred to men increased the share of female chores and some male-favoured goods. Evidence from Ethiopia and Vietnam suggest that joint-titling of agricultural land (where husband and wife are legal co-owners) can improve expenditure on children's health and clothing, women's self employment, vulnerability to poverty and empowerment (Muchomba, 2017; Menon et al, 2017; Newman et al 2015)

In the case of Mexico, land certificates were given under the name of the rights holder, according to the 2007 Ejido Census more than 75 percent of ejido rights' holders are men. If this program distorted the balance of intra-household bargaining power, and men have different preferences regarding children's allocation of time, it is possible that PROCEDE leads to an increase in own-farm agricultural child labour. To shed some light in this issue, we estimate equation (4.1) with the number of household members between the age of 8 and 15 involved in own-farm agriculture. We restrict the sample to those households with children of those ages. Moreover, PROGRESA is a conditional cash transfer (CCT) transfer program that gives direct debit transfers to women in exchange of ensuring school attendance and medical check-ups of their children. Because this transfer is clearly related to child labour outcomes, we also restrict the sample to include only households that were not part of PROGRESA.⁷²

If land titling increases the value of land, this wealth effect is expected to reduce child labour (Basu and Van, 1998). However, some authors have documented that for low levels of landholdings increasing land assets may lead to increases in child labour (Bhalotra and Heady, 2003; Basu et al, 2010; Oryoie et al, 2016). Since PROCEDE also liberalize land markets, increasing average cultivated land in the ejido, it is possible the certification may have increased child labour. The outcomes for child labour in own-farm agriculture are presented in table 4.4. In columns 5 and 6 we can see that there is a negative effect of PROCEDE on the number of children working in agriculture.

Table 4.4: The effect of PROCEDE on children in own-farm agriculture

	(1)	(2)	(3)	(4)	(5)	(6)
Title	0.0051 (0.0136)	0.0051 (0.0136)	0.00186 (0.0145)	0.00219 (0.0145)	-0.0396* (0.0208)	-0.0393* (0.0209)
Time FE	YES	YES	YES	YES	YES	YES

⁷² Results are also consistent if we do not exclude PROGRESA beneficiaries.

Ejido FE	YES	YES	NO	NO	NO	NO
Household FE	NO	NO	YES	YES	YES	YES
Ejido Characteristics*Time FE	NO	NO	NO	NO	YES	YES
<i>No. of observations</i>	9575	9549	9575	9549	9575	9549
<i>No. of households</i>	2955	2955	2955	2955	2955	2955

The household controls are: age of the HH head, HH head is female, HH size, cultivated land and whether the HH has a migrant. Ejido characteristics include the size of the ejido, the number of ejidatarios, the number of vecinados, the number of posecionarios, total land in individual parcels and distant to city. Standard errors in parentheses clustered at the household level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.6.2 The effect of PROCEDE in land access

The land reform of 1992 also liberated land markets. This means households now are able to adjust their operational size given their endowment of other factors of production (e.g. labour). Land abundant households were able to lease land to labour abundant households. In the context of the ejido, vecinados are members of the community with no access to land. The restrictions imposed on individual parcels for many years created a situation where elderly ejido members could not farm the land, and young landless lack access to land. By lifting such restrictions, PROCEDE allowed landowners to increase their operational scale, and also liberated land to be farm by previously landless peasants. Moreover, many household members in the ejido move out of rural areas. In table 4.5 we present results related to land cultivated. De Janvry et al (2015) use additional datasets from PROCAMPO beneficiaries—a decoupled cash transfer program given to farmers for cultivating basic crops— and satellite images to look at the effect of land titling in cultivated area. Our results are based on the self-reported cultivated area in the ENCEL surveys and are consistent with their results. The certification program allowed households to expand their operational scale, interestingly having a migrant member in the household is also positively related to cultivated land.

Table 4.5: The effect of PROCEDE on land cultivated (log)

	(1)	(2)	(3)	(4)	(5)	(6)
Title	0.0604*** (0.0218)	0.0651*** (0.0217)	0.0665*** (0.0222)	0.0674*** (0.0221)	0.0703** (0.0297)	0.0713** (0.0297)
Time FE	YES	YES	YES	YES	YES	YES
Ejido FE	YES	YES	NO	NO	NO	NO
Household FE	NO	NO	YES	YES	YES	YES
Ejido	NO	NO	NO	NO	YES	YES

Characteristics*Time FE						
<i>No. of observations</i>	26690	26564	26564	26690	26690	26564
<i>No. of households</i>	7576	7576	7576	7576	7576	7576

The household controls are: age of the HH head, HH head is female, HH size, cultivated land and whether the HH has a migrant. Ejido characteristics include the size of the ejido, the number of ejidatarios, the number of avecinados, the number of posecionarios, total land in individual parcels and distant to city. Standard errors in parentheses clustered at the household level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.7 Robustness checks

The main threat to our identification strategy is the correlation between timing of PROCEDE and our main outcome variables. If households anticipated the timing of PROCEDE and increase their labour supply in wage employment and child labour, the land titling program may be a reflection of households going back to average levels of labour supply and child labour when PROCEDE happened. We estimate the following specification to confirm that the timing of PROCEDE is not related to our outcome variables:

$$\Delta Y_{ijt} = \theta_t + \sum_{k \geq t} \mu_k I(\text{PROCEDEYEAR}_j = k) + \varepsilon_{ijt} \quad (4.2)$$

Where ΔY_{ijt} is the household-level percentage change in hours of wage employment per capita and number of children in agriculture across time. PROCEDEYEAR_j are the main explanatory variables and they are dummy variables taking a value one in the year PROCEDE took place. θ_t are time FE and ε_{ijt} is the error term. Tables 4.6 and 4.7 present the results of pre-treatment changes on household wage hours per capita and the number of children working in own-farming, respectively. In the first column the sample is restricted to years 1997 and 1998. The second column restricts years to 1997-1999, and the last column does not restrict the sample. None of the coefficients in tables 4.6 and 4.7 are statistically significant, this suggests that the effects we observe on these variables are being caused by PROCEDE and not other unobserved time-varying factors.

Table 4.6: Pre-treatment changes in HH wage hours per capita

	Δ HH wage hours, 97-98	Δ HH wage hours, 98-99	Δ HH wage hours, 99- 2000
PROCEDE completed in 1999	-0.0247 (0.0336)		
PROCEDE completed in 2000	0.0222 (0.0301)	0.457 (0.316)	

PROCEDE completed after 2000	-0.0125 (0.0248)	-0.343 (0.357)	-0.132 (0.408)
Time FE	YES	YES	YES
Ejido FE	NO	YES	YES
<i>No. of observations</i>	7016	12019	17689

Standard errors in parentheses
 * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4.7: Pre-treatment changes in the number of children working in own-farming

	Δ Child labour, 97-98	Δ Child labour, 98-99	Δ Child labour, 99-2000
PROCEDE completed in 1999	0.000595 (0.00163)		
PROCEDE completed in 2000	0.000595 (0.00161)	-0.00000989 (0.0107)	
PROCEDE completed after 2000	0.00181 (0.00134)	0.00000256 (0.0106)	0.0000125 (0.00851)
Time FE	YES	YES	YES
Ejido FE	NO	YES	YES
<i>No. of observations</i>	7016	12019	17689

Standard errors in parentheses
 * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.8 Conclusions

Weak enforcement of property rights distorts household allocation of labour. Land titling can reduce the need for labour to be employed for guarding purposes, allowing households to increase their off-farm activities. However, increases in tenure security enhance investment incentives, which can increase the returns to labour in agriculture. Also, property rights give the opportunity to increase the operational size of the farm, incentivizing more labour input in agriculture.

This chapter examined the effect of a nation-wide land titling program in Mexico, that along with the official land documents it granted the authorization for land markets to operate legally. Our results show that the certification reduced wage labour and increased cultivated land. However, we did not find any significant effects of the certification on own-farm labour supply.

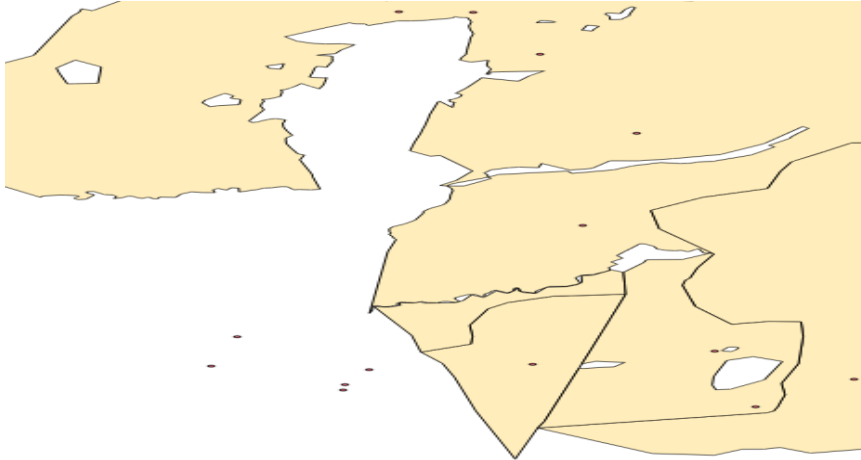
Moreover, we shed light on an issue that is seldom discussed in the property rights literature; the effect of property rights in intra-household labour supply. Our results suggest that households participating in the program decreased the number of children working in their farms.

Appendix

4.A Merging the roll-out of PROCEDE with the ENCEL surveys

The ENCEL surveys do not provide a way to identify if the household is located inside an ejido or community; however it does show the locality in which the household is located. Using a spatial join in QGIS, we matched localities and ejidos using the coordinates of the centroid of the locality. We considered the locality to match the ejido when the centroid of the locality was inside the boundaries of the ejido. The spatial merge resulted in 249 localities (out of 506) falling into 245 different ejidos.⁷³ The number of households that fell inside the ejidos as a result of this process is 14,531. In the final dataset, only households matched in ejidos certified between 1997 and 2006 are included (approximately 7,500 households). Figure 2 illustrates an example of the ejido-locality matching.

Figure 4.A: Spatial join of ejidos and localities



Note: The shaded polygons represent different ejidos, a locality was considered to be inside an ejido if the coordinates of its centroid were inside the boundaries of the ejido. As it can be seen, it is possible that more than one locality is matched to an ejido

⁷³ This result is consistent with the fact that half of Mexico's land is ejido, thus the large number of localities that were not matched is not a concern.

4.B Coefficients of household characteristics

Table 4A presents the estimated coefficients of our specification when the dependent variable is the monthly hours of wage employment per capita. The results suggest that increases in the number of household members reduce labour allocation into wage employment. Similarly, households with more cultivated land tend to spend fewer hours in wage activities. This is not surprising as households with higher endowments of land and labour are more likely to engage in own-farm agriculture, reducing their time in other income-generating activities. Moreover, households that have a migrant member spend fewer hours in wage employment.

Table 4A: Hours of wage employment

	(1)	(2)	(3)
HH head age	0.157*** (0.0193)	-0.132* (0.0724)	-0.111 (0.0699)
HH head is female	-3.451*** (0.933)	0.843 (1.398)	-0.348 (1.376)
HH members	-3.034*** (0.123)	-0.683*** (0.256)	-0.783*** (0.254)
Cultivated land	0.0598 (0.0713)	-0.191** (0.0744)	-0.230*** (0.0797)
Migrant	-1.302 (1.051)	-5.929*** (1.786)	-6.259*** (1.797)
Time FE	YES	YES	YES
Ejido FE	YES	NO	NO
Household FE	NO	YES	YES
Ejido Characteristics*Time FE	NO	NO	YES
<i>No. of observations</i>	26564	26564	26564
<i>No. of households</i>	7576	7576	7576

Ejido characteristics include the size of the ejido, the number of ejidatarios, the number of avecinados, the number of posecionarios, total land in individual parcels and distant to city. Standard errors in parentheses clustered at the household level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In table 4B we show the coefficients in the case of household members in own-farm agriculture. Although PROCEDURE did not show any significant effects on the number of household members in agriculture, it is still worth discussing the implications of some household characteristics. We can see that as the household head grows older, the number of members in agriculture increases. Also, households with more members and more cultivated land tend to participate in own-farm agriculture more intensely.

Table 4B: HH members in own-farm agriculture

	(1)	(2)	(3)
HH head age	0.0064*** (0.000356)	0.0034** (0.00152)	0.0027* (0.00151)
HH head is female	-0.0821*** (0.0139)	-0.0059 (0.0254)	-0.0013 (0.0254)
HH members	0.0434*** (0.00263)	0.0447*** (0.00661)	0.0480*** (0.00648)
Cultivated land	0.0362*** (0.00531)	0.0250*** (0.00510)	0.0226*** (0.00485)
Migrant	0.0423* (0.0226)	-0.0213 (0.0437)	-0.0442 (0.0421)
Time FE	YES	YES	YES
Ejido FE	YES	NO	NO
Household FE	NO	YES	YES
Ejido Characteristics*Time FE	NO	NO	YES
<i>No. of observations</i>	26564	26564	26564
<i>No. of households</i>	7576	7576	7576

Ejido characteristics include the size of the ejido, the number of ejidatarios, the number of avecinados, the number of posecionarios, total land in individual parcels and distant to city. Standard errors in parentheses clustered at the household level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In table 4C we have the results for children working in the family farm. When the household head changes from a man to a woman (columns 2 and 3) there is a decrease in the number of children (suggested by the negative sign). However, given the small variability in these variables most of the coefficients in this specification are not significant. When the specification does not control for household fixed-effects (column 2) we see that household size and cultivated land are positively related to the number of children in agriculture.

Finally, table 4D presents the results of the control variables' coefficients when the dependent variable is cultivated land. Increases in the number of household members are positively related to the size of cultivated land. Interestingly, households with a migrant member tend to cultivate more land. This may happen because remittances alleviate financial restrictions to undertake agricultural ventures.

Table 4C: Children in own-farm agriculture

	(1)	(2)	(3)
HH head age	-0.000170 (0.000237)	0.000480 (0.00106)	0.000296 (0.00101)
HH head is female	0.00293 (0.0108)	-0.0276 (0.0456)	-0.0158 (0.0430)
HH members	0.00538*** (0.00142)	0.000315 (0.00344)	0.00104 (0.00344)
Cultivated land	0.00275** (0.00118)	0.00205 (0.00152)	-0.000157 (0.00154)
Migrant	0.0257 (0.0191)	0.00814 (0.0247)	-0.0184 (0.0238)
Time FE	YES	YES	YES
Ejido FE	YES	NO	NO
Household FE	NO	YES	YES
Ejido Characteristics*Time FE	NO	NO	YES
<i>No. of observations</i>	9549	9549	9549
<i>No. of households</i>	2955	2955	2955

Ejido characteristics include the size of the ejido, the number of ejidatarios, the number of avecinados, the number of posecionarios, total land in individual parcels and distant to city. Standard errors in parentheses clustered at the household level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4D: Cultivated land (log)

	(1)	(2)	(3)
HH head age	0.0094*** (0.000493)	0.0022 (0.00213)	0.0023 (0.00215)
HH head is female	-0.0819*** (0.0204)	0.0786* (0.0453)	0.0365 (0.0457)
HH members	0.0349*** (0.00275)	0.0209*** (0.00805)	0.0252*** (0.00786)
Migrant	0.0322 (0.0283)	0.103** (0.0445)	0.102** (0.0434)
Time FE	YES	YES	YES
Ejido FE	YES	NO	NO
Household FE	NO	YES	YES
Ejido Characteristics*Time FE	NO	NO	YES
<i>No. of observations</i>	26564	26690	26564
<i>No. of households</i>	7576	7576	7576

Ejido characteristics include the size of the ejido, the number of ejidatarios, the number of avecinados, the number of posecionarios, total land in individual parcels and distant to city. Standard errors in parentheses clustered at the household level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Chapter 5: **Conclusions**

In this thesis we presented three empirical chapters analyzing the role of land property rights on household labour supply, rental markets, gender equality and agricultural production in developing countries. The second chapter focus on the gender-differentials in land tenure security and its implications in the functioning of rental markets. The third chapter analyzes the effect of an improvement in tenure security in labour supply and agricultural production. These both chapters were conducted using rural household panel data from Vietnam. The fourth chapter looks at the rollout of a nation-wide land certification program in Mexico to assess its impact on household labour supply, shedding some light in the implications of land certification for intra-household labour allocation.

In the second chapter we find that female-headed households are less likely to receive any type of compensation when they lease land to their relatives. However, having a land certificate for the plot transacted eliminated this effect. The results of this chapter suggest that the gender gap in tenure security reduces the compensation received by female landlord when they transfer land to their relatives. However, legal documents are a good way to address this imbalance in property rights. Additionally, this chapter provides an estimation of the productivity and income losses due to these market imperfections.

In the third chapter we find that Vietnam's Land Law of 2013 decrease labour supply in own-farm agriculture. However, households experiencing the increase in tenure security did not increase their participation in off-farm employment. Our results suggest that the reduction in own-farm labour can be explained by an increase in capital usage and the reductions of landholdings. The findings of this chapter are robust to various specifications and support the parallel trends assumption.

The fourth chapter provides empirical evidence of the effects of land certification on household labour supply. Improvements in property rights can lead to a reduction in own-farm labour because agents no longer need to devote resources to protect their property. However, land

institutions can foster investment and land transactions, increasing the potential profitability of own-farm agriculture. This chapter provides empirical evidence of a reduction in wage labour hours due to the land certification program. However, it did not find evidence of an increase in farming activities. The chapter also shed light on an issue that is commonly ignored in the literature of land titling: the intra-household allocation of labour. The findings in this chapter suggest land certification reduced the number of children working on their farms.

Property rights are a key component of rural development and agricultural productivity. Their establishment guarantees you will reap the fruit of your work, incentivizing investment. It allows landowners, particularly those who have been traditionally neglected in terms of land rights, to engage in land markets without significant transaction costs. This promotes an efficient use of resources, as well as a fair compensation for the asset owners. Even without a serious threat of appropriation, land institutions in developing countries tend to establish land ownership through continuous use of the land. In this thesis we have provided evidence of the inefficiencies this type of institutions create in household labour allocation and agricultural production.

Bibliography

- Adamopoulos, T., Brandt, L., Leight, J., & Restuccia, D. (2017). *Misallocation, selection and productivity: A quantitative analysis with panel data from China* (No. w23039). National Bureau of Economic Research.
- Agarwal, B. (1994). *A field of one's own: Gender and land rights in South Asia* (Vol. 58). Cambridge University Press.
- Ahn, H., & Powell, J. L. (1993). 'Semiparametric estimation of censored selection models with a nonparametric selection mechanism'. *Journal of Econometrics*, 58(1-2), pp.3-29.
- Akram-Lodhi, A. H. (2005). 'Vietnam's agriculture: processes of rich peasant accumulation and mechanisms of social differentiation'. *Journal of Agrarian Change*, 5(1), pp.73-116.
- Albertus, M., Diaz-Cayeros, A., Magaloni, B., & Weingast, B. R. (2016). Authoritarian survival and poverty traps: Land reform in Mexico. *World Development*, 77, 154-170.
- Alchian, A. A., & Demsetz, H. (1973). The property right paradigm. *The journal of economic history*, 33(01), 16-27.
- Appendini, K. (2001). Land regularization and conflict resolution: The case of Mexico. *Report for FAO (Food and Agriculture Organization of the United Nations), Rural Development Division*.
- Ayerst, S., Brandt, L., and Restuccia, D. (2018). 'Market Constraints, Misallocation, and Productivity in Vietnam Agriculture'. Unpublished Manuscript, University of Toronto.
- Banerjee, A. V., Gertler, P. J., and Ghatak, M. (2002). 'Empowerment and efficiency: tenancy reform in West Bengal'. *Journal of political economy*, 110(2), pp.239-280.
- Basu, K., Das, S., & Dutta, B. (2010). Child labor and household wealth: Theory and empirical evidence of an inverted-U. *Journal of development economics*, 91(1), 8-14.
- Basu, K., & Van, P. H. (1998). The economics of child labor. *American economic review*, 412-427.
- Bellemare, M. F. (2012). 'Insecure land rights and share tenancy: Evidence from Madagascar'. *Land Economics*, 88(1), pp.155-180.
- Bellemare, M. F., Chua, K., Santamaria, J., & Vu, K. (2018). 'Tenurial security and agricultural investment: Evidence from Vietnam' (No. 2018/76). WIDER Working Paper.
- Besley, T. (1995). Property rights and investment incentives: Theory and evidence from Ghana. *Journal of Political Economy*, 903-937.

- Besley, T., and M. Ghatak (2010). 'Property rights and economic development'. In *Handbook of development economics* (Vol. 5, pp. 4525-4595). Amsterdam: Elsevier.
- Bhalotra, S., & Heady, C. (2003). Child farm labor: The wealth paradox. *The World Bank Economic Review*, 17(2), 197-227.
- Boucher, S. R., Barham, B. L., & Carter, M. R. (2005). The impact of "market-friendly" reforms on credit and land markets in Honduras and Nicaragua. *World Development*, 33(1), 107-128.
- Brandt, L., Le, D., Huong, G., Trang, C., Pham, G., Nguyen, N., and Luu, V. (2006). 'Land access, land markets, and their distributive implications in rural vietnam'. Department of Economics, University of Toronto, Toronto.
- Chari, A. V., Liu, E. M., Wang, S. Y., and Wang, Y. (2017). 'Property Rights, Land Misallocation and Agricultural Efficiency in China'. Cambridge, MA: National Bureau of Economic Research No. w24099.
- Chen, C., Restuccia, D., and R. Santaaulàlia-Llopis. (2017). 'Land markets, resource allocation, and agricultural productivity'. Unpublished Manuscript, University of Toronto.
- Córdova, A. (2014). *La ideología de la Revolución Mexicana*. Ediciones Era.
- De Janvry, A., K. Emerick, M. Gonzalez-Navarro and E. Sadoulet (2015). 'Delinking land rights from land use: Certification and migration in Mexico'. *American Economic Review*, 105(10), 3125-49.
- De Janvry, A., Gonzalez-Navarro, M., & Sadoulet, E. (2014). Are land reforms granting complete property rights politically risky? Electoral outcomes of Mexico's certification program. *Journal of Development Economics*, 110, 216-225.
- De Janvry, A., Gordillo, G., & Sadoulet, E. (1997). *Mexico's second agrarian reform: household and community responses, 1990-1994*.
- De Moura, M. J. S. B., Ribeiro, M., & Piza, C. (2014). Are there any distributive effects of land title on labor supply? evidence from Brazil. *IZA Journal of Labor & Development*, 3(1), 11
- De Soto, H. (2000). *The mystery of capital: Why capitalism triumphs in the West and fails everywhere else*. Basic books.
- Deininger, K., & Bresciani, F. (2001). Mexico's Second Agrarian Reform: Implementation and Impact. *World Bank document*.
- Deininger, K., & Feder, G. (2009). Land registration, governance, and development: Evidence and implications for policy. *The World Bank Research Observer*, 24(2), 233-266.
- Deininger, K., and Jin, S. (2005). 'The potential of land rental markets in the process of economic development: Evidence from China'. *Journal of Development Economics*, 78(1), pp.241-270.
- Deininger, K. and S. Jin (2008). 'Land sales and rental markets in transition: Evidence from rural Vietnam'. *Oxford Bulletin of Economics and Statistics*, 70(1), pp.67-101.

- Deininger, K., Zegarra, E., & Lavadenz, I. (2003). Determinants and impacts of rural land market activity: Evidence from Nicaragua. *World Development*, 31(8), 1385-1404.
- Demsetz, H. (1967). "Toward a Theory of Property Rights." *American Economic Review* 57 (2): 347-59.
- Do, Q.T. and L. Iyer (2008). 'Land titling and rural transition in Vietnam'. *Economic Development and Cultural Change*, 56(3), pp.531-579.
- Dower, P. C., & Pfutze, T. (2015). Vote suppression and insecure property rights. *Journal of Development Economics*, 114, 1-19.
- Duarte, M., and Restuccia, D. (2010). 'The role of the structural transformation in aggregate productivity'. *The Quarterly Journal of Economics*, 125(1), pp.129-173.
- Feder, G., (1985) 'The relation between farm size and farm productivity: The role of family labor, supervision and credit constraints'. *Journal of development economics*, 18(2-3), pp.297-313.
- Feder, G., Tongroj O., and Y. Chalamwong. (1988). "Land Policies and Farm Performance in Thailand's Forest Reserve Areas." *Economic Development and Cultural Change* 36 (3): 483-501.
- Field, E. (2007). Entitled to work: Urban property rights and labor supply in Peru. *The Quarterly Journal of Economics*, 122(4), 1561-1602.
- Ghebru, H., and S.T. Holden (2014). 'Reverse-share-tenancy and agricultural efficiency: Farm-level evidence from Ethiopia'. *Journal of African Economies*, 24(1), pp.148-171.
- Goldstein, M., and Udry, C. (2008). 'The profits of power: Land rights and agricultural investment in Ghana'. *Journal of political Economy*, 116(6), pp.981-1022.
- Gollin, D., Parente, S., & Rogerson, R. (2002). The role of agriculture in development. *American economic review*, 92(2), 160-164.
- Holden, S.T. and M. Bezabih (2008). 'Gender and land productivity on rented land in Ethiopia'. In Stein T. Holden, Keijiro Otsuka, and Frank M. Place (eds), *The emergence of land markets in Africa: Assessing the impacts on poverty, equity and efficiency*, pp.179-98. New York: Routledge.
- Holden, S.T., K. Deininger, and H. Ghebru (2011). 'Tenure insecurity, gender, low-cost land certification and land rental market participation in Ethiopia'. *The Journal of Development Studies*, 47(1), pp.31-47.
- Holden, S.T., K. Otsuka and F.M Place (eds.) (2010). *The Emergence of Land Markets in Africa: Impacts on Poverty, Equity, and Efficiency*". New York: Routledge.
- International Labour Organization (2018). Employment in agriculture (% of total employment) (modeled ilo estimate). Data retrieved from World Development Indicators, <https://data.worldbank.org/indicator/sl.agr.empl.zs>.

- Jin, S., & Deininger, K. (2009). Land rental markets in the process of rural structural transformation: Productivity and equity impacts from China. *Journal of Comparative Economics*, 37(4), 629-646.
- Khai, L.D., T. Markussen, S. McCoy, and F. Tarp (2013). 'Access to land: market and non-market land transactions in rural Vietnam'. In Holden, S., Otsuka, K., Deininger, K. (Eds.) *Land Tenure Reform in Asia and Africa: Assessing Impacts on Poverty and Natural Resource Management* (pp. 162-186). London: Palgrave Macmillan.
- Kimura, S., K. Otsuka, T. Sonobe, and S. Rozelle (2011). 'Efficiency of land allocation through tenancy markets: evidence from China'. *Economic Development and Cultural Change*, 59(3), pp.485-510.
- Kingham, C. and C. Newman (2017). 'The rural non-farm economy'. In Tarp, F., (Ed.) *Growth, Structural Transformation, and Rural Change in Viet Nam: A Rising Dragon on the Move* (pp. 91-113). Oxford: Oxford University Press.
- Kung, J. K. S. (2002). Off-farm labor markets and the emergence of land rental markets in rural China. *Journal of Comparative Economics*, 30(2), 395-414.
- Larreguy, H. (2013). *Monitoring Political Brokers: Evidence from Clientelistic Networks in Mexico*. Working paper.
- Macours, K., De Janvry, A., & Sadoulet, E. (2010). 'Insecurity of property rights and social matching in the tenancy market'. *European Economic Review*, 54(7), pp.880-899.
- Magaloni, B. (2006). *Voting for autocracy: Hegemonic party survival and its demise in Mexico*. Cambridge: Cambridge University Press.
- Markussen, T. (2017). 'Markets, property rights, and investment', in Tarp F. (Ed.) *Growth, Structural Transformation, and Rural Change in Viet Nam: A Rising Dragon on the Move* (pp. 117-138). Oxford: Oxford University Press.
- Markussen, T., & Tarp, F. (2014). 'Political connections and land-related investment in rural Vietnam'. *Journal of Development Economics*, 110, pp.291-302.
- Menon, N., van der Meulen Rodgers, Y., and Kennedy, A. R. (2017). 'Land Reform and Welfare in Vietnam: Why Gender of the Land-Rights Holder Matters'. *Journal of International Development*, 29(4), pp.454-472.
- Muchomba, F. M. (2017). Women's land tenure security and household human capital: Evidence from Ethiopia's land certification. *World development*, 98, 310-324.
- Nakasone, E. (2011). The impact of land titling on Labor allocation: evidence from rural Peru. *IFPRI-Discussion Papers*, (1111).
- Narciso, G. (2017). 'Labour and migration'. In Tarp, F., (Ed.) *Growth, Structural Transformation, and Rural Change in Viet Nam: A Rising Dragon on the Move* (pp. 139-157). Oxford: Oxford University Press.
- Newman, C., F. Tarp, and K. Van Den Broeck (2015). 'Property rights and productivity: The case of joint land titling in Vietnam'. *Land Economics*, 91(1), pp.91-105.

- Oryioe, A. R., Alwang, J., & Tideman, N. (2017). Child labor and household land holding: Theory and empirical evidence from Zimbabwe. *World Development*, 100, 45-58.
- Pingali, P.L. and V.T. Xuan (1992). 'Vietnam: Decollectivization and rice productivity growth'. *Economic development and cultural change*, 40(4), pp.697-718.
- Promsopha, G. (2015). 'Land ownership as insurance and the market for land: A study in rural Vietnam'. *Land Economics*, 91(3), pp. 460-478.
- Ravallion, M. and D. Van De Walle (2004). 'Breaking up the collective farms'. *Economics of Transition*, 12(2), pp.201-236.
- Ravallion, M., and D. Van de Walle (2008). 'Land in transition: Reform and poverty in rural Vietnam'. World Bank Publications. Washington, DC: World Bank.
- Skoufias, E. (1995). 'Household resources, transaction costs, and adjustment through land tenancy'. *Land Economics*, pp.42-56.
- Smith, W. (1997). 'Land and the Poor: A Survey of Land Use Rights in Ha Tinh and Son La Provinces, Vietnam'. Hanoi: ActionAid Vietnam.
- Tanaka, T. and Q. Nguyen (2010). 'ROSCA as a saving commitment device for sophisticated hyperbolic discounters: field experiment from Vietnam'. Working paper.
- Tran TQ. (2001). 'Land Reform and Women's Property Rights in Vietnam'. Hanoi: Center for Gender: Environment and Sustainable Development Working Paper.
- Udry, C. (1996) 'Gender, agricultural production, and the theory of the household'. *Journal of political Economy*, 104 (5), pp.1010-1046.
- Valsecchi, M. (2014). Land property rights and international migration: Evidence from Mexico. *Journal of Development Economics*, 110, 276-290.
- Wang, S. Y. (2014). Property rights and intra-household bargaining. *Journal of Development Economics*, 107, 192-201.
- World Bank. (2002). 'Promising Approaches to Engendering Development: Land Use Rights and Gender Equality in Vietnam.' Washington, DC: World Bank.
- World Bank (2009). 'Vietnam Development Report 2010: Modern Institutions.' Hanoi: The World Bank in Vietnam.
- Yunez-Naude, A. (2003). The dismantling of CONASUPO, a Mexican state trader in agriculture. *World Economy*, 26(1), 97-122.
- Yúnez-Naude, A., & Paredes, F. B. (2004). The agriculture of Mexico after ten years of NAFTA implementation. *Documentos de Trabajo (Banco Central de Chile)*, (277), 1.