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Women's Land Rights and Children's Human Capital in Vietnam

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Summary. — Vietnam's 1993 Land Law created a land market by granting households land-use rights which could be exchanged, leased, and mortgaged. Using a matched household sample from Vietnam's 2004 and 2008 Household Living Standards Survey, this study analyzes whether land titling for women led to improvements in child health and education. Results indicate that female-only held land-use rights decreased the incidence of illness among children, increased their health insurance coverage, raised school enrollment, and reallocated household expenditures toward food and away from alcohol and tobacco. These effects were almost all stronger than in households with male-only or jointly-held land-use rights.
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1. INTRODUCTION

Improving women's control over assets such as land can augment women's economic security and bargaining power, which in turn may have powerful consequences for the health and well-being of their children. Improving women's titling to land can increase the availability of collateral to obtain loans, which in turn can provide women the financial means to invest in entrepreneurial activities and to increase household expenditures. Formal, registered land rights can also affect women's agricultural productivity and earnings power through increased security of land tenure. In addition to improving women's income-generating capacities, land ownership may also strengthen their control over resources within the household. There is an established literature on bargaining in the context of households where even if the budget of the household remains constant, social changes may alter intra-household spending patterns (Manser & Brown, 1980; McElroy & Horney, 1981). Although improvements in household assets may benefit all members, resources concentrated in the hands of women may do more for children than those concentrated in the hands of men (Lundberg & Pollack, 1991; Thomas, 1990). Women's control over financial resources has well-documented effects on human-capital outcomes for themselves and their children through cooperatively-bargained processes.

In practice, stronger property rights in developing countries have come primarily through land titling programs.[1] In the case of Vietnam, the 1993 Land Law prompted one of the largest land-titling programs seen to date in the developing world both in terms of scope and pace of implementation; within 7 years, rural households were issued about 11 million land-use certificates (Do & Iyer, 2008). The large-scale reform has made Vietnam the subject of several studies examining the effect of land reform on agricultural productivity and household decision-making. Notable findings include an increase in the proportion of cultivated areas planted with more profitable crops, increased labor supply in nonfarm activities, and greater food security (Do & Iyer, 2008; Markussen, Tarp, & Van Den Broeck, 2011). A topic which has not been examined as yet is whether Vietnam's land reforms led to overall improvements in children's human capital, and whether such effects were especially pronounced in households in which women held land rights individually or with their spouses. Our study explores this topic by examining whether three categories of land use rights—those held by woman alone, held jointly with husbands, or held by husbands alone—had differential effects on child well-being.

Although previous evidence has shown that resources concentrated in the hands of women result in positive benefits to children (Doss, 2006; Quisumbing & Maluccio, 2003), there is little existing work that can trace the effects of women's land rights on children's human capital. To the best of our knowledge, Allendorf (2007) is the main exception. This study uses a cross-section of data from Nepal and finds that women who own land are more likely to have the final word in household decisions and less likely to have children who are underweight. However, if household unobserved characteristics such as preferences determine patterns of land ownership and outcomes at the same time (for example, progressive households

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may have more land registered in women's names and may also have better health outcomes for children), a single cross-section of data does not facilitate estimation of causal impacts.

This study uses data on matched households from the 2004 and 2008 Vietnam Household Living Standards Surveys (VHLSS) in which land-use rights are identified with specific stake-holders within the home. The data allow us to control for household-level differences and to directly ascertain the gender-differentiated impact of the titling program on child health and education. Although it is possible that the person in whose name the land is registered differs from the person making actual decisions on how to manage the land, our methods and data improve on other studies in that we can determine the relative impact of different categories of land-use registration by gender on measures of children's human capital. Results indicate that after controlling for observed and unobserved household-level characteristics, an increased proportion of land registered in women's names only generates substantial health and educational benefits for their children.

2. BACKGROUND: LAND LAW REFORMS IN VIETNAM

As part of its sweeping "Doi Moi" policy reforms in the 1980s, Vietnam's government began the move away from a collective agricultural system toward a new structure that allowed farm households to lease plots of land for 10–15 years (Do & Iyer 2008). Based on a wide-scale reallocation process, the new system was intended to reduce inequality and improve incentives for farmers to invest in their land. However, in practice, the land-use rights were not viewed as being secure as they were not tradable and consequently, many farmers were reluctant to make long-term investments in their fields. To improve the incentive structure facing farm households, the government passed a new Land Law in 1993 that extended the lease period and allowed farmers to trade, transfer, rent, bequeath, and mortgage their land-use rights. The law change was implemented through the issuance to farm households of land-use rights—known in Vietnam as Land-Use Certificates (LUCs). Although the issuance of LUCs proceeded quickly, implementation across the provinces remained uneven because the application and authorization processes entailed numerous application steps and approvals by different layers of government. Problems included delays on the part of the management agencies in setting guidelines for issuing LUCs, land-use tax rates that were initially too high, inaccurate records on prior landholdings, large numbers of disputes that required resolution and debts that needed to be cleared before LUCs could be issued, and a lack of awareness among farm households and local authorities about the importance of formal land-use rights (Do & Iyer, 2008).

Issuance of land-use rights also demonstrated uneven patterns in terms of gender. In principle, the reforms did not discriminate in granting rights because legal decrees on implementation of the Land Law relied on gender-neutral language such as "individuals" and "users" in referring to the targeted beneficiaries of the reforms. Rather, gender disparities that favored men in the issuance of land-use rights resulted from implementation. In particular, in the initial years, the LUCs had space for only one name that was to be filled by the household head. That is, the original Land Law issued LUCs at the household level. Since more households were headed by men, the unintended consequence was that few women had their names on the LUCs (Ravallion & van de Walle 2008). This pattern began to change with a further set of legal reforms in 2000 and 2001.[2] The Marriage and Family Law of 2000 stipulated that any LUC obtained by husband and wife over the course of the marriage would be considered their common property, while any LUC obtained prior to the marriage or through inheritance by the husband or wife would be considered common property only by mutual agreement. Hence, for LUCs obtained during the marriage, the names of both husband and wife should be inscribed. Further, the 2001 Land Law reform led to the issuance of LUCs at the plot level. Thus household members could own multiple plots, and any plot under the common ownership of husband and wife was required by law to be registered under the names of both husband and wife. In practice, however, these new regulations governing joint ownership were not well enforced since the government agency in charge of rural land titling lacked the administrative capacity to ensure full compliance across provinces (Ravallion & van de Walle, 2008).

Another source of gender discrepancies in the issuance of land-use rights was that many localities stipulated that the amount of acreage allocated to a household would depend on the ages of household members, with individuals of working age receiving the largest allocations. Since female-headed households tended to have fewer working age adults, such households, on average, received less land than male-headed households.[3] Further, the legal retirement age for women remained 5 years earlier than for men (age 55 for women compared to 60 for men). Consequently, the amount of land allocated to women ages 55–59 was half that allocated to men of the same age. Gender inequities in the issuance of land-use rights were also exacerbated by social norms and cultural traditions in Vietnam that favored men in decisions regarding the reallocation of land and the approval of LUC applications.

3. LAND RIGHTS AND BARGAINING POWER: CONCEPTUAL FRAMEWORK AND EVIDENCE

In principle, formal, registered land rights are positively linked to household behavior through four channels.[4] First, land owners are more likely to make long-term investments in their land if they are confident that the state cannot expropriate their holdings. Second, stronger land rights can make it easier to obtain loans in credit markets as land is the most common form of collateral. Third, secure land rights may reduce vulnerability in the case of aggregate economic shocks such as those from weather-related phenomena, or individual-specific events such as dissolution of the household after divorce or widowhood. Finally, when land rights are transferrable, households have the opportunity to generate gains from trade in land sales and rental markets.[5]

Each of these channels helps to boost women's income-generating capacities. Higher yields due to agricultural investments, greater access to credit, and gains from trade in land markets can give women the financial capital they require to finance a host of economic activities. Moreover, long-term investments in agricultural inputs that are incentivized by greater security of tenure—for example, investments in land improvements and irrigation systems—may be labor-saving, with a resulting shift of labor hours into other nonagricultural activities (Do & Iyer, 2008). Such shifts could also provide women with earnings that improve their socioeconomic status and that of their households.

Not only can land ownership help to improve women's income-generating capacities, it can also strengthen their bargaining power and their control over resources within the household. Greater control of income by women results in

Table 1. *Sample statistics for dependent and independent variables*

Variable	2004	2008
Dependent variables		
Percent of children sick in past 4 weeks	0.098 (0.253)	0.150 (0.324)
Percent of children sick in past 12 months	0.391 (0.436)	0.535 (0.457)
Percent of children sick in past 12 months and absent from school	0.241 (0.376)	0.287 (0.413)
Percent of children sick in past 12 months and bedridden	0.090 (0.238)	0.100 (0.264)
Percent of children covered by health insurance	0.526 (0.451)	0.840 (0.342)
Percent of children enrolled in school	0.911 (0.233)	0.911 (0.260)
Percent of expenditures on food & beverages	0.497 (0.128)	0.494 (0.126)
Percent of expenditures on alcohol, beer, tobacco, cigarettes and betel-nut	0.025 (0.023)	0.024 (0.021)
Percent of expenditures on education	0.053 (0.051)	0.052 (0.053)
Independent variables		
Property rights		
Dummy for land use certificate held by man only	0.504 (0.500)	0.436 (0.496)
Dummy for land use certificate held by woman only	0.121 (0.326)	0.084 (0.278)
Dummy for land use certificate held jointly by man and woman	0.116 (0.320)	0.131 (0.338)
Household characteristics		
Age of household head in year	46.453 (13.740)	47.651 (12.363)
Dummy for household has a male head	0.786 (0.410)	0.800 (0.400)
Grade completed by household head	6.571 (3.722)	6.988 (3.540)
Dummy for household head has a diploma in vocational training	0.082 (0.274)	0.103 (0.304)
Dummy for household head is married	0.843 (0.364)	0.870 (0.337)
Total number of children in household between 6 and 15 years of age	1.540 (1.030)	1.409 (0.916)
Dummy for household owns livestock	0.656 (0.475)	0.585 (0.493)
Dummy for Kinh/Chinese majority household	0.820 (0.384)	0.837 (0.369)
Dummy for urban household	0.174 (0.379)	0.203 (0.402)
Total hours of housework completed by women in household	3.849 (2.058)	3.835 (2.116)
Total number of people in household with no education	1.095 (1.286)	0.865 (1.138)
Share of dependent members (0–14 years, >65 years) in household	0.430 (0.162)	0.383 (0.189)
Total number of girl children between 5 and 17 years in household	0.925 (0.906)	0.873 (0.855)
Total number of members in household	5.348 (1.588)	5.242 (1.637)
Total number of household members who engage in housework	3.003 (1.323)	3.062 (1.278)
Total number of household members who work for wages/salary	1.103 (1.136)	1.129 (1.080)
Log of real income from wage employment for men in the household	1.796 (2.935)	2.085 (3.123)
Log of real income from wage employment for women in the household	1.228 (2.560)	1.459 (2.786)
Total number of household members who are self-employed in nonagriculture	0.687 (0.921)	0.673 (0.925)
Total number of women who are self-employed in agriculture	1.066 (0.863)	0.970 (0.820)
Dummy for household belongs to the poorest wealth quintile	0.274 (0.446)	0.254 (0.435)
Total area of land owned by household in square meters	6.339 (15.844)	7.912 (25.798)
Dummy for household has LUC for annual agricultural type of land	0.609 (0.488)	0.599 (0.490)
Dummy for household has LUC for perennial land	0.139 (0.346)	0.157 (0.364)
Dummy for household has LUC for residential land	0.691 (0.462)	0.251 (0.434)
Commune characteristics		
Dummy for commune belongs to hilly region	0.060 (0.237)	0.050 (0.217)
Dummy for commune belongs to poor communes category	0.183 (0.387)	0.163 (0.369)
Dummy for commune has a car-accessible road	0.763 (0.425)	0.761 (0.426)
Dummy for commune has access to a market	0.475 (0.499)	0.462 (0.499)
Dummy for commune has primary school	0.767 (0.423)	0.761 (0.426)
Dummy for commune has junior sec. school	0.685 (0.465)	0.710 (0.454)
Dummy for commune has a senior sec. school	0.109 (0.312)	0.117 (0.321)
Number of households in commune benefitting from reduction/exemption of hospital fees	58.4 (134.0)	394.7 (890.1)
Number of patients in commune needing doctor but did not use health center in last 12 months	0.494 (0.500)	0.534 (0.499)
Dummy for main religion practiced in commune is Buddhism	0.355 (0.479)	0.304 (0.460)
Dummy for main religion practiced in commune is Catholicism	0.087 (0.282)	0.069 (0.254)
Dummy for main religion practiced in commune is Protestantism	0.020 (0.139)	0.019 (0.136)
Dummy for main religion practiced in commune is Hao Hao (Buddhist sect)	0.019 (0.137)	0.013 (0.113)
Dummy for main religion practiced in commune is Islam	0.002 (0.043)	0.000 (0.000)
Dummy for main religion practiced in commune is other religion	0.007 (0.083)	0.001 (0.023)
Province characteristics		
Average population in province (millions)	1.686 (1.131)	2.020 (1.718)
Gross output of agriculture in province (constant 1994 prices in thousand billion dongs)	2.575 (1.609)	3.196 (1.970)
Area of province in thousand kilometers squared	5.485 (4.118)	5.718 (4.090)
Number of farms in province in thousands	1.944 (2.258)	2.248 (2.241)

changes in norms and attitudes that influence economic decisions and social behaviors within and outside of the home. Income generation and access to credit can have feedback effects on measures of autonomy such as an increased role in household decision making and improved bargaining power vis-à-vis male members in the household (Agarwal, 1994; Pitt, Khandker, & Cartwright, 2006). Central to the social context in which people operate is their autonomy, and control over assets can have empowering effects for women in intra-household power dynamics. Control over land rights may allow access to additional resources and employment opportunities, which in turn may strengthen women's negotiating power in household decision-making by improving their fall-back position. Land-use rights would then be connected to child health outcomes through, for example, increased household expenditures on items leading to positive outcomes for children at the expense of expenditures on adult substances such as alcohol and cigarettes.

A number of influential studies, including McElroy (1990) and Thomas (1997), have shown that additional income controlled by mothers leads to greater household expenditures on inputs into child well-being including food, education, and health services. More recently, Quisumbing and Maluccio (2003) examined household survey data for four countries and found that in Bangladesh and South Africa, the assets that women brought with them into a marriage, including land, had a positive effect on the household budget share spent on education. The authors also observed women's control over intra-household resource allocation in Ethiopia and in Sumatra, Indonesia, where mothers with more land invest preferentially in their sons, most likely so they can rely on their sons later for old-age support. Closely related, in Ghana, Doss (2006) found that women's land ownership is a positive predictor of budget shares spent on food and education while it has a negative effect of budget shares spent on alcohol and tobacco.

More broadly, a number of empirical studies have examined the effects of women's land rights on various measures of their bargaining power within the household. In turn, a shift in intra-household dynamics that favor women can translate into improved well-being for women along such dimensions as improved health outcomes, lower fertility, freedom from domestic violence, and increased educational attainment. In Asia, Mason (1998) found that land ownership has a positive impact on women's authority in deciding household-expenditures in India and Thailand. These empirical results for India are confirmed in qualitative evidence from comprehensive interviews conducted in Datta (2006). In particular, jointly-owned land increases various measures of autonomy for poor urban women in Chandigarh, India, including their participation in household decision-making, their access to information about financial matters and broader economic concerns, their self-esteem, and the amount of respect they received from their husbands. In Karnataka, India, Swaminathan, Lahoti, and Suchitra (2012) found that home ownership and land ownership have positive effects on women's mobility outside the home, and on their ability to make decisions about their own work, health, and expenditures. Moreover, Panda and Agarwal (2005) examined the likelihood of domestic violence using data collected from surveys in Kerala, India. The authors found that women's land and home ownership are both associated with a lower likelihood of being subject to physical and psychological abuse by their husbands. Similarly, Bhattacharyya, Bedi, and Chhachhi (2011) found that a wife's house ownership is associated with a decline in marital violence in Kaushambi, India.

Thus by implication, women without land rights are relatively worse off, a conclusion reached in Garikipati (2008) based on extensive field work in Andhra Pradesh, India. Garikipati (2008) argued that landlessness and inequitable poverty alleviation programs that favored men left poor rural women with no other means of financial support beyond agricultural wage work, which contributed to their lack of power in household decision-making processes. In China, Hare, Li, and Englander (2007) found that landlessness among women in low-income households in Shaanxi and Hunan provinces is associated with reduced decision-making power and a lower status for women.

Land and property rights have also furthered women's well-being and autonomy in Latin America and Sub-Saharan Africa. For example, Peru's national land titling program led to a substantial increase in the incidence of women's names on property documents and in women's decision-making power within the home (Field, 2003). There were reductions of approximately 20% in annual birth rates among program beneficiaries. Most of the observed decline in fertility is accounted for by women's increased agency in household decision-making processes. In Ecuador, Deere and Twyman (2012) found when women own a larger share of household wealth, there is a greater likelihood that the couple will make an egalitarian decision regarding decisions to work and to spend income. The same result applies when a husband and wife own real estate jointly, although the effect is smaller in magnitude. In Sub-Saharan Africa, Peterman (2012) noted that in a sample of households with widows in 15 countries, the total value of inheritance, especially land inheritance, is significantly correlated to higher levels of assets and long-term household consumption. Similarly, Kumar and Quisumbing (2012a) found that the area of inherited land is an important determinant of women's overall well-being in rural Ethiopia.

Despite the large literature on women's land rights and autonomy, and despite a large body of work on how women's bargaining power affects measures of child well-being, very few studies have bridged these areas of scholarship.[6] An exception is Allendorf (2007), which estimated an inverse relationship between women's land rights and children's malnutrition in Nepal. This relationship is attributed primarily to the additional income and resources that women's ownership of land brings, rather than the empowering effect of land ownership. In a less direct estimation of women's land rights and child well-being, Kumar and Quisumbing (2012b) found that recent legislative changes in Ethiopia's family code that favored women in terms of control over assets (land, livestock, home) in instances of divorce have strong impacts on child schooling. Children, particularly girls, are more likely to fall behind their cohort in highest grade attained when women perceive divorce laws as devolving assets to their husbands. Related, Deininger, Goyal, and Nagarajan (2013) found that India's Hindu Succession Act, a legal reform at the national level that gave girls the right to inherit land, led to an increase in daughters' likelihood of inheriting land and to an increase in girls' educational attainment in states that had enacted similar legislation at least a decade earlier. Yet daughters in the reform states still inherited only a small fraction of the land parcels, indicating the need for further study of the channels through which land law reforms change household behaviors.

4. ESTIMATION METHODOLOGY

A potential challenge in analyzing the effect of LUCs on measures of child well-being is that factors that cannot be easily

measured such as household-level preferences may influence patterns of LUC registration and child health simultaneously, a problem referred to as selection. Progressive or egalitarian households may be more likely to seek land-use rights in women's names and also more likely to have favorable human-capital outcomes for children. To estimate the causal impact of LUCs registered in women's names singly or jointly on child health and schooling, we need to control for household-level characteristics related to tastes or preferences that are not measured in the data (and are thus unobservable), and which may determine patterns of LUC registration and measures of child well-being concurrently.

The standard technique to correct for potential endogeneity of the LUC variables is instrumental variables. However, identifying an instrument that satisfies the exclusion restriction, remains free from correlation with omitted variables, and has adequate strength is not straightforward. For example, province-level characteristics that affected the speed of implementation of the reforms may at first seem a valid instrument, as in Do and Iyer (2008). However, such characteristics would not satisfy the exclusion restriction in our case. Although they might be related to LUC coverage, such characteristics are also likely to be correlated with other province level measures that may determine child health and education outcomes. For example, funding for health and education programs may be determined at the province level and simultaneously be related to the speed of implementation of laws (well-funded and administered provinces may implement laws more efficiently and have more resources for social sector programs). Since we do not possess information on health, education, and other social development entitlements at the province-level, these indicators would be omitted variables that may invalidate the exclusion restriction.

Given the difficulties associated with identifying an instrument that is relevant yet randomly assigned, we estimate causal effects by controlling for household-level unobserved differences in a fixed-effects framework. The 2004–08 time window is arguably small enough that household-level unobservable characteristics may be treated as time-invariant.[7] The model includes region and time dummies and their interactions to additionally control for factors that may vary at these levels over time. That is, they control for omitted variables that are region and time specific and may be changing contemporaneously over the years of the study. Further, in addition to household characteristics and region and time controls and their interactions, several commune- and province-level characteristics are also included to address possible nonrandom variation in land registration at these levels. An example of nonrandom variation at the regional-level would be if registration proceeded relatively quickly in areas with people who were more educated, for instance.[8]

The estimation model takes the following form:

$$Y_{ijt} = \alpha_0 + \alpha_1 H_i + \alpha_2 R_j + \alpha_3 T_t + \alpha_4 (R_j x T_t) + \beta X_{ijt} + \partial \mathrm{LUC}_{ijt} + \varepsilon_{ijt} \quad (1)$$

where i denotes a household, j denotes a region, and t denotes time. The notation H_i is the time-invariant household-level unmeasured variable, R_j is the time-invariant regional unmeasured variable and T_t is a time dummy. Household, commune, and province characteristics in X_{ijt} are identified in the framework of Eqn. (1) since they change from 2004 to 2008. The coefficient of interest ∂ represents the impact of different categories of land-use certificates on Y_{ijt}, which encompasses six different measures of child health and schooling and three different measures of household expenditures. The LUC variables are whether a land-use certificate is held solely by a man, solely by a woman, or jointly by husband and wife. The regressions also include a host of household characteristics (indicators of household head's age, gender, schooling, marital status, and ethnicity; separate measures for real income from wage employment for men and women in the household; land area; and type of land owned—for annual crops that are replanted every year, for perennial crops that do not require annual replanting, and land owned for residential purposes), commune-level characteristics (geographical terrain, poverty rates, major religion, access to roads, market, and electrical power), and province-level characteristics (population, number of farms, gross agricultural output, and area). Standard errors are clustered at the regional level following Bertrand, Duflo, and Mullainathan (2004).

In order to understand the mechanisms underlying the association between land rights in women's names and child health and education outcomes, it is important to carefully consider the relationship between household structure and the patterns of land rights that apply. The two alternative mechanisms of interest are an increase in bargaining power for women arising from solely or jointly-held rights in male-headed households, or an increase in women's income that accrues from holding land rights. Such demarcations situate the context within which land-use rights may have an effect on child outcomes. For example, we cannot attribute the positive impacts of land titles on child health to an increase in bargaining power for women if they are heads of households without any adult males present by virtue of separation, widowhood, or divorce. Hence the analysis takes household structure and the inherent male-only, female-only, and jointly-held land-holding patterns into account in order to ascribe plausible causal mechanisms to the results.

5. CONSTRUCTION OF THE SAMPLE

The study uses household survey data from the 2004 and 2008 waves of the VHLSS. The VHLSS, begun in 2002 and conducted every 2 years by Vietnam's General Statistics Office, have data on a range of individual and household characteristics including ethnicity, region of residence, household structure, hourly wages, education, and income earned from different agricultural activities. The surveys are cross-sections with a panel component in that a subset of the households are tracked and re-surveyed in the following wave. We focus on the 2004 and 2008 waves since they contain specialized modules on land use with detailed information on registration of LUCs and the identity of the first and second stakeholders.[9]

We began by constructing a panel data set of households and their members from 2004 and 2008. The panel allows us to identify departure of old (2004) members, arrival of new (2008) members, and whether there was a switch in holdings of LUCs from male-only to female household members (either held alone or jointly with the husband). Since the VHLSS occur every 2 years, we used a concordance list of household identifiers from 2004 and 2006 to match households across these years (household identity codes may change across years and this list allows households to be identified and tracked from 2004 to 2006). Similar to the technique employed in McCaig (2009), we tallied gender and year of birth of household members during 2006–08 to create a similar concordance list for households across 2006 and 2008. Matched households during 2004–08 were identified by combining information from the 2004–06 and 2006–08 concordance lists. The final panel dataset at the household level has 1,728 matched households during 2004–08. Assignment of households into the panel followed a stratified random cluster sampling procedure

by the VHLSS. Thus, our constructed 2004–08 household panel constitutes a representative sample at national and regional levels.

After creating the panel, we proceeded to match individuals within households across these years. Although we do not control for individual-level effects since the focus is on children who may have been absent in the earlier year of the data (not yet born), tallying individuals within matched households provided an additional check and reaffirmed the integrity of the panel. For individuals common across both years, the main discrepancy was that the identification codes for the same person in a particular household changed from 1 year to the next. For example, a woman may have an identification code of one if she was head of the household in 2004, but in 2008 the same woman may be identified with an identification code of three if she was now living with her adult son and his wife and was no longer considered to be the head of the household. In cases such as these, we assigned a modified identification code value in 2008 that matched their identification code value in 2004. In total, 22% of individuals fell into this category.

As expected, there were new people present in 2008 but absent in 2004 (about 10%), and some individuals from 2004 could no longer be tracked in 2008 (about 15%). Reasons for new members in 2008 who were absent in 2004 include the birth of a child, a new spouse, or an older child returning home after being away in 2004. In cases such as these, we assigned revised identification codes in 2008 that tallied with their relative position in 2004 had they been present in the household. Alternatively, there were cases where members in 2004 were no longer members of that same household in 2008. Examples include the death of a spouse or an older child leaving home. In cases such as these, the individuals were assigned a revised 2008 identification code that had missing values. The different categories of "corrected" individual-level identification codes for 2008 were then used to match individuals across 2004 and 2008. In total, after accounting for attrition and new additions to households across 2004 and 2008, we were able to match about 75% of the individuals perfectly. The final panel dataset at the household level has 1,728 matched households containing 7,623 individuals in 2004 and 7,203 individuals in 2008. Health-related outcomes are estimated over households in the panel with children between zero and 15 years of age (9,205 observations), and education-related outcomes are estimated over households with school-age children between 6 and 15 years of age (7,256 observations).

Several other sources of information were used to compile the data. First, income from wage employment for men and women across 2004 and 2008 were deflated using a standard method to adjust VHLSS nominal incomes based on the regional deflator provided in the original VHLSS databases and the annual consumer price index for Vietnam (General Statistics Office of Vietnam (GSO), 2012). Second, data from several different years of the *Statistical Handbook of Vietnam* and the *Statistical Yearbook of Vietnam* were used to include information on province-level characteristics including population, number of farms, gross agricultural output, and land area (GSO, 2005, 2008a,b, 2009).

The VHLSS questions on land-use rights in 2004 and 2008 are at the plot level. Thus, some households had responses for multiple plots of land for a particular type of land and/or for more than one type of land. For purposes of this study, the corresponding LUC variables are aggregated to the household-level. The fact that some households had multiple plots of land implies that the variables describing whether a LUC is inscribed in the name of the husband only, the wife only, and/or both the husband and the wife are not mutually exclusive. However, since the vast majority of households have just one plot in each year, this aspect affects just a small proportion of observations.

Weighted summary statistics for the dependent and independent variables are found in Table 1 (estimates are weighted using the VHLSS sampling weights). The dependent variables include six measures of children's human capital (five measures of health and one of schooling) and three measures of household expenditures. The five measures of child health include percent of children in the household sick in the past 4 weeks, sick in the past year, sick in the past year and absent from school, sick in the past year and bedridden, and the percent of children in the household covered by health insurance. Incidence of recent and past sickness and intensity of that sickness are relatively straightforward measures of child health. We focus on health insurance coverage for children as a possible mechanism underlying better child health in households where women hold LUCs. In Vietnam, health insurance is available at user fees for mandatory state and nonstate policies under three programs—SHI, HCFP, and free care for children under six (Ekman, Liem, Duc, & Axelson, 2008). SHI is an employment-based scheme whereas HCP provides care for

Table 2. *Sample statistics for land-use certificates (in weighted proportions)*

	Any type of land		Annual Ag land only		Perennial Ag land only		Residential land only	
	2004	2008	2004	2008	2004	2008	2004	2008
Panel A: Proportion of all sample households who hold land-use certificates								
All households	0.753	0.597	0.552	0.494	0.115	0.122	0.683	0.243
Male-headed households	0.780	0.646	0.595	0.540	0.129	0.139	0.708	0.270
Female-headed households	0.672	0.466	0.426	0.372	0.073	0.076	0.613	0.170
HH head age $\leqslant$34	0.657	0.545	0.554	0.491	0.089	0.109	0.609	0.217
HH head age >34	0.767	0.601	0.552	0.495	0.118	0.123	0.694	0.245
Kinh/Chinese ethnicity	0.751	0.580	0.532	0.470	0.108	0.117	0.681	0.227
Ethnic minorities	0.767	0.738	0.711	0.698	0.169	0.166	0.702	0.372
Panel B: Proportion of land-use certificates held by males, females, and joint holders								
Male only	0.630	0.620	0.660	0.632	0.695	0.632	0.626	0.636
Female only	0.213	0.198	0.194	0.196	0.170	0.157	0.212	0.175
Joint holders	0.157	0.183	0.146	0.172	0.135	0.211	0.162	0.189

Notes: Means weighted using sampling weights included in the 2004 and 2008 VHLSS. Sample size is 1,728 matched households

Table 3. *Household structures and land ownership (in weighted proportions)*

	Male-headed households (n = 7,362)		Female-headed households (n = 1,843)	
	Adult residents male only	Adult residents male and female	Adult residents female only	Adult residents male and female
No LUC	0.330	0.269	0.544	0.392
LUC held by male only	0.670	0.566	0.000	0.132
LUC held by female only	0.000	0.021	0.456	0.413
LUC held jointly	0.000	0.144	0.000	0.063
Total	1.000	1.000	1.000	1.000

Notes: Means weighted using sampling weights included in the 2004 and 2008 VHLSS. Sample size is 9,205 individuals in the pooled sample of households with children ages 0–15 years. Adults are ages 16 and above.

socially vulnerable groups such as the poor and ethnic minority groups in mountainous regions. Children under 6 years of age receive free care under these compulsory schemes. Since the sample for the health regressions consists of children from zero to 15 years of age, the health insurance estimates indicate possible re-allocation of household income toward purchase of insurance and pre-payments when LUCs are held in women's names. There is independent evidence that these insurance schemes have improved child and adult nutrition, reduced out-of pocket expenses, and provided protection against negative health shocks (Sepehri, Sarma, & Simpson, 2006; Wagstaff, 2005; Wagstaff & Pradhan, 2005).

Sample statistics in Table 1 show that incidence of recent and more long-term sickness for children has increased somewhat from 2004 to 2008, whereas percent of children sick in the last year and bedridden has remained about the same. The greatest change in child health measures has occurred for the proportion of children covered by health insurance - estimates reveal that this indicator increased by over 30% during 2004–08. The percent of children enrolled in school—the final measure of children's human capital—remained about the same across the four-year period. This pattern is consistent with summary measures for the three expenditures variables (the percent of household expenditures on food and beverages; on alcohol, beer, tobacco, cigarettes and betel-nut; and on education), which are comparable in magnitude from 2004 to 2008.

Table 1 further reveals a small decline in the proportion of LUCs held solely (either by men or women) and a rise in the proportion of LUCs held jointly. However, these statistics are computed for the full sample of households and not just households that own land, so the sample statistics do not take land ownership into account. [10] The regressions include a host of household characteristics including age, gender, schooling, and marital status of the household head; household ethnicity, urban status, education status, gender composition and number of children, and dependency ratio; household geographical and employment indicators; measures of household wealth and land area; and indicators for LUC ownership for different types of land (annual, perennial, or residential). Sample means reveal that household heads are older, have more schooling and vocational training, and are more likely to be married across the period. There is a decline in livestock ownership, in the number of people in a household who are illiterate, and in the share of dependent members from 2004 to 2008. The total number of girl children between 5 and 14 years of age has fallen, whereas real income from wage employment for men and women has increased. There is also evidence of declining poverty since the proportion of households belonging to the poorest wealth quintile has decreased from 2004 to 2008. [11]

Table 1 also reports descriptive statistics for commune characteristics (geographical terrain, poverty status, infrastructure, availability of schools and health facilities, and major religion), and for province-level features (average population, gross real agricultural output, land area, and number of farms). Most of these measures have not changed much from 2004 to 2008 except for a marked increase in number of households in the commune benefitting from a reduction or exemption of hospital fees. Also of note are increases in province-level average population, real gross output, and the number of farms.

Sample statistics for land-use certificates by different types of land and by the gender of the holder are reported in Table 2. Panel A shows that for the sample of matched households, 75% of all households in the sample held a LUC in 2004, with a decline to 60% in 2008. Underlying this decline is the drop in the share of households who responded that they have any type of land from 95% of all sample households in 2004 to 71% in 2008. This relatively large decline is in keeping with other studies on Vietnam that have noted dramatic increases in land sales and rental market activity over a relatively short time-span arising from the advent of transferable land-use rights and a rise in off-farm work. For instance, using the 1992–93 and 1998 VHLSS, Deininger and Jin (2008) document that at the national level, the proportion of land sales increased from 0.3% in 1992–93 to almost 2% in 1998 (an almost six-fold increase). Despite the decline in land ownership, LUC coverage increased during the period. Looking at just households that owned any type of land at the time of the survey, 81% of households had a LUC in 2004, with an increase to 86% in 2008.

Delving deeper into these estimates, the share of newly registered LUCs (defined as those that were acquired in the previous year) is comparatively low in these data. For instance, considering households in 2004, only 57 households reported registering LUCs in the previous year (about 3% of the sample). In 2008, only three households reported registering LUCs in the previous year (about 0.2% of the sample). Furthermore, 150 households had LUCs held by males only in 2004 and then switched to either jointly-held LUCs or female-only held LUCs in 2008 (about 9% of the sample). Thus, the proportion switching away from male-only held LUCs to other LUC categories over time is higher than the share of newly-registered LUCs in the estimation sample.

In Table 2, the highest incidence of land ownership through formal land-use rights occurred for residential land in 2004 and annual agricultural land in 2008. Also, in both years, male-headed households with any type of land were more likely to hold a LUC relative to female-headed households with any type of land. Further, ethnic minorities had higher rates of possessing land-use certificates as compared to the Kinh/Chinese majority, with a particularly large differential

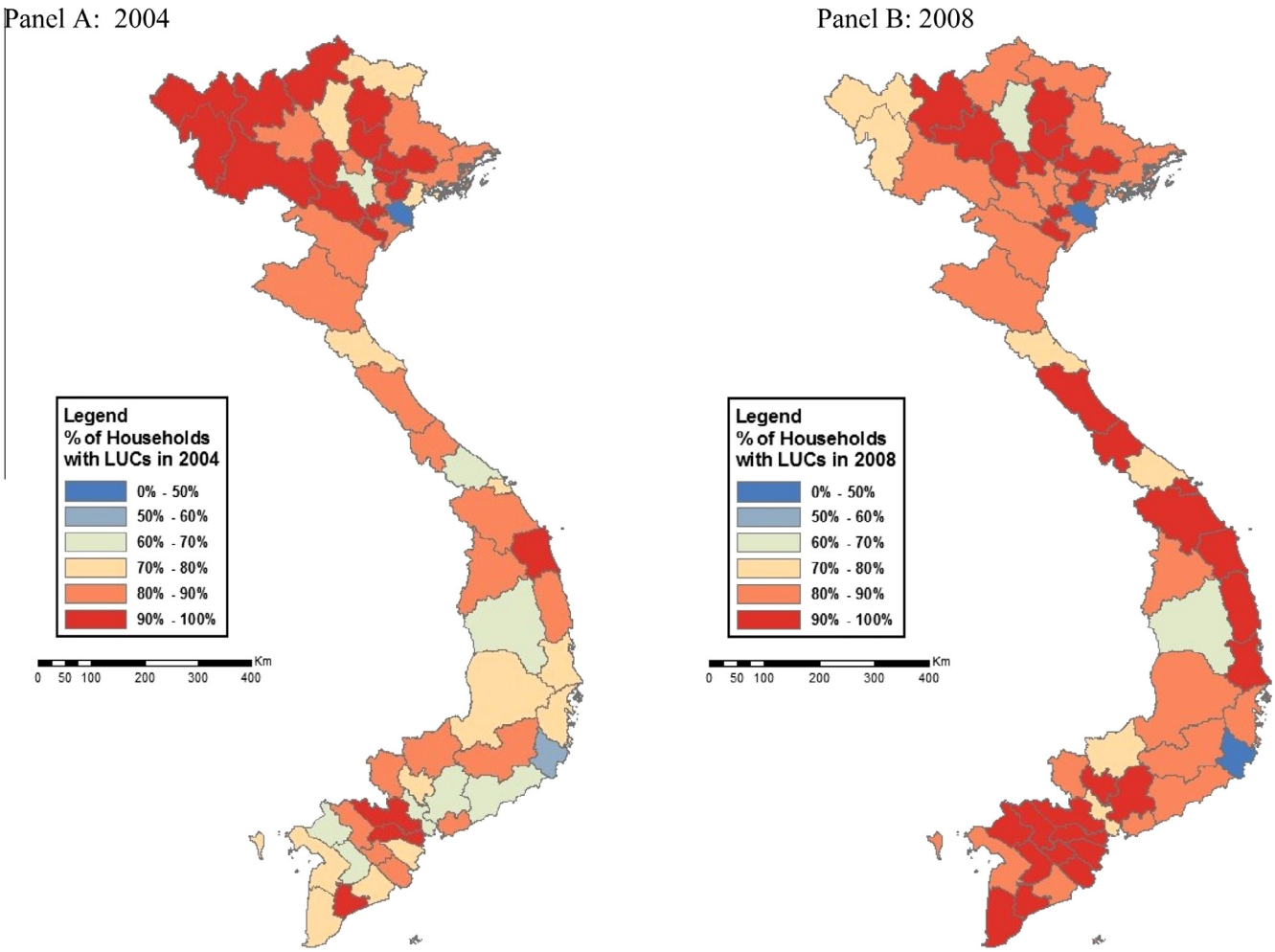

Figure 1. *Incidence of land-use certificates among landholders in Vietnam, by province. Source: Constructed using ArcGIS software applied to the 2004 and 2008 VHLSS*

for agricultural land in 2008. Land titling also appeared to increase with age of household head. Overall, a land-owning household with a mature household head was more likely to hold formal property rights as compared to a household with a younger head. The exception was households with annual agricultural land where the proportion of LUC ownership by head's age was quite similar. Panel B of Table 2 shows that in both years, at least 60% of land-use certificates of any type of land were held solely in the name of a man as compared to about 20% of land-use certificates held solely in the name of a woman. Interestingly, the incidence of jointly-held LUCs increased for each type of land from 2004 to 2008, rising from 16% of LUCs to 18% for any type of land. The increase for this category of LUCs was particularly large for perennial agricultural land.

Also of interest is the relationship between household structure and land-use rights, as shown in Table 3 for the pooled weighted sample of all individuals in households with children ages 0–15 years. [12] The table shows that among male-headed households with only adult male residents, 33% live in households with no LUC at all. In contrast, among male-headed households in which there are both adult male and female residents, about three quarters of individuals live in households that do have a LUC. In most cases those LUCs are held by men alone (57%), but 14% of individuals live in households with jointly-held LUCs. Interestingly, about 2% of LUCs are held by females alone in male-headed households with mixed-gender residents. Arguments that relate to property rights increasing women's bargaining power in the household are more likely to apply to male-headed households where LUCs are held jointly or by females alone, which is about 16% in this sample.

The patterns for individuals in female-headed households are different. When adult residents are only females, more than 45% of individuals live in households that hold LUCs, all of which are female-held since there are no males in the home. This result also applies to the case of individuals living in female-headed households with both adult male and female residents, suggesting that the dominant pattern of LUC registration in these households does not change with the presence of men. A smaller proportion of individuals in mixed-sex female-headed households own land that is jointly-held as compared to male-headed households (6% *vs.* 14%). However, we cannot draw any implications on the relative egalitarianism of preferences in male-headed *vs.* female-headed households since it is possible that the difference in jointly-held LUC proportions reflects statutory marital property laws in male-headed households, while female-headed households are likely to be female-led due to widowhood or divorce. [13]

A graphical depiction of LUC coverage by provinces in 2004 and 2008 is shown in Figure 1. The figure indicates that in 2004, provinces in the northern part of Vietnam near the capital Ha

Table 4. *Effects of land-use certificates on children's human capital outcomes*

	Prop. of children sick in past 4 weeks	Prop. of children sick in past 12 months	Prop. of children sick in past 12 months and absent from school	Prop. Of children sick in past 12 months and bedridden	Prop. Of children covered by health insurance	Prop. of children enrolled in school
Panel A: Impact on child health and schooling						
LUC held by male only	−0.068* (0.039)	−0.035 (0.040)	−0.010 (0.017)	−0.075* (0.040)	0.018 (0.054)	0.009 (0.021)
LUC held by female only	−0.184*** (0.045)	−0.091*** (0.034)	−0.097* (0.058)	−0.050* (0.029)	0.046* (0.026)	0.041** (0.019)
LUC held jointly	0.194 (0.120)	−0.051 (0.081)	−0.055 (0.047)	0.072* (0.042)	0.074 (0.068)	0.082** (0.041)
Test for equality of LUCs held by male and jointly	3.010 [0.143]	0.090 [0.777]	1.810 [0.237]	3.500 [0.120]	1.910 [0.225]	4.170 [0.097]
Number of observations	9,205	9,205	9,205	9,205	9,205	7,256
Panel B: Impact on household expenditures						
	Prop. of expend. on food and bev.		Prop. of expend. on alcohol and tob.		Prop. of expend. on education	
LUC held by male only		0.005 (0.011)		−0.0003 (0.002)		−0.005 (0.005)
LUC held by female only		0.011** (0.004)		−0.005** (0.002)		0.002 (0.005)
LUC held jointly		−0.0002 (0.006)		−0.003*** (0.001)		0.006 (0.007)
Test for equality of LUCs held by male and jointly		0.220 [0.661]		2.330 [0.188]		1.830 [0.234]
Number of observations		9,205		9,205		7,256

Notes: Weighted to national level with weights provided by the VHLSS. Standard errors, clustered by region, in parentheses. *p*-Values in square brackets. All regressions include a constant term; controls for types of land; controls for household, commune and province characteristics; and region dummies, time dummies, and region-time interactions.

*** $p < 0.01$
** $p < 0.05$
* $p < 0.10$.

Noi tended to have the greatest coverage of land-use certificates while provinces in the south had relatively less coverage. This geographical variation is consistent with the argument that administrative inconsistencies caused implementation of LUCs across provinces to remain uneven after the new Land Law was passed. By 2008, coverage had spread geographically to include the central and southern provinces as well. Further, possibly indicative of land transactions activities, regions with high coverage in 2004 appear to have lower proportion of households with LUCs by 2008, especially among the northern provinces.

6. ESTIMATION RESULTS

The effects of different categories of land-use certificates on children's human capital outcomes and expenditures are reported in Table 4. All models in both panels of Table 4 include controls for household, commune and province characteristics, as well as region dummies, time dummies, and their interactions. Importantly, household characteristics include measures of real income from wage employment. That is, the models include controls for real earnings from wage employment for men and another control for real earnings from wage employment for women in the household. We focus on wage employment since wages are arguably more exogenous than income. Hence the impacts on child health and schooling estimated in this research are net of controls for wage earnings. Focusing on measures of child health and schooling in Panel A first, estimates for recent illness in the first column of Table 4 indicate that LUCs held by women only lead to an 18 percentage point drop in the share of household children who were sick in the past 4 weeks. The magnitude of this effect is almost three times that of LUCs held by men only, indicating that female-only LUCs have a particularly potent beneficial effect on the incidence of recent sickness. The channels through which this effect may have occurred include improved health insurance coverage for children or increased expenditures on food, both of which are found in our results. Jointly-held LUCs have no statistically significant impact on this child outcome. To understand whether jointly-held LUCs have similar effects to male-only held LUCs, we tested for the equivalence of the coefficients of these variables. The *p*-value for this test in the first column confirms that statistically, these two categories of land rights have an equal impact on recent child sickness.

The second column of Table 4 considers effects on the proportion of children who have been sick in the past 12 months and again, female-held LUCs have strong effects. Estimates indicate that the share of children who were sick in the past year declines by 9 percentage points when LUCs are held by a female only, while male-only held LUCs show no statistically evident impact. [14] Jointly-held LUCs have the hypothesized negative effect, but the coefficient is measured with error. Consistent with the results in the first column, a test of equivalence of male-only and jointly-held LUCs cannot be rejected in this case as well. The next two indicators of child health consider the intensity of sickness should children fall ill. The share of children sick in the past year and absent from school declines by 10 percentage points when LUCs are held by females only, while the effects of male-only held and jointly-held LUCs are in the hypothesized direction but measured imprecisely. The share of children sick in the past year and bedridden also declines when LUCs are solely female-held; however in this case, male-only held LUCs have a slightly larger comparative ameliorating effect on child health (a 5 percentage point and an 8 percentage point decline, respectively). As in the first two columns, we cannot reject

equivalence of the male-only and jointly-held LUC coefficients for the two measures of sickness intensity.

The remaining two columns of panel A evaluate effects on health insurance coverage and school enrollment for children in the household. Estimates indicate that female-only held LUCs lead to a 5 percentage point increase in health insurance coverage for children, thus highlighting a mechanism to explain the beneficial effects on child health. Male-only or jointly-held LUCs have no statistically significant impact on children's health insurance coverage. In terms of education, estimates in Table 4 show that LUCs held solely in the name of women generate a 4 percentage point increase in the share of household school-age children who are enrolled in school. The impact of jointly-held LUCs on child schooling is even stronger at 8 percentage points. However, a joint test of equivalence between the coefficients on male-only held LUCs and jointly-held LUCs indicates that we cannot reject that these coefficients are equal at the conventional 5% level, indicating that at this level of significance, jointly-held LUCs are statistically equivalent to male-only held LUCs in their impact on school enrollment. [15]

The final three indicators in panel B of Table 4 are for expenditure shares. Coefficient estimates reveal that when LUCs are held solely by women, there is a 1 percentage point increase in the share of household expenditures allocated to food and beverages, while LUCs held jointly or by men alone are not found to have any significant impact. Since nutrition is a determinant of health, an increase in the share of expenditure on food and beverages is another possible mechanism underlying improvements in child health. LUCs controlled by women alone also decrease expenditures shares allocated toward alcohol, beer, tobacco, and betel-nut by up to 1 percentage point. Spending on these adult substances is also found to decrease in the case of jointly-held LUCs, and the impact is about the same as when LUCs are held by women alone. Expenditure shares on education show the expected positive sign for LUCs that are held jointly or by women alone, but the estimates are not measured with precision. A likely reason is measurement error in the education-expenditures variable, which is a composite of spending on different items such as tuition, books and uniforms, all of which are subject to recall error if assessed less recently. Measurement error in the other expenditures items is less likely since they encompass fewer, more specific items on which households spend more frequently. As with panel A, we cannot reject the equivalence of jointly-held and male-only held LUCs for the three household expenditures shares evaluated in panel B. [16]

In summary, female-only held land-use rights decreased the incidence of illnesses among children measured in four ways: the proportion of household children sick in the past 4 weeks, sick in the past 12 months, sick in the past 12 months and absent from school, and sick in the past 12 months and bedridden. [17] In three of these cases, the impact of female-only held LUCs is larger in magnitude than that of male-only or jointly-held LUCs. Furthermore, female-only held LUCs increase health insurance coverage for children and the proportion of children enrolled in school, and raise the share of household expenditure directed toward food and beverages. In keeping with this finding, the share of expenditure spent on adult substances such as alcohol and tobacco declines when LUCs are held individually by women. [18]

7. CONCLUSIONS AND POLICY IMPLICATIONS

The study has provided new evidence on the relationship between land titling and child health and education in Vietnam and to the best of our knowledge, is among the first studies to analyze the effects of gender-segregated land rights on measures of children's human capital in a developing country. Evaluating the economic benefits of women's holdings of land-use rights is particularly important given the emphasis in scholarly and policy discourse on the many benefits of concentrating resources in the hands of women. The analysis has an additional rationale from the heavy weight the government of Vietnam has placed on meeting the needs of vulnerable members of the population like children, and reducing poverty.

Estimates indicate that female-only held land-use rights decreased the incidence of children's illnesses, raised school enrollment, and reallocated household expenditures away from alcohol and tobacco. These effects were almost all larger in magnitude than those of male-only held land-use rights. In general, these results provide support for strengthening and promoting procedures to encourage women's titling to land. Somewhat surprisingly, despite the emphasis of the 2001 policy reforms to increase joint titling, we found that in most cases jointly-held LUCs did not have a statistically significant impact on measures of child health and spending or on household expenditures and where they did, the impacts were essentially equivalent to male-only held LUCs. This finding highlights a limitation of our study in that we have information on whose names are inscribed on the land titles rather than who actually controls the land, and land rights do not imply jurisdiction over land. Further, given the nuanced connotation of headship and household structure in Vietnam, our analysis is cognizant of the association between household headship, land-use rights, and household structure. We have tried, to the best of our ability, to interpret our results within this context, and to "back-out" plausible causal mechanisms based on increases in bargaining power *vs.* income to explain them. Other studies with access to better survey data may be more successful in directly measuring the mechanisms that underlie such patterns.

Our findings are consistent with the conclusion in Razavi (2003) that the relative advantages of joint *vs.* individual titling are not straightforward. Women can potentially enjoy greater flexibility in managing their farm output, bequeathing land, and claiming land in the case of divorce, if they hold land rights individually as compared to jointly. However, individually-held land titles may not help women if their land holdings are very small and resource constraints prevent them from investing in capital equipment. Jointly-held land titles could help alleviate resource constraints, diversify risk and provide greater access to investible funds, but these potential benefits hinge on household dynamics in which women have bargaining power and a voice in the distribution of resources. The successful implementation of joint-titling policies is also complicated by trust and commitment issues between husbands and wives, in that a woman's insistence on having her name placed on a joint title could be seen as a signal that she distrusts her husband (Jackson, 2003). Our finding that individually-held land rights for women yielded more beneficial effects than jointly-held rights suggests that the continuation of patriarchal divisions of power within Vietnamese households may have limited the extent to which joint-titling policy reforms translated into tangible, measurable benefits over and above land titling for (mostly male) household heads. Closely related, the importance of individually-held land rights for women in improving health and schooling outcomes for children suggests that land titling acted more to increase women's income-generating capacity than it did to strengthen their bargaining power in couple-led households with jointly-held land titles.

Since access does not ensure ownership or actual rights to the land, a lesson from the Vietnam land reform is that rights need to be guaranteed in such a way that women can exchange, lease, bequeath, sell, or mortgage their land in an enforceable manner. Policy recommendations for Vietnam and other countries with similar land titling initiatives center on improvements in the administration and management of land law reforms, especially when implementation results in gender disparities in the issuance of land titles. Such improvements include an increase in administrative capacity at the local level to manage land-title applications and approvals, greater dissemination of information to households about the process through which they acquire land titles, an increase in women's legal retirement age to 60 (the same as men), and stronger efforts to ensure gender equity in the distribution of certificates.

However, as this study has demonstrated, simply issuing land-use rights alone may not be sufficient to guarantee improvements for women and their children. Reforms also need to encompass institutional changes such as easier access to credit markets (Duong & Izumida, 2002), fewer gaps in the social safety net, and changes in cultural attitudes that disfavor women. For example, while land-titling programs may promote the security of women's land ownership, women may also face more obstacles in obtaining credit due to historical and sociocultural reasons. Such impediments could weaken the efficaciousness of land reforms and restrict the potential of land titling to yield tangible benefits. Hence land titling reforms may be more effective if they were embedded in an integrated framework that sought to change perspectives and widen the scope of existing country-wide institutional structures.

NOTES

1. For surveys on land rights and policies related to land in the developing world see Feder and Nishio (1999), Deininger and Feder (2001), Deininger (2003), and Pande and Udry (2005). Even though land-titling programs may improve ownership rights *de jure*, for women in particular, increased land rights do not necessarily imply *de facto* control over land (Deere & León, 2001; Lastarria-Cornhiel, Behrman, Meinzen-Dick, & Quisumbing, 2011).

2. These legal changes were codified in the Marriage and Family Law, No. 22/2000/QH10 of June 9, 2000; and the Land Law, No. 13/2003/QH11, Resolution No.51/2001-QH10 on December 25, 2001.

3. The argument that female-headed households have relatively fewer working age adults is based on two empirical observations from Rodgers and Menon (2010). First, only about two-thirds of female-headed households in Vietnam have adult male members over 18 years of age whereas all male-headed households have such members. Second, about 44% of female-headed households have elders (those who are over 60 years of age) present *vs.* 29% in male-headed households. Female-headed households may have more working adults in other contexts, but this does not seem to be the case in Vietnam where on average, households led by women are smaller in size than households led by men (3.5 *vs.* 4.3, respectively).

4. Note that more secure access to land may come about from institutionalized formalization processes or through alternatives that encourage communal participation. Formalization may be controversial and bring questionable benefits (Deininger & Feder, 2009).

5. See Besley and Ghatak (2010), Kumar and Quisumbing (2012c) and Lastarria-Cornhiel *et al.*(2011) for more discussion on these channels.

6. See Lépine and Strobl (2013) for a literature review on women's bargaining power and child health, as well as original evidence in the case of Senegal.

7. We assume that unobservable characteristics which do not change over time may be measured in level form, instead of relying on nonlinear forms such as a quadratic model. The four-year window is small enough that this is an unrestrictive assumption.

8. Regions are administrative groupings of provinces and include the Red river delta, northern midlands and mountain area, north central area and central coastal area, central highlands, southeast area, and the Mekong river delta. We include commune characteristics in lieu of including over 700 commune fixed-effects. Furthermore, we include province characteristics in place of 64 province fixed-effects which are difficult to identify given the relatively small sample size of the matched household data.

9. We cannot track the management of registered land plots since that information is only contained in the 2004 VHLSS. Rudimentary tests with the 2004 VHLSS data indicate that the identities of the LUC owner (first and second stakeholders) and the actual plot manager making decisions about the land do not always coincide.

10. When we take land ownership into account, the proportion of jointly-held LUCs increases from about 16% in 2004 to 19% in 2008 whereas female-only held LUCs declines from 16% in 2004 to 12% in 2008.

11. Wealth quintiles are provided in the VHLSS data. In general, the General Statistics Office of Vietnam (which implements the VHLSS surveys) calculates these quintiles by gathering information on household wealth and asset indicators and then assigning a "wealth score" to each household based on principal components analysis. Households are then assigned to different wealth quintiles based on previously determined thresholds of the wealth score. This information was obtained from http://catalog.ihsn.org/index.php/catalog/1028/variable/V512, accessed on May 5, 2013.

12. Appendix Table 6 shows these estimates disaggregated by year in order to understand changes in the distribution of land use rights by gender and joint over time. In general, patterns evident in Table 3 are reflected in this table. Further, in male-headed households, the proportion of LUCs held jointly has increased from 2004 to 2008 whereas it has remained about the same in female-headed households. Also, in comparison to 2004, the proportion of households with no LUCs is higher in 2008.

13. Household headship is defined in the VHLSS. Household members are asked the identity of the individual who would be considered the head of that household. In Vietnam, some households may be female-headed not by virtue of the absence of male members (Lee, 2008). For example, households may be female-headed and yet the female head is married with the husband present in the home. Such households headed by married women are distinct in that they are over-represented in urban areas, and have relatively high standards of living as measured by completed levels of schooling, engagement in wage work, and representation in the richest quintiles of the expenditure distribution (Lee, 2008). Furthermore, households headed by widows may have adult male members. Hence the relation between household headship and household structure is not straightforward.

14. There may be some attenuation in the sickness coefficients that explains the trend downwards as length of recall increases. There is probably less measurement error in the variable that captures children who were sick in the recent past as compared to those sick in the past year.

15. Separating effects by gender of the child did not lead to different results for boys *vs.* girls.

16. We also estimated the models using data differentiated by gender of the household head to better understand the relationship between female-only held LUCs and female-headed households. These results yielded little that was different from the regressions that did not take gender of household head into account, possibly because the number of individuals in female-headed households is only about 20% of the full sample of individuals.

17. Since the beneficial impacts on child health and education of female-only LUCs are evident despite the declining trend in LUCs that are solely held by females, the results in this study are underestimated. That is, if the proportion of female-only LUCs had increased from 2004 to 2008, the positive effects on child health and education would have been even stronger.

18. We included interactions of region and jointly-held LUC indicators in the models of Table 4 and re-estimated the equations to analyze regional variation in this category of LUCs. These regression results are reported in Appendix Table 5 and clearly show that there is substantial region-level variation in land use certificates held jointly by men and women, even though the 2001 decree did apply retroactively. A possible explanation for the regional variation is administrative inefficiencies.

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APPENDIX A.

Table 5. *Effects of regional and joint titling interaction terms for children's human capital outcomes*

	Prop. of children sick in past 4 weeks	Prop. of children sick in past 12 months	Prop. of children sick, absent from school	Prop. of children sick, bed-ridden	Prop. of children covered by health ins.	Prop. of children enrolled in school	Prop. of expenses on food and beverages	Prop. of expenses on alcohol and tobacco	Prop. of expenses on education
HH has LUC for annual land	−0.009 (0.052)	0.013 (0.027)	0.033 (0.023)	−0.027 (0.026)	0.032 (0.054)	0.046 (0.056)	0.003 (0.007)	0.000 (0.004)	−0.001 (0.003)
HH has LUC for perennial land	−0.060 (0.051)	0.026 (0.038)	0.071*** (0.023)	0.081** (0.032)	−0.031 (0.019)	0.059* (0.031)	−0.002 (0.010)	0.002 (0.004)	−0.016 (0.014)
HH has LUC for residential land	−0.073 (0.099)	0.030 (0.040)	0.051 (0.049)	0.007 (0.025)	−0.009 (0.037)	−0.050*** (0.018)	−0.005 (0.007)	0.000 (0.002)	0.003 (0.010)
LUC held by male only	−0.248*** (0.018)	−0.029 (0.041)	−0.006 (0.016)	−0.210*** (0.020)	0.050 (0.060)	0.016 (0.021)	0.003 (0.011)	0.000 (0.002)	−0.006 (0.005)
LUC held by female only	−0.369*** (0.019)	−0.089*** (0.034)	−0.096 (0.060)	−0.189*** (0.047)	−0.008 (0.055)	0.051** (0.025)	0.010** (0.004)	−0.005** (0.002)	0.003 (0.005)
LUC held jointly	0.387*** (0.096)	0.219*** (0.039)	0.072*** (0.027)	0.214*** (0.037)	0.051 (0.061)	0.011 (0.028)	0.017 (0.012)	0.002 (0.002)	0.006 (0.009)
Interaction of region2 and jointly-held LUC	−0.300*** (0.057)	−0.286*** (0.018)	−0.056** (0.026)	−0.186*** (0.021)	0.008 (0.016)	0.086*** (0.025)	−0.013** (0.005)	−0.004** (0.002)	−0.036*** (0.003)
Interaction of region3 and jointly-held LUC	−0.248*** (0.023)	−0.347*** (0.013)	−0.168*** (0.025)	−0.108*** (0.022)	0.021 (0.013)	0.039 (0.036)	−0.030*** (0.008)	−0.008*** (0.002)	0.008 (0.006)
Interaction of region4 and jointly-held LUC	−0.002 (0.058)	−0.126*** (0.028)	−0.093*** (0.020)	−0.055*** (0.020)	−0.088*** (0.022)	0.110*** (0.040)	−0.048*** (0.007)	−0.009*** (0.001)	−0.025*** (0.003)
Interaction of region5 and jointly-held LUC	−0.161*** (0.027)	−0.327*** (0.024)	−0.231*** (0.036)	−0.351*** (0.026)	−0.021 (0.028)	0.109* (0.057)	0.027*** (0.005)	−0.002 (0.002)	0.012 (0.008)
Interaction of region6 and jointly-held LUC	−0.185*** (0.030)	−0.320*** (0.024)	−0.061* (0.037)	−0.234*** (0.033)	0.314*** (0.031)	0.476*** (0.063)	−0.016* (0.010)	−0.001 (0.003)	0.031*** (0.011)

Notes: Weighted to national level with weights provided by the VHLSS. Standard errors, clustered by region, in parentheses. All regressions include a constant term; controls for household, commune and province characteristics; and region dummies, time dummies, and region-time interactions.

*** $p < 0.01$

** $p < 0.05$

* $p < 0.10$.

Table 6. *Change in distribution of land rights by gender and joint from 2004 to 2008 (in weighted proportions)*

	2004				2008			
	Male-headed HHs (n = 3,766)		Female-headed HHs (n = 984)		Male-headed HHs (n = 3,596)		Female-headed HHs (n = 859)	
	Adult residents male only	Adult residents male and female	Adult residents female only	Adult residents male and female	Adult residents male only	Adult residents male and female	Adult residents female only	Adult residents male and female
No LUC	0.000	0.229	0.519	0.329	0.406	0.312	0.572	0.465
LUC held by male only	1.000	0.607	0.000	0.142	0.594	0.522	0.000	0.121
LUC held by female only	0.000	0.026	0.481	0.466	0.000	0.016	0.428	0.351
LUC held jointly	0.000	0.138	0.000	0.063	0.000	0.150	0.000	0.063
Total	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Notes: Means weighted using sampling weights included in the 2004 and 2008 VHLSS. Sample size is 4,750 individuals in 2004 and 4,455 individuals in 2008, in households with children ages 0–15 years. Adults are ages 16 and above.

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