Tabla 3. The effect of the 2013 Land Law in own-farm labour days per capita (*continuation*)

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Annual*Law2013	-5.745***	-2.671	-2.847*	-2.210	-10.62***	-11.04**
	(1.644)	(1.658)	(1.642)	(2.523)	(3.373)	(4.392)
Children						
Annual	0.584***	0.513*	0.557**	0.828	-0.639	-3.437**
	(0.215)	(0.275)	(0.279)	(0.537)	(1.095)	(1.361)
Law2013	-0.172	0.374	0.588**	0.880*	0.234	-0.939
	(0.278)	(0.249)	(0.260)	(0.489)	(0.611)	(0.786)
Annual*Law2013	-0.522**	-0.394	-0.481*	-0.454	-0.347	0.769
	(0.233)	(0.268)	(0.274)	(0.479)	(0.738)	(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

Note: Standard errors in parentheses clustered at the household level; * p < 0.10; ** p < 0.05; *** p < 0.01. 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 LURC, the proportion of land acquired in 1993 or before, the proportion of irrigated land, and the proportion of land devoted to annual crops.

Source: VARHS (2008-2016).

In columns 1 to 4, the coefficients for the indicators of annual farming (Annual) and the post-2013 Land Law period (Law2013) are statistically significant and positive, indicating that days spent working the land are higher for annual farmers and increase after the Land Law's implementation. However, these coefficients lose significance when we restrict the sample to farmers who did not switch crops. The interaction term between these variables (Annual*Law2013) is our primary focus, as it reflects the differential effect of tenure security for annual crops post-2013. This coefficient is consistently negative and statistically significant across all six specifications, with larger effects in columns 5 and 6, where the sample is limited to non-switching and non-restricted farmers. This indicates that the tenure security improvement from the 2013 Land Law led to a reduction in labour supply

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 may have gone other non-income generating activities.

Table 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	-1.610	-0.707	-1.051	-17.79	-5.920
	(3.289)	(3.169)	(3.043)	(4.262)	(13.17)	(18.06)
Law2013	20.50***	20.68***	12.05**	1.089	19.39	32.63*
	(6.898)	(5.790)	(5.742)	(8.572)	(13.48)	(18.36)
Annual*Law2013	-0.642	-1.994	-1.388	2.490	-19.73**	-18.81
	(4.370)	(3.680)	(3.659)	(4.893)	(8.233)	(11.93)
Off-farm self-employment						
Annual	-9.004***	-0.808	0.231	0.491	16.90**	6.506
	(2.532)	(2.132)	(2.191)	(2.717)	(8.169)	(7.220)
Law2013	-27.46***	-0.0103	-2.127	-1.356	4.603	-3.280
	(4.253)	(3.202)	(3.308)	(4.374)	(5.830)	(12.26)
Annual*Law2013	3.539	-0.0271	0.136	-0.325	-3.075	-0.579
	(2.754)	(2.200)	(2.211)	(2.819)	(5.555)	(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

Note: Standard errors in parentheses clustered at the household level. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$; 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 LURC, the proportion of land acquired in 1993 or before, the proportion of irrigated land, and the proportion of land devoted to annual crops.

Source: VARHS (2008-2016).

The effect of tenure security on household's use of capital in agricultural production

The evidence suggests that the 2013 Land Law reduced labour devoted to own-farm cropping, aligning with past findings that weak land rights compel households to invest in guard labour (Besley, 1995; Goldstein and Udry, 2008). With improved tenure security through the law's extension of usufruct rights, we observe a drop in per capita days spent on own-farm activities. However, we do not find an increase in off-farm labour time. Two explanations may account for this: First, as Bellemare *et al.* (2020) noted, enhanced tenure security led to more investment in irrigation and soil conservation, potentially restructuring agricultural inputs toward greater capital intensity and reducing labour demand.

In table 5 we show the results of the estimations using the same specification as in equation (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.[19] Expenditure on capital services is the amount in VND spent per square meter in services such as rentals of machinery or cattle for ploughing.[20] 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.

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

[20] 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.

Table 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	-11.75	-9.849	-10.66	1.063	-4.285
	(7.836)	(8.189)	(8.349)	(9.804)	(6.889)	(15.32)
Law2013	-5.631	-114.1	-106.6	-182.9	-13.22	-9.950
	(9.689)	(95.20)	(94.57)	(168.7)	(8.969)	(9.069)
Annual*Law2013	1.839	3.570	2.909	0.211	20.03**	19.46**
	(9.130)	(9.173)	(10.93)	(14.44)	(7.860)	(8.680)
Expenditure on capital services per worker (value)						
Annual	0.0016***	0.0024***	0.0025***	0.0016**	0.0264***	0.0271***
	(0.0005)	(0.0007)	(0.0007)	(0.0007)	(0.0066)	(0.0099)
Law2013	0.0050***	0.0011	0.0018	-0.0007	0.0029	0.0090
	(0.0014)	(0.0046)	(0.0047)	(0.0074)	(0.0066)	(0.0076)
Annual*Law2013	0.0029***	0.0018**	0.0031***	0.00154*	0.0088***	0.0035
	(0.0007)	(0.0008)	(0.0008)	(0.0008)	(0.0025)	(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
Household FE	No	Yes	Yes	Yes	Yes	Yes
Household controls	No	No	Yes	Yes	Yes	Yes

Note: Standard errors in parentheses clustered at the household level. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$; 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 LURC, the proportion of land acquired in 1993 or before, the proportion of irrigated land, and the proportion of land devoted to annual crops.

Source: VARHS (2008-2016).

Second, property rights lower transaction costs in land markets (Banerjee *et al.*, 2002; Deininger and Jin, 2005; Holden *et al.*, 2011) which allows farmers to readjust their operational scales. If households reduce their agricultural landholdings, they will require fewer labour resources.[21] We explore the effect of tenure security on landholdings in table 6.[22] 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.

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 labour resources.[23]

Table 6. The effect of the 2013 Land Law on landholdings per capita (log)

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Annual	0.530***	0.227***	0.277***	0.125**	0.220*	0.282
	(0.0852)	(0.0487)	(0.0473)	(0.0502)	(0.118)	(0.195)
Law2013	1.495***	-0.167**	-0.131**	-0.235***	-0.119	-0.00409
	(0.121)	(0.0679)	(0.0649)	(0.0752)	(0.128)	(0.207)
Annual*Law2013	-0.445***	-0.254***	-0.246***	-0.149**	-0.0218	-0.115
	(0.0809)	(0.0519)	(0.0502)	(0.0583)	(0.100)	(0.131)

Continue

[21] 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.

[22] The variable is based on survey responses about the size of all their agricultural plots (regardless of whether they grow any crops on them recently). Our measure is the log transformation of the sum of all the plots owned by the household.

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

Table 6. The effect of the 2013 Land Law on landholdings per capita (log) (*continuation*)

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
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

Note: Standard errors in parentheses clustered at the household level. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$; 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 LURC, the proportion of land acquired in 1993 or before, the proportion of irrigated land, and the proportion of land devoted to annual crops.

Source: VARHS (2008-2016).

6. Conclusions

Weak enforcement of property rights distorts household labour allocation, forcing farmers to devote excessive resources to maintaining land ownership. This paper shows that Vietnamese farmers facing uncertainty about their usufruct rights experienced such constraints. The Land Law of 2013 increased tenure security for annual crop growers, eliminating the need for labour dedicated to guarding land.

Using detailed panel data from Vietnam, we find that increased tenure security reduced days spent on own-farm cropping activities, particularly for female adults, without increasing off-farm labour time, consistent with reduced guard labour. Two additional channels are explored: First, improved tenure security likely shifted input shares and increased capital intensity among annual crop growers, leading to reduced labour supply. Second, enhanced land rights enabled households to adjust their operational scale and reduced total landholdings, which also contributed to the decline in agricultural labour supply. Overall, this paper highlights the significance of clear, enforceable property rights for efficient labour allocation, demonstrating that farmers with enhanced tenure security reduced both their farming days and landholdings.

Our findings on Vietnam's land tenure security can offer important lessons for Mexico and other Latin American countries, where insecure land rights continue to hamper agricultural productivity. In both regions, tenure insecurity limits investment in land and capital, leading to inefficient labour

allocation. Similar to Vietnam, land reforms that formalize or extend property rights could encourage Mexican and Latin American farmers to invest in more capital-intensive practices, reduce reliance on manual labour, and improve overall productivity. For example, Mexico's ejido system has often led to underinvestment due to unclear property rights. Reforms that enhance tenure security, similar to those in Vietnam, could encourage greater agricultural investment and labour reallocation (De Janvry *et al.*, 2015; Galiani and Schargrodsky, 2010).

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