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# The impact of international migration and remittances on agricultural production patterns: the case of rural Ecuador

El impacto de la migración internacional y las remesas en los patrones productivos: el caso del Ecuador rural

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**Resumen:** Este artículo analiza los efectos de la migración internacional en el gasto en fertilizantes y la compra de ganado en el Ecuador rural. Los resultados muestran que los hogares migrantes exhiben una mayor propensión a adquirir ganado que sus pares sin migrantes. Sin embargo, la cantidad de remesas recibidas por el hogar no tienen ninguna influencia en la adquisición de ganado. Estos resultados son consistentes con los de otros estudios que han analizado el impacto de la migración en la actividad de finca e indican que los hogares migrantes han abandonado los cultivos en favor de la ganadería como una estrategia para contrarrestar las pérdidas de mano de obra resultantes de la migración.

**Palabras clave:** migración, remesas, fertilizantes, ganado, Ecuador.

**Abstract:** This paper analyzes the effects of international migration and remittances on fertilizer expenditure and cattle acquisition in rural Ecuador. The results show that migrants' households exhibit a higher propensity to acquire livestock than their counterparts without migrants. However, the monthly amount of remittances received by a household does not have any influence on the likelihood of cattle acquisition. These results are consistent with those of several other studies analyzing the impact of migration on farm activity choice and indicate that migrants' households tend to switch from crop production to the less labor demanding cattle production in order to cope with household labor losses resulting from migration.

**Keywords:** migration, remittances, fertilizers, cattle, Ecuador.

## 1. Introduction

International migration from rural areas is a trend that has deserved considerable attention from researchers since the late 1990s. Given the importance of farming activities in rural regions, several studies have focused on analyzing the impacts of migration and/or remittances on rural income (Miluka *et al.*, 2007; Pfeiffer & Taylor, 2007), farm activity choice (Pfeiffer & Taylor, 2007; Wouterse & Taylor, 2008) asset accumulation (Adams, 1998; Lucas, 1987; Taylor, 1992), farm technical efficiency (Mochebelele & Winter-Nelson, 2000; Wouterse, 2008)

adoption of technology ( Quinn, 2009), agricultural input expenditure ( Gray, 2009; Miluka *et al.*, 2007 ) and labor force demand ( Gray, 2009; Salas Alfaro & Pérez Morales, 2007).

Several researchers have paid special attention to the effects of migration and remittances on agricultural expenditure and farm activity choice. To illustrate, Gray (2009) is able to determine that, *ceteris paribus*, remittance recipient households in southern Ecuador spent more on agricultural inputs than their counterparts without migrants. Instead, migration does not affect input expenditure. Gray points out those remittances are used to enhance yields and reduce labor demands on household members who stayed. Miluka *et al.* (2007) find that Albanian migrants' households spend less on agricultural inputs and equipment rental than their counterparts without migrants. The authors imply that instead of spending remittances on labor saving technologies, migrants' households prefer investing in the less labor demanding livestock production. Similar conclusions are drawn by Wouterse & Taylor (2008) who find out that intercontinental migration from Burkina Faso is associated with smaller net income from staple cropping and larger income from livestock production. According to the authors these findings reflect an imperfect labor market that averts migrants' households from using remittances for hiring wage labor and rather encourages them to invest remittances in livestock. McCarthy *et al.* (2006) report a shifting pattern from crop to livestock production in Albanian migrants' households. Rather than endorsing it to labor scarcity, the authors suggest that migrants' households switch to livestock production due to the fact that it is more profitable than crop production. Pfeiffer & Taylor (2007) report that migration has no effect on livestock production in Mexico. The authors explain this finding by addressing that livestock production requires little labor which can be provided by marginal labor force, e.g. children. These findings are consistent with several qualitative studies ( Caguana, 2008b; Jokisch & Lair, 2002; Kyle, 2000; Martínez, 2004; Pribilsky, 2007) carried out in Ecuador which hold that labor losses resulting from international migration have driven migrants' households to switch from subsistence cropping to cattle production.

In general, literature reports a tendency for migrants' households to leave cropping in favor of livestock production. This paper analyzes the effects of migration and remittances on a) households' fertilizer expenditure and b) the likelihood for a household to have acquired cattle. In this way it intends to clarify how international migration affects production patterns and livelihood strategies of rural Ecuadorian households. Besides this introduction this paper is structured as follows: part 2 introduces the data set and the variables used for the analyses, part 3 explains the methodology, part 4 present the results and part 5 concludes.

## 2. Data and variables

The main source of data for this research work is the Living Standards Measurement Survey (LSMS) 2005-2006 carried out by the National Institute of Statistics (INEC). This cross-sectional data set has national representation and includes information about: household composition, education and health, household assets, expenditure, entrepreneurship, agricultural activities, migration and remittances.

Information is available for a total of 13,581 rural and urban Ecuadorian households. The survey considers 5508 rural households for which an agricultural section is available. Such a section gathers information about landholding, plant, forestry and animal production, agricultural inputs, equipment, agricultural investment and credit, which makes this database useful for estimating the effects of remittances on agricultural production.

Road infrastructure is an important determinant of transaction costs of goods and services at rural level (Lanjouw, 1998). To proxy road infrastructure, this study relies on data provided by the National Agricultural Census 2000, also carried out by INEC. It is expected that the median of the distance to reach the closest road as well as the median of the time needed to reach the closest market both at provincial level are good proxies for road infrastructure. Table 1 displays the variables to be used in the analysis and their description together with the descriptive statistics.

## 3. Methods

In order to estimate the impact of migration and remittances on the log of expenditure on fertilizers, one should first consider that this variable has a value of zero for a considerable number of observations (55.78% of the total sample) but is still continuous with strictly positive values. Modeling this kind of corner solution outcomes with OLS methods result inappropriate and rather the use of tobit models is recommended (Wooldridge, 2002a). Labeling the number of household members working in a business as EI and supposing that there is an unobservable variable  $EI^*$  which is normally distributed and homoscedastic with 0 conditional mean:

$$EI^* = \beta_0 + \beta_1 Mi + \beta_2 Ri + \beta_3 xi + \epsilon_i$$

where  $Mi$  is a dichotomous variable taking the value of 1 if the household has migrants abroad,  $Ri$  is the monthly amount of remittances,  $xi$  is a vector of explanatory variables that will be described later on and  $\epsilon_i$  stands for the error term;

$$EI = 0 \text{ if } EI^* \leq 0 \text{ and } EI = EI^* \text{ if } EI^* > 0$$

For estimating the impact of migration and remittances on cattle acquisition, this study relied on a probit model of the following form:

$$\Pr(CAi = 1 | Mi, Ri, xi) = \Phi(\beta_0 + \beta_1 Mi + \beta_2 Ri + \beta_3 xi)$$

Where  $CAi$  is a binary variable that takes the value of 1 if the household has bought cattle during the year preceding the survey,  $Mi$  is the dummy

for migration,  $R_i$  stands for the monthly amount of remittances,  $x_i$  is the vector of control variables and stands for the cumulative density function.

#### 4. Results and discussion

Fertilizer expenditure seems to be raised by international migration but is not affected by remittances (Table 1). Looking at these results, it is possible to conclude that households with migrants abroad buy fertilizers to cope with labor losses caused by migration. These results are not consistent with those reported by Gray (2008a) & Gray (2009) who found that input expenditures are positively influenced by remittances but not affected by out-migration. Similarly, Gray reports that input expenditure is positively affected by the number of young men in a household and the cropping area, and negatively influenced by the number of adult women and the mean household education, predictors that appear as not significant in this study.

The number of land parcels owned by a household seems to positively affect fertilizer expenditure reflecting that households with spatially distributed land invest more in fertilizers. Access to electricity is also positively correlated with spending on fertilizers suggesting that households with access to electricity are more aware of agriculture technologies to improve yields, or that poorer households cannot afford fertilization of their crops.

Households living closer to roads spend more on fertilizers because transaction and transportation costs for fertilizers grow with the distance to drivable roads and also because wealthier households, for which fertilizers are affordable, live next to drivable ways. This finding contradicts those of Gray (2009) who found that distance to road has no effect on fertilizer expenditure in southern Ecuador, but is consistent with Perz (2003) who reports that households living closer to towns in the Brazilian Amazon are more likely to fertilize their crops than those located further away.

The results of the probit model for cattle acquisition are shown in Table 1. Migrants' households appear to be 4% points more likely to have bought cattle during the year preceding the survey than their counterparts without migrants. Female headed households appear to be less likely to buy cattle than their male headed equivalents. The number of plots owned by a household is positively associated with cattle acquisition. Home ownership is another factor that marginally increases the likelihood of buying cattle. Households that have access to credit have a 7% higher probability of buying cattle than credit constrained households. In short, besides credit, migration is the factor most increasing the odds for a household to buy cattle.

The results of this study are consistent with the strand of literature stating that migration impels livestock production in Ecuador (Caguana, 2008a; Jokisch & Lair, 2002; Kyle, 2000; Martínez, 2006b; Pribilsky, 2007) and around the world (McCarthy *et al.*, 2006; Miluka *et al.*, 2007; Salas Alfaro & Pérez Morales, 2007; Wouterse & Taylor, 2008). The main

argument to explain this trend is that migrants' households switch from crop to cattle production in an effort to cope with labor losses caused by out-migration. The argument of labor shortage is reinforced if one takes into account that the likelihood of cattle acquisition is negatively affected by the number of adult males in a household. However, the results also show that female headed households are less likely to acquire cattle than their male headed counterparts. This finding suggests that female headed households without male support are less likely to have sufficient money to buy cattle.

**Table 1**  
**Determinants of fertilizer expenditures and cattle acquisition.**

	Fertilizer expenditure (tobit)	Cattle acquisition (probit)
Migrant Household	0.890***	0.038**
Remittances	0.0003	0.0000
Age	0.014	0.0014
Age squared	-0.0002	-0.0000
Sex	-0.522**	-0.029***
Indigenous	-0.075	-0.004
Education	0.031	0.0000
Education squared	-0.0005	-0.0000
Children	-0.052	-0.0005
Young men	-0.036	0.0001
Young women	-0.044	-0.002
Adult men	0.207	-0.015*
Adult women	-0.056	0.004
HH education	0.026	0.0006
Owned land	-0.0002	0.0003**
Owned land squared	0.0000	-0.0000
Number of parcels	0.694***	0.012***
Owned home	0.089	0.019*
Electricity	0.865***	0.016
Piped water	-0.052	-0.011
Credit	1.846***	0.070***
Distance to the closest road	-1.773***	-0.001
Time to the closest market	-0.011	-0.0004
Number of observations	4,720	4,720
Log-likelihood	-7,035.721	-
Wald test	-	227.14***

Note: \*, \*\* and \*\*\* stand for statistical significance at 10, 5 and 1% respectively.

Remittances appear not to influence cattle acquisition. In this regard, it may be argued that nonmigrants' households that receive remittances have not experienced labor losses and hence are still able to crop, or that the amounts they received are not sufficient to buy cattle. Another predictor significantly increasing the odds of acquiring cattle is credit.

Financially constrained households are less likely to raise funds for buying cattle. Finally, cattle acquisition is also positively affected by available land and the number of parcels. However, the magnitude of the coefficients is small.

## 5. Conclusion

This study has analyzed the influence of international migration and remittances on fertilizer expenditures and cattle acquisition in rural Ecuador. It has demonstrated that international migration is associated with higher households' expenditure on fertilizers and with a higher likelihood for migrants' households to buy cattle. These results are consistent with other qualitative and quantitative studies, carried out in Ecuador and around the world, which concluded that this trend is imputable to households' strategies to cope with labor losses caused by international migration. On the contrary, remittances influence neither households' fertilizer expenditure nor the probability for a household to accumulate cattle. Overall, the results of this study show that the major constraint that migrants' households face after a migrant has left is the loss of labor. This problem spreads to the community level increasing general labor shortages. In this sense, policy interventions should be oriented to provide not only migrant households but the whole rural population with training, extension and credit for the use of labor-saving technologies.

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