Assessing the Impact of Massive Out-Migration on Agriculture

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Abstract

Over the past several years, rural areas in transition countries have experienced a structural transformation of their agricultural sectors combined with profound demographic changes, primarily due to massive out-migration towards urban areas and abroad. Despite the potential relevance of migration – and the resulting remittances – in fostering, or hindering, transformation in agriculture, very little is understood about the linkages between these activities. Using data from two waves of the Albania Panel Survey carried out between 2002 and 2003, this paper is an attempt to contribute to a better understanding of the role migration has played in the re-allocation of resources in agriculture among migrant families in Albania, a country which epitomizes the power of change associated with out-migration. As per the hypothesis, our findings suggest that migration exerts a strong downward pressure on agricultural labor per capita. However, the evidence also suggests that the loss in household labor in agriculture is compensated by increased access to capital, leading to overall improvements in both agricultural and total incomes.

Key Words: Migration, agriculture, household production.

JEL: D13, Q12.

1. Introduction[1]

The impact of migration, and the remittances generated by migration, on the migrants' households and communities of origin has recently received increasing attention in view of the potential role that it can play both in improving the livelihood of family members left behind as well as in fostering local development in sending countries. Rural households often employ diversified income generation strategies and migration of one or more household members can form part of an overall household-level strategy to manage market imperfections and failures, as is often the case with credit and insurance markets.

The value of remittances in relaxing credit constraints and providing insurance has been widely recognized in a growing body of literature connected with the "new economics of migration" theory. From this perspective, the decision to migrate may be considered a joint household decision with migration being one mechanism for diversifying risk and gaining access to capital (Stark and Bloom 1985; Stark and Levhari 1982). The migration decision is thereby viewed as an active attempt by households to overcome market imperfections to enhance the ability of the household to produce and purchase inputs – including labor – and to invest in productive assets.

The influence of migration on production is complicated by the fact that migration of household members alters the labor endowment of the household. In the presence of functioning labor (and credit) markets, the migrant sending household will substitute family for hired labor, with little or no effect. However, with imperfect labor markets, there may be negative consequences on household production. Furthermore, beyond this potential direct effect of migration on household labor supply, the income-effect of remittances may also affect labor decisions among the remaining members of the households, as household may re-allocate human resources away from productive activities and towards leisure. Overall, the expectation is that for households who face credit and insurance market imperfections, migration, and the resulting remittances, will relax those constraints and lead to greater spending on variable inputs and greater investment in productive activities. Furthermore, depending on the functioning of the labor markets and the characteristics of the production process (e.g. high moral hazard), investments will be directed towards activities with different capital-labor-land ratios and returns.

A number of empirical studies have been carried out which focus on the impact of migration on productive investment at the origin, and the potential trade-offs between the income effect of remittances and the productivity loss due to changes in labor supply. No clear pattern has emerged yet in terms of the circumstances under which migration leads to increased productive investment. As early as 1980, Lipton (1980) posited that remittances may have a negative effect on farm productivity, as a result of a number of factors including the loss of the youngest and most productive household members and a possible substitution of labor for leisure by the less efficient household members left behind. Some recent empirical evidence seems to support that hypothesis (Azam and Gubert, 2002). A number of other studies also

[1] The authors wish to thank Carlo Azzarri for his assistance in preparing and analyzing background data, and the Albania Institute of Statistics (INSTAT) for granting access to the data. We are also grateful for the useful comments of Martin Ravallion, and to Riccardo Faini and other participants at the conference "Beyond Agriculture: The Promise of the Rural Economy for Growth and Poverty Reduction", January 16-18, 2006, organized by the Food and Agriculture Organization, Rome.

find no impact on investment in productive activities[2]. Conversely, other empirical studies have found evidence that migration does indeed foster household investments in the regions of origin[3]. Similarly, studies have illustrated the generally net positive impact of migration on household farm production and/or income, as the remittance effect more than offsets the negative effect of migration on labor supply[4].

Following the fall of communism in 1990, the rural areas of Albania have experienced massive out migration of unprecedented proportions both towards urban areas and abroad. Almost fifteen years into privatization, agriculture in Albania remains primarily a subsistence-oriented sector, characterized by obsolete technology and low modern input usage. Investment in agriculture and rural infrastructures remains low, particularly in the marginal rural northern areas, also as a result of biased development policies historically favoring other sectors and regions.

While migration and the remittances generated have undoubtedly had an impact on the living conditions of migrants' households in Albania, its impact on productive investments and on the development of the rural communities of origin remains less straightforward and under-researched (IOM, 2005). In fact, despite this potential, anecdotal evidence suggest that only a small share of remittances is going towards productive investments in agriculture (King and Vullnetari, 2003, Germenji and Swinnen, 2003). Carletto, et al., (2004), based on the same data used in this study, find that only 12 percent of households receiving remittances reported using this funds for investment or purchase of durable goods; the average amounts going towards investments, though, were higher than for other uses. A number of factors are thought to contribute to these low levels of investment, including poor rural infrastructure, low public investments, safety concerns and low confidence levels, as migrants and their families reportedly use remittances mostly to cover basic needs and improve their living conditions[5].

Also in the Albanian context, remittance flows to the families and communities of origin are believed to partly compensate the potentially negative effect that migration has on labor household and local labor supply. With respect to family labor supply in agriculture, anecdotal evidence in Albania points to substantial reallocation of labor within households, with women and teenagers left to tend the family plots (King and Vullnetari, 2003), as young men are most likely to migrate. The effect at the community level will depend, among other things, on the characteristics of the local labor market and the demographic make-up of the migration flow. In light of the likely trade-offs resulting from migration, it remains unclear whether massive migration out of rural areas has promoted or hindered agricultural production and sectoral efficiency gains in Albania. Thus, although migration is seen by most Albanians as the only

[2] See, for example, Mines and de Janvry (1982), Durand et al. (1996) and Taylor et al. (1996) for Mexico, and de Brauw and Rozelle (2003) for rural China.

[3] Examples of a positive effect of migration on investments are provided in Lucas (1987) for Southern Africa, Dustmann and Kirchkamp (2001) for Turkey, Woodruff and Zenteno (2001) in Mexico, Black et al. (2003) in Ghana and Konseiga (2004) in Burkina Faso.

[4] Examples of this positive relationship are in Stark (1991), Taylor et al. (1996), Taylor and Wyatt (1996), de Brauw et al. (2003) and Mendola (2004). Conversely, Rozelle et al. (1999) show that remittances accumulated abroad partially compensate for lost labor and allow households to improve their agricultural productivity. However, the net impact is negative as the effect of migration on labor supply more than offset the remittance effect.

[5] However, an interesting finding in the same IOM study points out to a clear divergence of responses between the migrant and household member receiving the remittance: according to the former, only a marginal share of remittances are invested in agriculture, while based on the latter's response, one half of the investments goes into agriculture activities. The total share of remittances going to investment remains small, though (IOM, 2005).

avenue out of poverty, particularly in those impoverished rural areas in the Northern mountain region, it remains debatable whether it can provide a sustainable solution to agricultural and rural development for those remaining, as much depends on how remittances are ultimately used by the ones left behind This paper seeks to provide some insights on this important policy issue by assessing the impact of out-migration from rural areas on the rapidly transforming agricultural sector in Albania.

Using data from two waves of the Albania Panel Survey carried out by the Albanian Institute of Statistics (INSTAT) between 2002 and 2003, in Section 2 we begin by briefly describing the agricultural transformation and migration explosion underway in Albania, and exploring the nexus between the two. Section 3 describes the model development and the hypotheses to be tested. Following a brief description of the data used in Section 4, in Section 5 we present the model specification and results of the econometric analysis. We conclude in Section 6.

2. Agriculture and Migration in Albania

Agriculture in Albania: a Sector in Turmoil

Despite considerable progress since the fall of the communist regime in the early 1990s, Albania continues being one of the poorest countries in Europe, second only to Moldova. One in four people live below the poverty line, and poverty levels in the mostly rural remote areas of the northeast of the country are about double the national average (World Bank, 2003). In the face of massive internal movements registered in the 1989-2001 intercensal period, Albania remains a predominantly rural country—with 58 percent of the population in 2001 still living in rural areas (INSTAT, 2002).

As the communist regime collapsed in the early 90's so, at first, did the economy, which contracted by 10 percent in 1990, 28 percent in 1991 and an additional 7 percent in 1992. Since that point, with the exception of another major contraction in 1997 following the political and economic crisis triggered by the collapse of a series of pyramid 'saving' schemes, economic growth has been steady, with annual rates in most years above 6 percent. Along with growth, the changes in the sectoral composition of GDP between 1990 and 2002 have been dramatic. The engines of the socialist economy, industry and agriculture, dropped in importance from 77 percent of GDP to 32 percent and were overtaken by services and construction, which grew to 60 percent.

Economic growth was both stimulated and accompanied by profound changes in the economic structure and social fabric of the country. Albania was one of the countries in Eastern Europe that followed a 'shock therapy' as opposed to a gradual approach to transition. Price controls were lifted, internal and international markets were quickly liberalized and privatization, at least for small scale enterprises, was carried out swiftly. The public sector has, in terms of jobs, shrunk to less then one fourth of its size in 199. The magnitude and speed of the growth in the importance of the private sector is best exemplified by its share in employment which jumped from nil in 1989 to 64 percent in 1993 to 80 percent in 1995. In agriculture this meant that about 600,000 cooperative farm members and state farm workers became independent smallholders almost overnight.

Albania's approach to de-collectivization was unique both in magnitude and swiftness when compared to other countries in Central and Eastern Europe[6]. As much as 87 percent of collective farmland was already in private hands by October 1992. By 1994, 94 percent of all agricultural land was being farmed by individual farmers (Cungu and Swinnen, 1999). As a result, Albania's farm structure went from being organized into a few hundred farms with an average size of over 1,000 hectares to an atomized structure with almost half a million farm units averaging 1.1 ha in size (Kodderitzsch, 1999).[7]

Such dramatic changes at the beginning of transition accompanied an equally dramatic decline in agricultural output. Gross agricultural output declined by about 20 percent in the 1990-1991 biennium, and cereal production dropped by more than half (in volume terms) between 1990 and 1992 (OECD, 1996). Over the next few years agriculture would bounce back, recovering previous levels of output despite heavy out-migration. Over the long term, however, Albania's agricultural sector has entered into long decline compared to other sectors of the economy. While real agricultural GDP continues to grow consistently at around two to three percent a year, this is far slower then the economy as a whole. Total area under cultivation has declined 7 percent since 1992. Similarly, the numbers of the three most important types of livestock—cattle, sheep and goats—have decreased substantially since 1996.

Despite this rapid deterioration, agricultural and livestock production continues to play a key role in household economic strategies. While only 29 percent of total household income comes from on-farm activities, 62 percent of all households, urban and rural, had some on farm income. Approximately 50 percent of income among rural households derives from agriculture, and over 90 percent of all rural households, reaching virtually 100 percent in the Mountain region, had some on-farm activity.

Agricultural income and activities are more important for poor households than for wealthier ones. On average, 38 percent of income among households in the bottom consumption quintile derives from on-farm activities, while agriculture accounts for only 19 percent of income in the top quintile. Similarly, it is indicative that 72 percent of households in the poorest quintile carried out on-farm activities. More than half of the top 20 percent of wealthiest households also had agricultural activities.

However, very few households depend only on agricultural income. Approximately 1 in 2 households in the bottom quintile also had some off-farm income. Particularly prominent among the poor were public transfers; 63 percent received some kind of public transfer (primarily pensions and the cash assistance program known as ndihma ekonomika), comprising 22 percent of total income, while only 38 percent had off-farm wage income, and 25 percent remittances. Transfers are prominent in the income strategies of most households, regardless of income levels: one household in four in the bottom income quintile report receiving remittances, compared with one in three in the top quintile.

Despite small average land sizes, Albanian farmers show great diversity in terms of types of crops grown, with large variations across regions. Wheat production is concentrated among farmers in the Central and Coast regions (39 and 34 percent of farmers, respectively), while maize is relatively more important in the Mountain region (67 percent). Potato production is

[6] For a full account see Cungu and Swinnen (1997a; 1997b; 1999).

[7] Average farm size has been estimated at .9 ha in 1999 (EU PHARE, 2001), and according to ALSMS data it was at .7 ha in 2002.

concentrated in the Central region (35 percent), while bean production is most important in the Mountain and Central regions (56 and 46 percent, respectively). Overall, two thirds of farmers grow fruits, while 69 percent grow vegetables. The number of crops grown in the Central and Mountain regions suggests that farms in these areas are heavily diversified, while farmers in the Coast are somewhat more specialized. This is confirmed in the greater average number of crops grown by farmers in these regions, with an average of 8 crops grown by households in the Central and Mountain regions, vs. 5 crops in the Coastal areas.[8]

The vast majority of agricultural production, however, continues to be for home production. This is particularly true for staple crops, where overall only between 4 and 8 percent of farm households market production. The share of households marketing production of fruits and vegetables is higher, though still low, at about one fourth.

Livestock production, of both large and small animals, is also widespread, with almost two thirds of farm households owning cattle, and an equivalent share owning poultry. The share for cattle reaches 83 percent in the Mountain region. While only 22 percent of households owns sheep nationwide, in the Mountain region the share is double that. For those owning cattle, the average herd size is only 2, and for those owning sheep it is 16. Though only 1 household in 3 market animal products, this is still higher than row crops, fruits and vegetables, making them the most "marketed" products.

Within this framework of small land sizes and the subsistence nature of production, many farming households do not have access to modern inputs; though two thirds use chemical fertilizers, only 38 percent used pesticides or herbicides. Overall, only 4 percent of households hired wage labor for agricultural or livestock production. Very few own agricultural production equipment. Finally, land markets are very thin. The vast majority of households produce on their own land; only five percent rented-in land in 2002.

The migration explosion[9]

Migration is the defining political, social and economic phenomenon in post-communist Albania. Since 1990 at least one fifth of the total population has left the country and is living abroad, and Albania has experienced large scale movements of population from rural to urban areas. Between 1989 and 2001, the total population fell by 4 percent and the rural population by 15 percent. Migration, whether rural to urban or international to Italy or Greece, is the most common livelihood coping strategy in the country, and serves as an important escape valve for unemployment and other economic difficulties brought on by the transition to a market economy.

During the communist government (1944-1990), migration had come to a virtual halt, with migration officially prohibited and emigrants and family members left behind ostracized or severely punished. With the fall of the government, the end of the controls on internal and external migration and the unraveling of the centrally planned economy unleashed a demographic shift at an unprecedented pace, as individuals and entire households started migrating to the cities or leaving the country. Besides the two big "push" migration spikes in 1991 and 1997, persisting poverty and high unemployment and underemployment levels, particularly in rural areas, serve as constant push factors for migration, as Albania transitions

[8] See World Bank (2002) for more detailed information on Albania's agricultural sector.

[9] This section is based largely on Carletto et al. (2006).

to a market economy. Pull factors have also been important in fomenting migration. The allure of wealth and the Italian lifestyle conveyed by the exposure to Italian television programming, as well as the significant wage and wealth differentials between Albania and its European Union neighbors were obvious attractions.

These large migration flows have contributed to the growing importance of remittances as a major source of income for many Albanian households and for the national economy. Officially, private transfers are estimated to have reached US$ 1 billion annually in 2004, constituting 14 percent of GDP. Remittances thus serve as the most important source of foreign exchange, over 1.7 times larger then the value of exports.

From our own calculations, between 1990 and 2005, 57 percent of Albanian families currently residing in the country have engaged in some kind of international migration. Of these households, 41 percent experienced temporary migration only, 44 percent experienced only permanent migration and 15 percent experienced both. Overall, 13 percent of the adults currently living in Albania have migrated internationally for at least one month since 199. Over a third (34 percent) of Albanian families currently have at least one former household member living abroad. Further, as of 2002, one family out of two has at least one sibling of the household head living abroad, three out of four have at least one nephew of the head abroad, one out of two have at least one cousin and one out of five at least one grandchild. Only one family out of ten does not have any of these relatives of the household head living abroad (Carletto et al, 2005).

3. The model

A brief overview of migration theories

In order to provide context for our analysis of the role of international migration in household agricultural production decisions, below we briefly make reference to the two strands of the migration literature underlying the development of the empirical model.

Neo-classical models view migration as the result of a cost-benefit analysis carried out at the individual level (Sjaastad, 1962; Todaro, 1969; Harris and Todaro, 1970). Potential migrants compare differential income and cost of migrating and move if the decision produces a positive net present value. Differential income depends on income earning potential, the unemployment rate, and the manner in which human capital is valued in domestic and foreign labor markets. Other factors are the probability of success and the cost of migration, i.e. whether the individual is able to reach her destination and at what cost, and whether she manages to stay there as long as she wishes. The main implications of the neo-classical approach are that migration is driven by income differentials between different countries and by the cost (and probability of success) of moving, considered separately by each individual, given their particular characteristics. These analyses do not, however, consider potential impacts on the "sending" families.

Conversely, in the new economics of labor migration literature (Stark and Bloom, 1985; Stark, 1991) the migration decision becomes a joint household decision, in which both remaining household members and the migrant share the costs and returns to migration, and in which migration is part of a larger household economic strategy. Under this framework, migration is used as a mechanism to diversify economic activities in the face of risk and

obtain liquidity and capital in the presence of credit and insurance market failures (Stark, 1999; Taylor et al. 2003). Contrary to neo-classical theory, which implicitly views migration and household economic activities as substitutes at the level of the individual, the new economics of migration allows for the possibility that migration by one member can act as complement to household economic activities in the origin community, for instance by relaxing liquidity and credit constraints and/or act as insurance where such markets are missing or absent. Of course, where labor constraints are severe, migration may still lead to a reduction in household economic activities. While labor markets are indeed thin in Albania, credit and insurance markets are either also underdeveloped or entirely absent; and, given the nature of the recent land reform, farmland per household member is still relatively low.

Model development

Following the theoretical models from the new economics of migration literature discussed above, we posit the following expected utility model:

$$\max EU(y_i) = EU\left(\sum_k p_k f\left(l_{ik}^A, h_k, x_k; Z_i^{hh}, Z^C\right) - w_x x - w_l l_i^A + r l_i^M \right)$$

$$\text{s.t.} \quad \sum_k p_k f\left(l_{ik}^A, h_k, x_k; Z_i^{hh}, Z^C\right) - w_l l_{ik}^A - w_x x + r l_i^M \geq 0$$

$$\bar{L}_i - l_i^A - l_i^M \geq 0$$

$$\bar{H}_i - \sum_k h_k \geq 0$$

where p_k is a vector of prices for the k different agricultural products; f is the agricultural production function; l_{ik}^A, is the amount of labor allocated by household *i* to agricultural activity, *k*; h_k and x_k is the amount of land and variable inputs allocated to the *k*-th agricultural activity, respectively; Z_i^{hh} and Z^C are exogenous household and community/geographical characteristics affecting agricultural production; w_x and w_l are price of purchased inputs and labor, respectively; l_i^M is labor allocated to migration; *r* is migrant's wages; $\bar{L}_i$ is the total household labor endowment; and $\bar{H}_i$ is the total household land endowment. The first constraint is a cash constraint, while the second and third are the household time and land constraints. Dropping the production function arguments to simplify notation and substituting in the labor constraint, we can write the Lagrangian function as the following:

$$\max_{x, l_i^A, h_k} L = EU\left(\sum_k p_k f - w_x x - w_l l_i^A + r\left(\bar{L}_i - l_i^A\right) + \lambda^1 \left[\sum_k p_k f - w_x x + r\left(\bar{L}_i - l_i^A\right) \right] + \lambda^2 \left[\bar{H}_i - \sum h_k \right] \right)$$

which yields the following first-order conditions

$$\frac{\partial EU}{\partial l_i^A} = E\left\{ \frac{\partial U}{\partial Y}\left(1 + \lambda^1\right)\left[\sum_k p_k f_{l_i^A}^{'} - \left(w_l + r\right) \right] \right\} \geq 0$$

$$\frac{\partial EU}{\partial x_i} = E\left\{\frac{\partial U}{\partial Y}\left(1+\lambda^1\right)\left[\sum_k p_k f_{x_i}^{'} - w_x\right]\right\} \geq 0$$

$$\frac{\partial EU}{\partial h_k} = E\left\{\frac{\partial U}{\partial Y}\left(1+\lambda^2\right)\left[\sum_k p_k f_{h_k}^{'}\right]\right\} \geq 0$$

and, assuming second-order conditions are satisfied and by the implicit function theorem, the reduced-form demands:

$$l_i^{A*} = g\left(\overline{p}_k, w_l, r, \overline{L}_i, \overline{H}_i, Z_i^{hh}, Z^C\right)$$
$$x_i^* = g\left(\overline{p}_k, w_l, r, \overline{L}_i, \overline{H}_i, Z_i^{hh}, Z^C\right)$$
$$h_{ik}^* = g\left(\overline{p}_k, w_l, r, \overline{L}_i, \overline{H}_i, Z_i^{hh}, Z^C\right)$$

We can also write the reduced-form optimal agricultural and total household income as:

$$Y_i^{Ag*} = g\left(\overline{p}_k, w_l, r, \overline{L}_i, \overline{H}_i, Z_i^{hh}, Z^C\right)$$
$$Y_i^{Tot*} = g\left(\overline{p}_k, w_l, r, \overline{L}_i, \overline{H}_i, Z_i^{hh}, Z^C\right)$$

The impact of shifts in exogenous parameters on optimal input allocations for risk-averse producers is in general ambiguous, and depends on risk preferences, the covariance of income amongst activities, and the "strength" of the binding constraints. Perhaps the easiest exogenous parameter to sign is an increase in exogenous wealth. Using a similar model that assumes non-increasing absolute risk aversion, Kevane (1996) shows that an increase in exogenous wealth increases both labor and capital allocated to the agricultural activity by relieving the cash constraint and by reducing the "cost" of risk by reducing the coefficient of absolute risk aversion. Serra et al. (2005), using a mean-variance approximation of expected utility over wealth, determine that an increase in exogenous income will increase the use of risk-increasing inputs and thus involvement in riskier types of production.

The impact of increased returns to migration on non-labor input demands is likely to be similar to those from exogenous increases in wealth; greater returns will increase inputs allocated to riskier activities, though overall impacts will depend on cross-factor marginal returns as well. For instance, where the cross-marginal product of labor and land allocated to a specific activity is very high, land allocated to that activity may decrease, even where such an activity is relatively risky as well. Overall, we hypothesize that greater migrant earnings will favor the expansion of agricultural activities that are relatively riskier and more capital (or, "purchased input") intensive.

Impacts of returns to migration on household labor is quite difficult to tease out with the model presented above. To the extent that the labor constraint is binding even in the absence of migration, household labor remaining at home should be fully employed in any case, except, perhaps, where migration occurs and where agricultural labor is a relatively strong risk-reducing input. Where the labor constraint is not binding, impacts should be similar to an increase in exogenous wealth, with an expansion in inputs that increase risk. In the Albanian context of small but fragmented subsistence agriculture, labor may well be a risk-reducing input. Also, not modeled are the opportunity costs of home labor in terms of leisure; to the

extent that leisure is a normal good, we might expect greater mean household income to increase leisure and reduce household labor. However, even here the overall impact is ambiguous and depends on the impact of increased leisure on income. Additionally, labor allocated to non-farm sources of income (e.g. petty trade, small shops) may increase with migrant remittances to the extent that such activities require cash outlays and/or are relatively riskier. For this reason, we estimate total household income as well as agricultural income.

Finally, impacts of other exogenous parameters will depend on at least three effects, as outlined in Moschini & Hennessy (2000). The first and second are the wealth and insurance effects. To the extent that any change increases overall wealth and reduces the coefficient of absolute risk aversion and also acts to reduce income variability, agricultural inputs will increase; following the logic in Serra et al., the expansion will favor riskier activities. The third effect is the "coupling" effect, basically capturing whether the cross-derivative of the marginal product of the input with the exogenous parameter is positive; where this is positive, input demand will increase.

Turning now to the empirical case at hand, our dependent variables are agricultural and total household income, as well as input demands (in terms of land shares allocated to various uses or livestock production) and an index of cropland diversity. We include this latter as an additional test of the impact of migration on household risk management; to the extent that migration increases mean incomes and reduces the "cost" of risk (assuming non-increasing absolute risk aversion), all else equal, we expect crop diversification to be lower the greater is migration. For input demands, we estimate agricultural labor, livestock holdings, and farmland allocation. We have information on six land-use types: forest/natural pasture, forage, fruits, vegetables, cereals, potatoes and beans. Using information on average capital:land and labor:land ratios, plus additional information provided in the Albanian Agricultural Report (2003), we make the following assumptions regarding alternative land-uses and livestock holdings[10]:

1. Forest and natural pastures have minimal capital and labor requirements, and are low risk. If shifts in labor out of agriculture are not too great *and* increases in livestock are moderate, we expect migration to reduce land in forest and natural pastures. However, migration, combined with large investments in livestock, may indeed result in an increase in land shares in forest and pasture indirectly.
2. Forage crops are moderately capital and labor intensive, with relatively low risk. The impact of migration is ambiguous; as for forest and natural pasture, we would only expect a positive sign to the extent that migration induces greater livestock holdings.
3. Fruits are relatively capital intensive, moderately high risk. They are also very sensitive to peak labor demands, even though labor: land ratios aggregated over the season may be lower than forage and cereals. Overall, we expect migration to favor expansion of fruits.
4. Staple crop production is considered relatively labor intensive, but moderately low risk and capital. We aggregate land allocated to wheat, maize, potatoes and beans to derive the proportion of land allocated to staple crops. The impact of migration is hypothesized to be negative.

[10] Here we are using "intensive" to mean relative to landholdings, thus capital intensive means higher capital:land ratios; labor intensive means higher labor:land ratios. We also ran all model specifications described above on the share of land allocated to vegetables. However, the estimation performed poorly and bore uninteresting results, with the exception of the positive and significant coefficient on irrigation. For this reason, in the remainder of the paper we do not report the full estimation results for vegetables.

5. Livestock is capital intensive and moderately risky. We thus expect migration to increase livestock production.

In this next section, we define household and community characteristics expected to affect household agricultural production, and consider their expected impacts on agricultural inputs and incomes.

Migration: Expected impacts are as described above. Because we do not know the migrant-specific wage rate, we instead use the total number of household members now migrating internationally (***International Migration***). Following the model above, this is clearly an endogenous variable; we thus use an instrumental variable specification described more fully below.

Human Capital: We include the remaining household labor constraint (***HHSize***) which is the number of household members residing at the homestead; and average years of schooling of adults in the household (***AvgEdu)***. Additionally, besides remittances from migrants, households may receive income -- and perhaps even some labor -- from adult children living in Albania (***ChilAlb***), but no longer at home. To the extent that such family networks constitute reciprocal relationships and a basis for informal insurance, we expect that a greater number of such children will increase land allocated to riskier, capital intensive activities and to livestock.

Finally, many household heads have migrated in the past. As with education, it is has been proposed that those who have migrated internationally acquire additional skills relevant to the management of enterprises that may be helpful for productivity when the migrant returns (Lucas, 2006). Past migration may also proxy for financial assets that are otherwise unaccounted for. For both of these reasons, we use in the estimations the number of months that the household head spent abroad between 1990-2001 either to Greece (***HeadMigExp_Gr***), or to Italy and/or further destinations (***HeadMigExp_It***). Those migrating to Italy versus Greece tend to undertake different jobs with different opportunities and returns in the destination countries, which may imply different skills acquisition and thus different activities for the migrants when they return home (Carletto et al., 2004). For this reason we differentiate in the regressions between these two types of flows. We expect that more experience will lead to an expansion of risky, high-value activities such as livestock, and particularly those generally thought to require more sophisticated management and marketing skills, such as fruits and vegetables. We also expect that such experience increases the marginal returns to agricultural labor, and will thus lead to higher total and per capita labor allocated to agriculture.

Physical Assets: This is captured by the sum of all productive agricultural assets held by the household (***TotAssets)***. We also use the proportion of agricultural land within a commune (sub-district level) with irrigation (***IrrCom***); though we do have household-level data on land shares with irrigation, this is potentially endogenous and so we instead use this district-level proxy. Agricultural assets should increase agricultural and total incomes, as well as labor allocated to agriculture. As most agricultural assets are crop-focused (as opposed to livestock), we expect greater land allocated to crops and fruits, and less to forage and forest/natural pasture. We also include a simple dummy indicating whether or not the house has indoor bathroom plumbing to proxy for dwelling conditions (***IntPlumb***). This variable, as well as land and agricultural assets, is also proxy for household wealth. Wealthier households

are expected to favor riskier crop activities, the impact on agricultural labor and agricultural incomes is ambiguous, though total incomes should be higher.

Natural Capital: Besides total land owned (***TotLand***), we also include the number of plots held by the household (***Plots)***. Much of the land redistributed was fragmented into a number of parcels (motivated by the need to ensure that everyone had access to the same mix of land qualities); such fragmentation should increase labor and perhaps agricultural incomes, as well as favor crop diversity, but with ambiguous impacts on land shares. We also include a dummy for whether or not the household accessed non-owned resources (mainly state forests and pastures) during the past year (***AccNon-Owned Land***). We would expect that such access relieves the land constraint, but with ambiguous impacts on land allocation. Livestock holdings, however, should increase. We have no further agro-climatic data; the three regional dummy variables (indicating whether the household is located in the ***Coastal***, ***Central*** or ***Mountain*** zones[11]) are intended to pick up these effects, as well as other regional differences.

Social Capital: Density of organizations in the area probably picks up not only social capital, but "marketing" capital as well. As such, a greater density of such organizations is expected to improve marketing capacity and reduce exposure to market risk, and thus facilitate livestock and fruit production, and crops in general. To capture the impact of such organizations, we simply summed the number of organizations enumerated in the community (using information from the community questionnaire) and also took into account whether or not there was a community meeting room (***NOrgCR***).

We have also created an index of trust and social cohesiveness within the community, using household level data on the following four aspects: 1) the total number of people on whom the respondent can rely in times of need; 2) the extent to which the respondent believes others in the community are willing to help each other out (responses were made on a 5-point scale); 3) a dummy variable indicating whether or not the respondent feels he or she can generally trust other people, and 4) the extent to which the respondent feels that differences amongst community members divide the community (responses also coded using a 5-point scale). We then performed a factor analysis on these four responses, and took the first factor score to create ***HighSC***. Social capital is expected to reduce risk and perhaps increase access to (small amounts of) capital and labor where reciprocal arrangements are important. Thus, we expect social capital to increase livestock and, indirectly, land allocated to forage and forest and pasture, and perhaps fruit. The impact on agricultural labor is ambiguous; to the extent social capital does increase marginal utility of agricultural labor, we expect an increase; however, as with organizational density, higher social capital may increase the opportunity costs of agricultural labor.

Finally, we expect that the level of criminal activity reduces returns to certain agricultural activities. We use a dummy variable from the community-level questionnaire which takes a value of 1 if the community representative mentioned crime as the most severe problem facing the community. We expect crime to reduce land allocated to high-value crops as well as labor; thus we expect lands in fruits to decline in particular. Livestock, which can be more easily stolen than most crop outputs, is also expected to decline, and thus we expect forage to decline, as well, as a consequence of changes in livestock holdings.

[11] In all regressions, the Mountain region is used as reference group.

4. Description of the data

The data for this paper come from two rounds of a panel survey conducted by INSTAT with technical assistance from the World Bank. The first survey, the Albania Living Standards Measurement Survey (ALSMS02), was conducted in 2002 on a sample of 3599 households, of which about one half were from rural areas. The sampling frame was stratified in four regions (Coastal, Central, Mountain and the city of Tirana) that roughly reflect a partition of the country along agro-ecological as well as socio-economic lines. The survey instruments in the ALSMS02 included a household questionnaire, with detailed expenditure and income information, as well as a community questionnaire.

In the spring of 2003, a lighter questionnaire was administered to a sub-sample of LSMS households by INSTAT. A sample of over 5,200 individuals over the age of 14 from 1750 of the original households was re-interviewed as part of this second wave of the panel study. In terms of information on migration and agriculture, the two waves complement each other. In fact, in addition to a common set of information, additional questions were added in the 2003 survey, while other parts, e.g. full expenditure and income data, were not included in the second wave. The econometric analysis in the remainder of this paper is based on the rural sub-sample of this panel survey for which full information was available, consisting of a total of 736 farm households. Among these, 31 percent reported having at least one permanent migrant abroad.

In Table 8 we present the descriptive statistics of the variables used in the econometric analysis, overall and by migration status. A number of differences are evident between categories of households. Households with migrants have on average significantly larger landholdings, while households without migrants are located in districts with more irrigation and greater access to state forest or pastures. While migrant households have a greater share of land in cereals, and households without migrants a greater share in forage, both types of households have similar livestock holdings.[12] Migrant households on average have, however, significantly greater agricultural and total household income. Finally, migrant households are somewhat smaller in size and have lower levels of average education; these are likely the result of the migration of the children.

5. Estimation and Results

Our major estimation issue is identifying instruments for household members engaged in permanent international migration. We considered five household and community-level variables as potential instruments. The commune/municipality-level[13] proportion of the male population aged 20 to 39, which were computed from the 2001 Population Census, varies quite dramatically across areas. To the extent that lower proportions captures the density of migration within a commune, we expect that this proxy of the access to extended migration networks abroad and consequently lower information costs will be correlated with household migration decision. As noted above, however, households rely almost exclusively on household labor for agricultural production; thus we do not expect that this instrument will be

[12] Livestock included cattle, sheep and goats. The total household herd size was constructed using a conversion factor for each type of animal in tropical livestock units (TLU), as developed ed in Jahnke (1982).

[13] In its third-level administrative sub-division, the country is divided in 309 communes (rural) and 65 municipalities (urban), for a total of 374 administrative units.

correlated with on-farm decisions. Similarly, we use the density of cars within the municipality as another measure of 'connectedness' and thus lower costs of accessing migration networks. The third commune-level variable is the unemployment rate; this variable captures local off-farm income generating opportunities and thus opportunity costs of migrating; and again, should have no direct impact on on-farm decisions given the reliance on household labor there. At the household level we consider two variables. The first is an index measuring the household's "relative deprivation"[14] as a measure of one of the potential push factors for migration. As discussed by Stark and Taylor (1989), the wealth position of the household with respect to a spatially adjacent reference population can be an important push factor where relatively poor households feel motivated to engage in migration in order to improve their relative position in the neighborhood. The second household-specific variable is length of time at the current residence; as with the community-level variables, we expect duration at current residence captures connectedness to other households and thus reduced costs of accessing information regarding migration flows[15].

For each of the dependent variables, we considered a number of tests to determine the best set of "good and strong" instruments. Following output provided by STATA for instrumental variable regressions, Hansen's J statistic was used to determine whether the equation was overidentified[16]. Additionally, we began by specifying the equations with all five potential instruments. To test whether the instruments were weak, and since we have only one variable to instrument, we considered the first-stage F-statistic and following Staiger & Stock (1997), we considered the set of instruments to be strong when this statistic was greater than 10. When we were satisfied with a set of instruments that were both good and strong, we then ran redundancy tests on that set for each equation, to arrive at the final specification. While all of these statistics are available for IV regressions, they are not for the tobits, which in this case include the land shares and livestock variables. We still ran the IV regressions for diagnostics on these equations, and then used the preferred instrument set for the IV tobits; and then performed a joint test of significance for the set of instruments from the first-stage estimation, and in all cases, these were jointly significant[17]. In the results shown below, we only report the second-stage regression output. In Appendix 1, we present the full first-stage regressions results for land allocated to forage only, and then present the coefficients and standard errors from the first-stage on the instruments used in each equation as well as the Hansen's J and first-stage F-statistic for the remaining equations.

[14] The index of relative deprivation measures the relative poverty of the household with respect to other families living in the same community. Following Stark and Taylor (1989) relative deprivation is measured by the product of the mean excess wealth of households richer than household *i* and the proportion of households in the community that are richer than household *i*. Wealth is defined as the predicted consumption expenditure of the household (for more details see Carletto *et al.*, 2004).

[15] Duration at current residence is also correlated with age of household head, with a simple Pearson correlation coefficient of .37, and also with the total household labor constraint (.16). We note here that age of head itself was never statistically significant in any of the regressions and is not included; which is perhaps not surprising given the dramatic change in the agricultural sector. Nonetheless, the duration variable may thus reflect a "pull" factor of lower migration information and coordination costs but also "push" factors associated with older households.

[16] Hansen's J statistic was genereated, instead of the Sargan statistic, given that all equations were corrected for heteroskedasticity using the "robust" option.

[17] Additionally, we ran each of the censored variables as OLS, and checked the instruments using *overid*; again, the instruments were valid.

All equations suffer from heteroskedasticity. Results presented below are those for instrumental variable regressions or tobits corrected for heteroskedasticity using the Huber-White applied by STATA's robust command.

We now turn to the estimation results. In Table 2, we present the results of the land share and livestock equations. Permanent international migration variable has a negative impact on staple cereals as expected, as these crops are relatively low risk and moderately labor-intensive. However, migration also has a strong negative impact on land allocated to fruits. Given that this activity is relatively capital intensive and risky, we expected a positive sign. However, international migration has a significant positive impact on land allocated to forest and pasture -- the least labor intensive activity. And, international migration has a positive impact on livestock holdings, which is clearly complimentary with land allocated to forest and pastures. Previous experience of the household head with temporary migration, whether to Greece *(HeadMigExp_Gr)* or to Italy and further afield (*HeadMigExp_It*) has no statistically significant effect on livestock decisions, and experience in Italian migration reduces land allocated to forests and natural pasture. Similar to international migration, both reduce staple crop production. Experience with migration to Greece increases fruit production, consistent with the observation that many Albanian migrants to Greece work on fruit farms there.

Adult children living outside the home but in Albania (*ChilAlb*) has a statistically significant and positive impact on livestock holdings, and also leads to a greater share of land in forage. This is an interesting contrast with children engaged in international migration. While livestock holdings increase in response to higher number of children either in Albania or abroad, having children in Albania, possibly living in the same community or nearby, increases lands allocated to more labor-intensive forage crops with no impact on land allocated to forest and natural pastures. Both of these land uses can be used to feed livestock, but forage should generate substantially more animal nutrients per hectare than does forest and natural pasture land.

Among other variables affecting land allocation, larger, male-headed households are more likely to invest in livestock production. On the contrary, household size (*HHSize*) has no statistically significant impact on any of the land share equations. Thus, household labor endowments per se do not affect land allocation patterns. Greater average education of household members only increases land allocated to forest and pastures, indicating that those with greater human capital endowments are indeed leaving agriculture. Households with more land and more plots are more likely to allocate a greater share of land to extensive cultivation like forage and staple crops, as well as to livestock (again, consistent with the increase in forage production). Greater agricultural assets increases land allocated to staples and fruits, but reduces land allocated to forage. Irrigation has a negative impact on, perhaps capturing the fact that a large proportion of land in fruit is in vineyards, which are not irrigated in the Albanian context[18].

Access to public land increases livestock (and forage) production, indicating that privately grown forage and state-owned forest and pasture resources are complements in livestock production. Access to state-owned forest and pasture is associated with lower shares in all

[18] We also had information on land allocated to vegetables that performed very poorly, and for which a valid set of instruments for international migration could not be found. One of the few robust results, unsurprisingly, was the positive impact of irrigation on land allocated to vegetables.

other land uses, including privately owned forest and pastures. As expected, the level of self-reported crime at the community level has a significant and negative impact on livestock holdings. And, the impact of social capital on livestock holdings is positive and land allocated to staples is negative, both as expected; however, land allocated to fruits is also negative. Interestingly, the number of organizations in the community has a very distinct impact from the social capital indicators, especially given that many authors use number of organizations as a proxy for social capital. In the Albanian case, a greater number of organizations increases land allocated to cereals and fruits; perhaps indicating that such organizations improve flows of market information and opportunities to sell. Number of organizations also increases land allocated to forest and pasture and reduces land in forage, with no impact on livestock.

To summarize, international migration impacts both land use patterns as well as livestock holdings, with results suggesting that households with these migrants are more likely to invest in extensive livestock production and to move out of staple cereal production. Previous experience abroad also reduces land allocated to staple crops, but otherwise has no impact with the exception of experience with migration which favors fruit crop production. Like permanent international migration, having more adult non-migrant children increases livestock but under a more intensive forage-based system. Finally, the household labor constraint does not appear to be binding in terms of land use, though it does increase livestock holdings.

Next, we turn to agricultural labor. In Table 3, we present two specifications; the dependent variable in the first column is total agricultural labor (in hours), and the second is the average number of agricultural hours worked per family member. The first striking, but expected, result is the strong negative impact of international migration on both total and per capita agricultural labor. The stronger impact at the household level may indicate the combination of both an income and labor supply effect. Not surprisingly, household size increases the total amount of labor hours, while per capita allocation to agriculture drops as family size increases. Labor hours, both total and per capita, also increase with the stock of agricultural assets, landholdings, number of plots, and the wealth proxy. Additionally, the coefficient on community safety is positive and significant in both total and per capita labor allocation. Interestingly, adult children living in Albania has the opposite effect on labor vis-à-vis international migration; the coefficient is statistically significant and positive in both equations. Irrigation also increases labor per capita, as does being located at the coastal or central regions vis-à-vis the mountain region. Neither social capital nor number of organizations has a statistically significant impact on either labor allocation equation.

Looking at the results for crop diversity presented in Table 4, we first note that international migration has a strong negative impact on the Simpson index. Additionally, previous migration experience to Italy or further afield also has a negative impact on crop diversity, while Greek temporary migration has no statistically significant impact. The first two results are consistent with the hypothesis that both current migration and migration experience reduce household exposure to risk, and thus the necessity to spread risk through crop diversity. However, the results are also consistent with the previous findings on labor allocation, suggesting a shift away from agriculture in general perhaps due to an income effect[19]. On the other hand, the coefficient on adult children living in Albania is positive and statistically

[19] For example, as previously shown, permanent migration of former household members and Italian experience of current members also reduce labor allocated to agriculture.

significant, consistent with positive impact on total and per capita labor allocation. These results suggest that a network of immediate family members in Albania relaxes agriculture-specific constraints, but does not necessarily reduce income variability. If these relationships are reciprocal, the impact on income variability may well be limited, particularly if the original (parent) household still bears a greater burden of mitigating impacts of shocks. To the extent that this latter measure indicates that people can rely on each other in response to idiosyncratic production shocks, this too is consistent with a reduction in risk exposure enabling households to move towards specialization.

Finally, we consider the impact of these variables on household agricultural incomes[20], as well as total household income. Results are reported in Table 5. As we can see, both permanent international migration and adult children in Albania increase both agricultural incomes and total incomes. This result, in combination with the land allocation findings, seems to suggest that expanding livestock production as a result of migration -- even under less intensive (per hectare) systems relying on private and state-owned forest and natural pasture -- increases both agricultural and total incomes.

Conversely, temporary migration by the household head, whether to Greece or any other country, is not associated with higher agricultural or total household incomes. This may suggests that the expansion into fruit production by migrants to Greece has not, as yet, led to improved welfare[21]. Agricultural incomes also increase with household size and average education; it thus appears that education increases productivity irrespective of the agricultural activity undertaken, as it had no impact in any of the land allocation, livestock or labor allocation equations. Rather at odds with other empirical evidence showing negative impacts of land fragmentation, the number of plots has a statistically significant and positive coefficient on agricultural and total incomes. This would be expected if in the process of land distribution across state farms and cooperatives, a greater number of redistributed plots was associated with better average land quality. Coefficients on total assets and landholdings are statistically significant as expected. Both agricultural and total incomes are positively affected by wealth as captured by indoor plumbing. Greater perceived safety in the community also has a positive impact on both total and agricultural incomes, though neither the social capital nor community organizations variables have a statistically significant impact

6. Concluding Remarks

Over the past 15 years, Albania has experienced a turbulent transition from a centrally-planned economy, characterized, among other things, by a rapid privatization of landholdings which ignited a radical transformation of the agricultural sector. In addition, the country has been at the center of a migration phenomenon of immense proportion, with well over one half of Albanian households having experienced some form of international migration in only few years. Despite the potential relevance of migration in fostering, or hindering, this agricultural transformation, very little is known about its impact. This paper is an attempt to contribute to

[20] Agricultural income includes both crop and livestock income.

[21] Returns from migration to Greece can be expected to be substantially lower than the ones from Italy and further destinations. Also, although we are using lagged migration experienced, we are aware of potential problems of endogeneity of the temporary migration variables. As shown elsewhere (Carletto et al, 2005), temporary migrants to Greece are generally younger and less educated, and they are more likely to work in agriculture, thus suggesting initial lower levels of human and physical assets.

a better understanding of the role migration has played in the re-allocation of resources in agriculture among migrant families in Albania.

The characterization of diverse migration flows by current and former household members to domestic or international destinations reveals differential effects on the allocation of resources to different agricultural activities on the basis of their capital and labor requirements, and driven by the household's physical and human capital endowments. With respect to permanent migration of former household members, such movements clearly favor livestock production; and, despite the extensive nature of that type of activity, leads to higher agricultural and total household incomes. The presence of adult children outside of the household, but still living in Albania, is also associated with higher livestock production, although also to a higher reliance on higher-value and more labor-intensive forage crops. This too leads to higher agricultural and total incomes. On the contrary, past time spent abroad by the current household head in the form of temporary/seasonal migration reduces livestock holdings, but increases land in fruit cultivation in the case of migration to nearby Greece. Perhaps the experience acquired by these seasonal workers in the destination countries – being often engaged in the production and harvesting of fruits – contributes to this effect. Employment in livestock-specific activities, on the other hand, seems to be much less important for migrants abroad. Thus, skills learned in migration may influence production decisions for return migrants; though, as yet, there is no evidence that favoring fruit production increases agricultural or total incomes.

Permanent migration also exerts a strong downward pressure on agricultural labor, both total and per capita. This is consistent with expansion of leisure hours by remaining members as a result of permanent migration abroad by household members who, through remittances, can provide higher and less variable income. However, our evidence is also consistent with other studies (Stark, 1991; Taylor et al., 1996; Taylor & Wyatt, 1996) that show that the loss in labor in agriculture is compensated by increased access to capital. Given the overall impact of migration on agricultural and total incomes and the limited impact of the household labor constraint on land allocation, as well as anecdotal evidence that despite heavy out-migration from the rural areas there is still under- and unemployment in the rural areas, it would appear that the labor constraint is simply not yet binding in the Albanian countryside. On the other hand, adult children living in Albania actually increases total agriculture labor supplied as well as the per capita effort into the farm by current household members. This, too, leads to higher agricultural and total incomes.

Our findings are generally in line with the initial hypotheses and are robust to different model specifications; however, a number of disclaimers are in order. First, it must be noted that it remains difficult with the available cross-sectional data to properly account for household fixed effects and latent variables. In addition, we were unable to identify instruments to enable us to differentiate alternative destinations of permanent international migration. Finally, no mention is made in the paper on the likely re-distribution of labor activities within the household as a result of migration. The hypothesis of a possible feminization of Albanian agriculture, in particular, warrants further analysis.

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Table 1: Descriptive statistics of selected variables

Variable	Full Sample	Households with Migrants	Households without Migrants
Number of Household Members *(HHSize)*	4.9	**4.8**	**5.0**
Average Education Level (years) (*AvgEdu*)	5.7	**5.2**	**6.0**
Female headed household (%) (*hhh_female)*	1.0	**14.2**	**7.8**
Dwelling with Indoor plumbing (%) (*IndPlumb*)	.39	**.48**	**.35**
Total Agricultural Assets Index (*TotAssets*)	.46	.44	.46
Total Land Owned (sq. meters) (*TotLand*)	7,940	**9,347**	**7,308**
Number of Plots Owned (*Plots*)	3.9	4.0	3.9
Irrigation Availability (sq. meters) at the district level (*IrrCom*)	1,020	**951**	**1,050**
Accessed State Forest/Pastures (%) (*AccNon-Owned Land*)	.18	**.12**	**.21**
Number of Organizations and Community Room in Community (*NOrgCR*)	2.7	2.7	2.8
Trust and Cohesiveness in the Community (*HighSC*)	.007	-.013	.016
Crime: Problem in Community (%) (*ComCrime*)	.16	.21	.14
Adult Children no Longer at Home (*ChilAlb*)	1.5	1.8	1.4
Number of Children Abroad (*International Migration*)	.59	1.89	0
HH head migration experience to Greece (no. months) (*HeadMigExp_Gr*)	2.8	**1.9**	**3.3**
HH head migration experience to Italy and other countries (no. months) (*HeadMigExp_It*)	.5	.4	.6
Share of Land in Cereal	.36	**.29**	**.39**
Share of Land in Forage	.30	**.36**	**.27**
Share of Land in Forest & Pasture	.09	.10	.08
Share of Land in Vegetables	.09	.08	.10
Share of Land in Potatoes & Beans	.06	.06	.07
Share of Land in Fruits	.08	.09	.08
Livestock Units	1.3	1.4	1.3
Total Ag. Labor (hrs)	2,859	2,672	2,942
Per capita Ag. Labor (hrs)	600	613	595
Total Ag. Income (ln Old Leks)	8.9	**9.1**	**8.9**
Total Household Income (ln Old Leks)	9.8	**1.3**	**9.7**

*Differences in bold are significant at 95% level, or higher.

Table 2: Land shares and livestock

Regressors	Land Shares				Livestock
	Forage^	Forest and Pasture	Fruits	Staples	
International Migration	.22	4.24**	-6.60	-19.89 *	.52**
	(7.84)	(2.25)	(9.20)	(9.72)	(.21)
Human Capital					
HHSize	.29	1.96	1.20	-.42	.11**
	(1.24)	(2.73)	(1.33)	(1.28)	(.03)
HHHFemale	-1.48	1.83	-1.82	1.85	-.51**
	(7.67)	(1.84)	(8.21)	(7.57)	(.179)
AvgEdu	-.92	4.54**	.72	-1.82	.03
	(1.15)	(2.68)	(1.27)	(1.22)	(.03)
ChilAlb	2.69*	-.86	.23	-.03	.055*
	(1.00)	(2.45)	(1.04)	(.92)	(.32)
HeadMigExp_Gr	-.03	-.23	.41**	-.45*	-.002
	(.23)	(.60)	(.20)	(.21)	(.009)
HeadMigExp_It	.33	-15.29**	.59	-.99*	-.014
	(.71)	(7.79)	(.89)	(.56)	(.011)
Physical Capital					
TotAssets	-5.19**	.87	3.99*	4.33*	.043
	(2.29)	(4.74)	(2.23)	(2.46)	(.73)
IrrCom	-.007**	-.015*	-.006*	-.001**	-.0002**
	(.003)	(.007)	(.003)	(.0002)	(.00008)
IntPlumb	9.61**	-1.67	.36	-4.70	-.28**
	(4.91)	(11.77)	(5.43)	(5.03)	(.13)
Natural Capital					
TotLand	.001**	.0003	.00004	.002**	.00004**
	(.0003)	(.0013)	(.0006)	(.004)	(.00002)
Plots	3.34**	.60	.37	1.59**	.11**
	(1.27)	(3.21)	(1.28)	(1.24)	(.038)
AccNon-Owned Land	19.4**	-31.81**	-17.52**	-1.73	.36**
	(4.90)	(13.43)	(5.73)	(4.54)	(.114)
Coastal Region	27.36**	94.44**	48.03**	-36.26**	-.76**
	(6.83)	(16.74)	(8.41)	(6.42)	(.17)
Central Region	2.58	-26.14*	5.82*	-28.89**	-.92*
	(6.29)	(13.48)	(8.35)	(5.41)	(.15)
Social Capital					
NOrgCR	-3.15**	3.37*	3.68**	1.51**	-.01
	(.87)	(1.78)	(.91)	(.74)	(.025)
HighSC	5.05	8.86	-11.46**	-8.51*	.30**
	(5.32)	(12.97)	(5.62)	(4.83)	(.15)
ComCrime	.83	16.47	-.95	-3.16	-.31*
	(7.58)	(14.67)	(6.97)	(6.72)	(.15)
Constant	-5.01	-97.96**	-8.81**	48.03**	.37
	(14.19)	(33.52)	(16.63)	(15.07)	(.37)
No. of Observations	731	731	731	731	733
Log Likelihood Ratio	-1594.8	-1392.8	-1366.4	-1552.8	-2182.3
Prob>chi 2	.0000	.0000	.0000	.0000	.0000

Note: Statistics in parentheses are robust standard errors; * indicates significance at the 10 % level, ** indicates significance at the 5% level

Table 3: Total and per capita agriculture labor

Regressors	Total Household Agricultural Labor (hrs)	Per Capita Agricultural Labor (hrs)
International Migration	-640.94**	-118.33*
	(305.36)	(64.20)
Human Capital		
HHSize	243.54**	-7.95**
	(65.37)	(13.12)
HHH_Female	-208.87	-75.01
	(272.23)	(59.90)
AvgEdu	41.39	7.04
	(46.29)	(1.77)
ChilAlb	122.46**	23.69**
	(44.29)	(9.06)
HeadMigExp_Gr	-4.90	-1.46
	(9.64)	(1.73)
HeadMigExp_It	-39.45**	-5.60**
	(13.01)	(2.38)
Physical Capital		
TotAssets	409.69**	79.92**
	(123.46)	(22.20)
IrrCom	.17	.06**
	(.13)	(.032)
IntPlumb	-318.30*	-63.72
	(187.21)	(42.41)
Natural Capital		
TotLand	.076**	.02**
	(.025)	(.005)
Plots	111.21**	27.59**
	(52.25)	(11.47)
AccNon-Owned Land	95.79**	71.14
	(211.84)	(49.09)
Coastal Region	1393.44**	26.72**
	(327.99)	(61.21)
Central Region	731.24**	117.67**
	(262.82)	(51.65)
Social Capital		
NOrgCR	-2.53.6	-3.80
	(39.57)	(8.47)
HighSC	-282.88	-37.90
	(230.35)	(47.90)
ComCrime	-170.80	23.55
	(27.80)	(67.27)
Constant	-394.20	502.42**
	(606.41)	(129.95)
No. of Observations	625	625
Centered R-Squared	.17	.14
Prob>chi 2	.0000	.0000

Note: Statistics in parentheses are robust standard errors; * indicates significance at the 10 % level, ** indicates significance at the 5% level

Table 4: Crop diversification

Regressors	Crop diversification Index
International Migration	-.26**
	(.12)
Human Capital	
HHSize	-.02
	(.014)
HHH_Female	-.12
	(.09)
AvgEdu	-.01
	(.01)
ChilAlb	.04**
	(.013)
HeadMigExp_Gr	-.0004
	(.002)
HeadMigExp_It	-.015**
	(.004)
Physical Capital	
TotAssets	.02
	(.06)
IrrCom	-.0004
	(.0004)
IntPlumb	-.07
	(.06)
Natural Capital	
TotLand	.00002**
	(.000007)
Plots	.09**
	(.02)
AccNon-Owned Land	.13*
	(.07)
Coastal Region	.27**
	(.09)
Central Region	.11
	(.07)
Social Capital	
NOrgCR	-.0006
	(.011)
HighSC	-.11
	(.07)
ComCrime	-.08
	(.08)
Constant	1.47**
	(.18)
No. of Observations	722
Centered R-squared	.07
Prob>chi 2	.0000

Note: Statistics in parentheses are robust standard errors; * indicates significance at the 10 % level, ** indicates significance at the 5% level

Table 5: Agriculture and total household income

Regressors	Total Agricultural Income (ln New Leks)	Total Household Income (ln New Leks)
International Migration	.35**	.31*
	(.08)	(.168)
Human Capital		
HHSize	.08**	.08**
	(.03)	(.03)
HHH_Female	.11	-.18
	(.12)	(.16)
AvgEdu	.05**	.05**
	(.03)	(.02)
ChilAlb	.04*	.05*
	(.02)	(.02)
HeadMigExp_Gr	.004	.001
	(.003)	(.004)
HeadMigExp_It	.008	.011
	(.009)	(.009)
Physical Capital		
TotAssets	.24**	.12**
	(.05)	(.04)
IrrCom	.00002	.00003
	(.00007)	(.00006)
IntPlumb	.04	.36**
	(.10)	(.09)
Natural Capital		
TotLand	.00003**	.00001
	(.00001)	(.000001)
Plots	.13**	.03
	(.03)	(.02)
AccNon-Owned Land	.05	.13
	(.10)	(.09)
Coastal Region	.42**	.24*
	(.14)	(.13)
Central Region	.26**	.14
	(.11)	(.10)
Social Capital		
NOrgCR	.01	-.02
	(.02)	(.02)
HighSC	-.14	.11
	(.11)	(.09)
ComCrime	.22*	.33**
	(.13)	(.11)
Constant	6.73**	8.20**
	(.28)	(.24)
No. of Observations	681	681
Centered R-Squared	.17	.21
Prob > chi 2	.0000	.0000

Note: Statistics in parentheses are robust standard errors; * indicates significance at the 10 % level, ** indicates significance at the 5% level.

Appendix 1: First-Stage Estimation Results and Instrument Tests

Table A.1: First-Stage Estimation Results, Instrumental Variables Regression of International Migration, from Share in Forage Equation

Regressors	International Migration
HHSize	-.06**
	(.03)
HH_Female	.19
	(.16)
AvgEdu	-.09**
	(.02)
ChilAlb	-.03
	(.02)
HeadMigExp_Gr	-.0044*
	(.0028)
HeadMigExp_It	-.013**
	(.006)
TotAssets	.05
	(.06)
IrrCom	-.00005
	(.00006)
IntPlumb	.27**
	(.08)
TotLand	.0005**
	(.00009)
Plots	-.03
	(.03)
AccNon-Owned Land	-.01
	(.02)
Coastal Region	-.04
	(.14)
Central Region	-.13
	(.11)
NOrgCR	.01
	(.02)
HighSC	.04
	(.11)
ComCrime	.16
	(.12)
Instruments	
Cars Per Capita	4.25**
	(1.76)
Proportion of Males, Aged 20-39	-.08**
	(.03)
Duration at Residence	.01**
	(.003)
No. of Observations	732
Hansen's J = .70; Chi-Squared P-value	.703
F-Test of excluded instruments	13.85
Prob>F	.0000

Note: Statistics in parentheses are robust standard errors; * indicates significance at the 10 % level, ** indicates significance at the 5% level

Table A.2: First Stage Instrumental Variables Regression, Instruments Only, Dependent Variable: International Migration; Land Shares, Livestock and Crop Diversification Equations

	Share of Land in Forest & Pasture	Share of Land in Fruits	Share of Land in Cereals	Number of Ruminant Livestock Held	Simpson Index of Crop Diversification
Instruments					
Proportion of Males, Aged 20-39	-.08**			-.08**	
	(.03)			(.03)	
Employment Rate		-1.13**	-.87**		
		(37)	(.37)		
Cars Per Capita					
Duration at Residence	.01**	.01**	.01**	.01**	.01**
	(.003)	(.003)	(.003)	(.003)	(.003)
Relative Deprivation Index	.25**		.21*	.24*	.24*
	(12)		(.13)	(.12)	(.12)
No. of Observations	732	732	732	732	722
Hansen's J, P-value	.32	.47	.31	.49	.15
F-Test of excluded instruments	12.93	15.23	10.44	15.38	15.38
Prob>F	.0000	.0000	.0000	.0000	.0000

Table A.3: First Stage Instrumental Variables Regression, Instruments Only, Dependent Variable: International Migration; Agricultural Labor and Household Income Equations

	Total Agricultural Labor Hours	Per Capita Agricultural Labor Hours	Agricultural Income	Total Income
Instruments				
Proportion of Males, Aged 20-39	-.08**	-.08**	-.08**	
	(.03)	(.03)	(.03)	
Employment Rate				-1.08**
				(.38)
Cars Per Capita	5.50**	5.50**		
	(2.01)	(2.01)		
Duration at Residence	.01**	.01**	.01**	.01**
	(.0043)	(.003)	(.003)	(.0043)
Relative Deprivation Index			.21*	
			(.13)	
No. of Observations	626	626	691	716
Hansen's J, P-value	.69	.84	.20	.9997
F-Test of excluded instruments	16.70	16.70	13.29	14.86
Prob>F	.0000	.0000	.0000	.0000

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