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How can migration unequalize inheritance: Theory and insights from Bolivia

Anne Michels, Jean-Philippe Platteau *

Center of Research on Economic Development (CRED) University of Namur, Belgium

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ABSTRACT

Indian communities in Latin America, like in the Middle East and other regions of the world, tend to have rules of equal inheritance. Yet, migration can transform ex ante egalitarian rules into unequal ex post practices. In this paper, based on evidence collected at both sides of the migration link in Bolivia, we find that the unequalization process caused by migration tends to paradoxically harm poor migrants from egalitarian communities who are driven to voluntarily forfeit their inheritance. To resolve the puzzle, we propose a novel theory placed in the framework of strategic exchange but where the migration decision is endogenized: upon migration, children take into account the prospect of potentially losing access to family land if they are unable to fulfill their care obligations. Voluntary exclusion from inheritance is especially likely if the value of rural public goods is low, farm output per capita is small, and the wages in the urban modern sector are high compared to those in the informal sector. The main policy implication is the following: a more equal pattern of economic growth, along both the rural–urban and the intersectoral intra-urban dimensions, helps minimize the disruption of rural families and communities, which play an important social insurance function.

1. Introduction

How fast do well-anchored rules adjust to drastic changes in the environment, whether economic, demographic, geographic, or political, and in which direction and with what welfare consequences, is one of the most fascinating issues at the heart of development economics and the economics of institutions in particular (for a recent survey, see Baland et al., 2019). In this paper, we address this issue in relation to inheritance rules in the context of egalitarian societies which have traditionally practiced equal sharing of family land among children. While some scholars have emphasized the lack of flexibility of partible inheritance rules, such as Kuran (2004, 2011) for Middle Eastern societies, there is abundant evidence that inheritance rules are susceptible of evolving in rural contexts where they are anchored in local customs rather than in religion-sanctioned codes.

We are able to confirm the latter view by looking at the way such rules have been transformed in the presence of (internal) migration possibilities in an egalitarian Indian society of Latin America. Yet, and rather unexpectedly, the resulting change in inheritance rules tends to harm poor people, which seems paradoxical insofar as their purpose was initially to ensure equality in land access. Revealingly, this result is conditional on the fact that the community of origin remains based on traditional collective institutions. In such a setup, unsuccessful migrants incur a comparatively higher probability of being unable to meet the obligations associated to continued community membership and land ownership. They are then goaded to forsake their land bequest.

* Corresponding author.
E-mail address: jean-philippe.platteau@unamur.be (J.-P. Platteau).

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This idea that loss of land inheritance rights often originates in a decision of children rather than parents comes out of a growing body of literature devoted to changes in inheritance rights in the context of migration (Hoddinott, 1992, 1994; de la Brière et al., 2002; La Ferrara, 2007; Goetghebuer and Platteau, 2010; Chort et al., 2012). The voluntary forsaking of bequest by the rightsholders is especially likely when children have been shoved to migrate by their parents, in which case the latter seem to be particularly worried about inflicting a double punishment (forced migration plus disinheritance) on the former (see Michels, 2019a, for the Bolivian Altiplano where our first-hand data have been collected).

As stated above, the problem looks deceptively simple: it boils down to a budget constraint that is violated for low-income migrants, yet not for high-income ones. This is forgetting two central facts, though. First, while deciding whether to leave their native community, children do actually consider the possible effects of a migratory move on their future inheritance prospects. They may therefore choose to suppress the risk of losing their inheritance by refusing to go away from their village. Second, the parents, acting as representative members of their community, determine the level of obligations associated to community membership and, hence, access to land bequest. One possibility is to set them at such a low level that the migrant children will always be able to honor them and preserve their rights to the family land. Because our fieldwork as well as other micro-studies have revealed the existence of these two features in our study area and beyond (more about this will soon be told), exclusion of some migrant children from inheritance is not to be taken for granted. Clearly, we are facing a thorny issue and we need to construct a rather complex economic argument in which the migration and bequest decisions are interdependent while the level of the so-called "community tax" (the fee required for maintaining land right access) is endogenous.

Towards that purpose, we propose a theory based on the idea of strategic exchange but where the migration decision is endogenized: when contemplating a decision to migrate, a child takes into account the prospect of losing access to land bequest. We start from the premise that, in accordance with the aforementioned observations, parents want to cling to a deep-rooted custom prescribing equal access of children to family land upon inheritance. Altruism does not appear to be the key motivation guiding parental behavior: as documented in the aforecited studies, they often act out of a concern to receive care and remittances from their children. This is precisely the intuition of the strategic bequest theory: by making access to parental wealth conditional on the children's display of attention towards them, the parents can induce them to behave according to their own interests (Bernheim et al., 1985). The mechanism hinges upon the willingness of migrant children to safeguard their access to family land either because they plan to return to their native place upon retirement and/or because they need to insure against income shortfalls in the destination place. Of course, a premature return to the family farm would renew land pressure.

In the setup of the strategic bequest theory, bequest decisions are taken at the level of the household under conditions of complete private property rights in land. But these conditions may not always apply as witnessed by the existence of corporate ownership rights vested in rural communities in clan-based regions of Latin America, Asia and SubSaharan Africa. Land is then allocated to families which hold individualized use rights while the local community (or the extended family) re-apportions land when the demographic balance is modified or some individuals stop honoring their erstwhile obligations towards the community and thereby lose their membership status (Platteau, 2004, 2006). This is verified not only in African countries such as Madagascar (Di Roberto, 2020: Chap. 3), but also in Latin American countries such as Peru and Bolivia (Albó, 1988; Rasnake, 1988; de Vries, 2015; Godfrey-Wood and Mamani-Vargas, 2017). Communal obligations, which befall residents as well as migrants alike, typically consist of contributions to local public goods (building and maintenance of irrigation infrastructure, schools and rural roads), including the organization of collective events and feasts (for example, the ritual for the symbolic return of dead ancestors in Madagascar). In Latin American countries like Bolivia, Peru, and Mexico, these duties are known as "cargo".

Honoring the prescribed communal obligations is especially constraining for migrants who must bear not only transportation expenses but also the opportunity cost of labor resulting from their temporary absence from work at the place of destination. In Bolivia, for example, migrants often have to suspend their urban income-earning activities for one year or more to be able to comply with their duties in the community of origin (Lazar, 2008; Godfrey-Wood and Mamani-Vargas, 2017). To avoid performing these stringent duties themselves, they are allowed to pay a monetary compensation to local residents who will then act on their behalf. This attests to the changeability of the rules governing community membership as a function of migration. In Peru, an in-depth case study has documented the fact that because migrants have to meet financial obligations lest they should lose their land access rights, the cash resources available to the community studied have significantly increased in the wake of migration (de Vries, 2015). Another illustration of rule adaptability is the aforementioned observation that in our study area in Bolivia the requirements of the parents regarding the conditions of access to inheritance vary depending on their own role in the children's migration decision.

In communities possessing corporate land rights, an interesting two-pronged dilemma arises. The first part of the dilemma involves a choice problem that is well-known in public finance theory. By imposing a higher tax on the migrants, a community is able to extract a larger amount per contributing individual, but it also runs the risk of reducing the number of such individuals, as shown in de Vries (2015) for Lazar (2008) for Bolivia. As a result, the total amount collected may decrease. Viewed in this way, the problem of the community is simple: it should aim at maximizing the total revenue obtainable from the migrant population.

The problem becomes even more knotty when the effect of the communal tax on land availability is taken into account: the more migrants choose to forsake their inheritance rights because of excessive taxation, the larger the amount of land per capita available in the native location. If it internalizes this new effect, the community will impose a higher tax than the revenue-maximizing level, a tax perhaps so high that unlucky migrants will not be able to afford it. In other words, the individuals most in need of the insurance provided by continuous ties with the native community may well be deprived of it. This is a perverse effect insofar as corporate ownership is designed to equalize land access between unequally endowed families. It is in striking contrast to the equalizing effect of common property stressed in the works of Weitzman (1974), Jodha (1986), Baland and Platteau (1996), and Baland and François (2005).[1]

A last source of complexity stems from the fact that the decision of a child to preserve or forsake land inheritance rights is interlinked with the migration decision itself. In other words, the cost of maintaining ties with the native community and/or the risk of losing access to land inheritance are internalized when the migration decision is made. This has been empirically shown by de la Rupelle et al. (2008) and Mullan et al. (2011) for China, and by Valsecchi (2014) for Mexico. When the two decisions are interdependent, a high tax has two contrary effects on land availability: (1) discouraging migrants from keeping their land access rights, which has the effect of freeing land for those left behind, and (2) discouraging community members from migrating (since they anticipate the high cost of safeguarding their membership status), which has the opposite effect of maintaining land pressure. Whether the unequalizing paradox persists is not evident when this double effect is taken into account. Only an elaborate formalized argument can settle the issue.

The development of this argument, which is the central contribution of this paper, leads to the conclusion that, in the chosen setup, family heads may impose a communal tax sufficiently high to make unsuccessful migrants unable to pay for it, thus driving them to forfeit inheritance. This scenario is especially likely if the preference for rural public goods is low, farm output per capita is small, and the wages in the urban modern sector are high compared to those in the informal sector. In sum, exclusion from inheritance for unsuccessful migrants is a possible outcome, and our theory helps to precisely identify which parameters, and which ranges of the parameter values, play a crucial role in determining the existence of exclusion or inclusion at equilibrium. What bears emphasis is that the underlying mechanism explains how a customary rule – equal inheritance – gets transformed in response to the emergence of migration opportunities which community leaders or family heads are willing to exploit for the benefit of their groups.

The paper consists of two main sections. In Section 2, we document the unequalizing outcome with the help of first-hand evidence collected in the Bolivian Altiplano: we compare two types of communities, one in which corporate ownership exists and migrants' inheritance rights are conditional upon the discharging of collective duties (the payment of a communal tax), and the other in which more complete private property rights in land prevail and migrants' obligations are significantly lower. The main finding coming out of what is essentially a descriptive statistical analysis (with no claim to establishing causality) is that migration is associated to unequalizing inheritance, yet only in communities where land ownership is corporate rather than individualized. In these communities, poorer migrants with more unstable incomes are more likely to voluntarily forego their land inheritance. In Section 3, in an attempt to obtain a full grasp of the behavioral logic driving this result, we write a model in which, unlike in the existing literature, the decision to migrate is endogenized and made interdependent with the decision to pay the community tax. Besides showing that the unequalizing paradox is perfectly intelligible, we prove that the probability of its occurrence is especially high when urban growth is unaccompanied by rural development and when there are large income inequalities on the urban labor market. Section 4 concludes the paper.

2. Documenting the unequalizing paradox: Case study of the Bolivian Altiplano

2.1. Communal taxation

In the Bolivian Altiplano, structural elements of traditional Andean organizations are still prevalent today, and the pre-conquest legacy of communal decision making in land matters remains largely intact (Albó, 1988; Barragn et al., 2007). Neither the Spanish invaders nor the ruling hispanicized national elite of the post-revolutionary period were able to destroy the existing Indian communities. If Andean peasants accepted the legitimacy of the heavy tax and labor burdens imposed by the ruling classes, they never agreed to abandon their cultural heritage and their ethnic identities (Albó, 1988; Rasnake, 1988; Klein, 1992).

In particular, they maintained two institutions which are central vectors of social cohesion and genuine pillars of community life: the local assembly and a communal taxation system known as the cargo. Composed of the heads of the landholding families, the local assembly constitutes the highest level of local authority. It takes the most important decisions concerning work organization, administrative questions and relations with the outside world. Decisions are typically reached by consensus so as to enlist general support. Participation is very important and even mandatory in some places.

Cargo duties include the compulsory fulfillment of authority positions inside the community as well as mandatory labor and monetary contributions to community projects. They must be honored by family heads in return for land access. Authority positions are attributed following a rotation principle, and every family head is expected to assume different offices during his lifetime, ideally ascending the entire hierarchical ladder.[2] Important financial, labor and time costs are involved since authorities have to organize, and bear the expenses of, different festivities and rituals. Although the highest authority positions require almost continuous presence in the community, they are essentially seen as a service that should not bring private awards or advantages. In particular, the

[1] In their setup, a portion of the available land, typically of below-average quality, is earmarked as common property resource accessible by every member of the community. Assuming that member households are unequal in wealth, say because they possess larger or smaller privately apportioned landholdings or because they have different outside opportunities, it is argued that the poorer members use the common property resource as insurance while the richer ones do not need it.

[2] The rotation principle for high positions within the *ayllu* was established by the Spaniards after the rebellion of the 1780's led by chiefs coming from different parts of the Andeans. Before, high authority positions were attributed following the rule of hereditary succession while lower authority positions, such as those governing the organization of smaller *ayllu* units, were probably already attributed following a rotation rule (Rasnake, 1988).

prestige gains associated with cargo positions are comparatively small, so that members are understandably tempted to eschew them. However, most positions include important religious and ritual functions and the community therefore holds the right to take away land from any member who does not fulfill his communal obligations (Albó, 1988; Rasnake, 1988; Godfrey-Wood and Mamani-Vargas, 2017).

2.2. Land in ayllu communities and ex-haciendas

In the Bolivian Altiplano, the average area of a family farm is high: 19 hectares in our sample. Land productivity is nonetheless very low at high altitudes (4000 m above sea level), a consequence of the limited number of vegetables that can be cultivated under harsh weather conditions. Most households are thus confronted with problems of land scarcity.

As a matter of principle, land is held under corporate ownership, implying that households have private usefruct rights over the parcels allotted to them, and the right to rent or bequeath them. These rights, however, ultimately depend on community membership, an attribute that may be denied in some circumstances, such as when a member ceases to participate in the most important activities of the community or is unwilling to pay the communal tax. Following the tradition, corporate ownership allows a community to allocate land to (compliant) members according to needs.

Communities differ significantly in the extent to which they follow the above two rules of corporate land ownership and communal taxation. Traditional communities known as "ayllus", which exist since pre-colonial times, must be distinguished from "ex-haciendas", which emerged from the dissolution of the highland haciendas during the 1953 agrarian revolution. While land titles are collective in the ayllus, members of the ex-haciendas received individual titles over equally shared lands during the revolution.[3] These differences in land rights have given rise to important variations in the stringency and enforceability of the rules governing the collective taxation system. The threat of land confiscation is indeed much less credible in ex-haciendas than in ayllu communities, even though only a very limited number of present community members is still in possession of a valid land title. In our empirical exercise, we will exploit these historical differences between traditional ayllus and ex-haciendas to explore the link between land tenure rules and land access rights for (rural–urban) migrants.

2.3. The dataset

Data was collected at both sides of the migration link, at the level of the migrants and at the level of their communities of origin. Community surveys first took place in eight Aymara communities from October 2008 to February 2009, followed a year later by a survey of migrants in La Paz and El Alto during the same months.

The eight communities of our sample were selected based on their distance from La Paz, so as to maximize variation in the incidence of migration between villages. During the rural survey, data was collected at both community and household levels. Three communal figureheads, the head and two members of the local assembly, were queried about local norms regarding customary land rights, inheritance rules, migration, and governance structures in particular. Furthermore, 454 households were drawn at random, and the household head or his spouse were interviewed to elucidate inheritance practices, intra-household organization of land property and usufruct rights, children's migration experience, and their role in the inheritance decision process.

In a second step, the migrant children themselves were surveyed in La Paz and El Alto, the two main poles of attraction for the emigrants of the Altiplano. The corresponding sample is composed exclusively of individuals belonging to households investigated during the rural household survey. Tracing the migrants has proven an extremely difficult task because family members living in the communities of origin almost never knew the address of the migrants, whether children or siblings. In fact, we could meet only 354 of the 765 migrants declared as living in La Paz or El Alto by the sample rural households. With such an important attrition rate, we may fear the presence of a sample bias. Fortunately, based on information collected among family members in the communities of origin, Michels (2019a) shows that the missing migrants are not statistically different from those who could be interviewed during the second round, at least in regard of key aspects for our study. Among the interviewed migrants, detailed information was collected on their interest for, and involvement in, the family farm, their migration experience, and their working conditions in La Paz and El Alto.

2.4. Descriptive statistics

Because of difficult living conditions, many young adults chose, or were forced, to leave their native place. At the time of the survey, 84 percent of the families interviewed in the first round counted at least one migrant, and 57 percent of the children belonging to the sample households had migrated. With very few exceptions, migration is permanent: only 4 percent of the migrants remained in the city for less than twelve months. Still, almost 40 percent of them plan to move back to their community in some distant future. Migration starts at a rather young age (18 years on average) when migrants are not yet married (they set up their

[3] Owing to this radical redistribution moment, it is not possible to argue that land should be more unequally distributed in ex-haciendas than in traditional ayllu communities where corporate land ownership aims at equalizing landholdings. This is especially so because, as precisely argued in this paper, migration is susceptible of influencing land distribution and even creating more land inequality in ayllu communities. Ideally, we would have liked to assess the differential impact of migration on land distribution inside the two types of communities but, unfortunately, the panel data required for such an assessment are not available.

Table 1
Indicators of the migrant child's interest in land.

1. Migrant told parents s/he was not interested in inheriting land	13.03%
2. Migrant refused her (his) share of inheritance	6.97%
3. Migrant gave away her (his) share of inheritance	5.26%

families in the city of destination) and responsibility for the migration decision lies mainly with the migrants themselves (for 77 percent of them).[4]

Urban centers in Bolivia are the main destination for migrants: La Paz and El Alto alone attract 72 percent of the migrants of our sample.[5] Upon arrival almost all started to work immediately and, at the time of the survey, 54 percent were self-employed (out of whom 37 percent owned their business). The three main occupations for men are driver, builder and tailor while women work mainly as shopkeepers, stallholders or domestic servants. Average monthly earnings amount to 1350 bolivianos per month,[6] yet this average conceals important inequalities: the richest 10 percent earn more than 2560 bolivianos while the poorest 10 percent earn less than 400 bolivianos. Job security is relatively low: not only do most migrants work as self-employed in the informal sector but, even among those working for an employer, only 12 percent possess a written job contract. Job turnover is also relatively high: the average migrant has held three long-term jobs and a multitude of short-term employments. Moreover, 21 percent suffered from rather long spells of unemployment.

In this context of high uncertainty, guaranteed access to land in the native community provides a valuable fallback option. Yet, during the rural interviews, lack of interest in the family land on the part of migrant children was often deplored by family members and later confirmed in the interviews with a significant fraction of the migrants themselves. Thus, on their own admission, 13 percent of the migrants told their parents they were not interested in their share of the family land while 12 percent had either refused or given away the land bequeathed to them (see Table 1).

The decision to forsake land inheritance does not appear to be influenced by anticipations of disinheritance (Michels, 2019a). In other words, expressions of disinterest in family land are not an ex post justification or a way to suppress cognitive dissonance. Note that, perhaps surprisingly, there are no significant gender differences regarding perceptions of inheritance practices and the children's roles in the related decisions.

2.5. Econometric evidence

As a rule, we expect more successful or richer migrants to forsake their inheritance rights. Indeed, there are four plausible reasons why migrants may wish to hold on to their share of family land. First, they may plan to return to their native community at old age. As noted earlier, more than one-third of the respondents mentioned this motive. A huge majority of the migrants were living under in poverty in unplanned, often informal, badly serviced urban settlements. Moreover, interviews revealed feelings of imperfect integration in the urban society.[7] Consequently most held a glorified image of community life and were looking forward to returning to the community at old age. Second, migrants may wish to keep land in their communities because of the incomes obtained from its cultivation. Yet, because a portion of those incomes accrues to the caretakers of the land (typically, the siblings), and soil quality is very low in the Altiplano, this second motive does not appear to be strong. A third motive, already mentioned, rests on the insurance benefits that the community provides. Finally, the emergence of the Indianist movements after the election of Evo Morales as the first Indian President in 2005 entailed important political benefits for active members of indigenous rural communities. Community membership became a strategic manner of asserting an Indian cultural identity that payed off in the ongoing political game at the time of the survey.

Out of the four benefits, the first three suggest that migrants enjoying high and regular incomes (named successful migrants henceforth) should be less interested in retaining their bequest rights and their ties with the community. The fourth motive probably drives the opposite relationship, yet there is no evidence in our sample that it plays any significant role.

To assess the above hypothesis we estimate the following equation using a probit specification:

$$Refusal_{i,j} = \alpha + \beta_1 Income_i + \beta_2 Unemployment_i + \delta Y_i + \eta Z_j + \varepsilon_{i,j}$$

where the dependent variable, $Refusal_{i,j}$, is a dummy variable equal to 1 when one of the following situations are observed: (i) the migrant clearly expressed to his/her parents a disinterest in land bequest, (ii) s/he refused his/her share of land inheritance at the time of bequest, and (iii) s/he donated it. Success is measured along two dimensions: the level and security of incomes at the migrant's destination place. $Income_i$ is measured continuously on a monthly basis and job security is proxied by $Unemployment_i$, the total number of months a migrant has been unemployed. There are also two vectors of control: a vector of individual characteristics, Y_i, and a vector of family characteristics, Z_j.

[4] Note that in our sample, we have not observed a single case where a male/female household head lives in the city while the wife/husband stays in the community of origin along with the children.

[5] Important wage differentials also make neighboring South American countries such as Argentina, Chile and Brazil attractive for migrants from the Bolivian Altiplano and 7 percent of the migrants of our community sample chose to migrate to this second type of destination. Finally, surrounding communities constitute a third important destination for rural Bolivian migrants (14 percent).

[6] At the time of the survey the exchange rate was: 7 bolivianos = 1 US dollar.

[7] See also Ströbele-Gregor (1994) and Canessa (2000).

Table 2
Migrant's decision to forsake land bequest.

	All cties (1)	Ayllu (2)	Ex-Hac. (3)	Ayllu (4)	Ex-Hac. (5)
Income	−0.073	−0.470**	1.277***	−0.229	1.089***
	(0.101)	*(0.226)*	*(0.357)*	*(0.213)*	*(0.371)*
Women ∗ Income				−0.681***	0.180
				(0.355)	*(0.524)*
Unemployment	0.184**	0.469***	−0.909***	0.272***	−2.537***
	(0.078)	*(0.109)*	*(0.330)*	*(0.090)*	*(0.533)*
Women ∗ Unemp.				0.336*	2.469***
				(0.188)	*(0.657)*
Women	−0.191	0.315	−1.704***	0.515	−3.176***
	(0.216)	*(0.300)*	*(0.505)*	*(0.604)*	*(0.984)*
Controls[a]	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Cty. effects	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Nr. Obs.	289	187	102	187	102
Wald Chi²	68.13	90.98	1103.22	119.39	
Pseudo R²	0.20	0.3789	0.504	0.403	0.568

Robust standard errors clustered at family level between brackets.
*Significant at 10% level.
**Significant at 5% level.
***Significant at 1% level.
[a]Controls include a large array of variables, namely: distance, land size, land quality, age, marital status, years of education, birth order, nr. of siblings, houseownership, nr. of children, land tenure status of the spouse, identity of the person responsible for the migration decision, intention to return to the community, nr. of migration destinations, migration duration, father's migration status, ownership of durable goods, and nr. of sheep owned by parents.

At first sight, the results displayed in the first column of Table 2 come as a complete surprise: the coefficients associated to the length of unemployment spells and the income levels both have a counter-intuitive sign: positive and significant for the former and negative and non-significant for the latter. So far, however, we have ignored the institutional setup of rural communities, thus bypassing the role of communal taxation. As it became clear during the interviews, the decision to forsake land inheritance was generally motivated by the high costs involved in maintaining land rights. Hence, the relationship between the attitude towards land inheritance and migration success must be re-estimated with explicit allowance for this institutional dimension. Towards that purpose, we distinguish between ayllu and ex-hacienda communities since the communal tax system is only effectively enforced in ayllus. In these latter communities, the high costs associated to community membership might force the poorest migrants with less secure employment conditions to give up their land inheritance rights. On the contrary, in ex-hacienda communities where the communal tax on migrants is low, weakly enforced, or has disappeared, the opposite, intuitive relationships should be observed: those who most need a fallback option do keep their access to land open. Consequently, we expect a negative coefficient of β_1 and a positive coefficient of β_2 for ayllu communities, and the opposite for ex-hacienda communities. This is what we observe in our data (see Table 2, columns 2 and 3): a significant positive correlation between income and the proclivity to forsake inheritance in ex-haciendas, and the opposite relationship for ayllus. Thus, it seems that, in ayllus, a rise in income eases a liquidity constraint that prevents migrants from bearing the costs associated with community membership. This is particularly true for female migrants, as we can see in column 4: for them, the liquidity constraint appears to be a particularly strong determinant of their decision to forsake or accept land bequest.[8] According to this account, women are thus more vulnerable than men to income shocks in their migration destination. In ex-haciendas, because these transaction costs are much less significant, the liquidity constraint appears binding for neither female nor male migrants.

A second result concerns the job security variable, measured as the duration of unemployment spells: migrants who experienced longer spells of unemployment, so that they would give more value to the insurance provided by the community, have a lower probability to forego land inheritance, yet only in ex-haciendas (Table 2 column 3) and only for male migrants (Table 2 column 5). On the contrary, in the case of ayllu communities where fulfilling communal obligations is very costly (it may require leaving a job in the city for one year or more, as noted in Section 1), job security seems to encourage the preservation of inheritance rights, and vice-versa. A plausible mechanism is the following: migrants who have experienced long periods of unemployment may be more reluctant, once they are back to employment, to give up an urban income-earning activity for the sake of maintaining community membership. This effect is again especially strong for female migrants. Moreover, unemployed urban workers are on the constant lookout for a job and a long absence from the labor market is likely to reduce their chances of being employed and earning the

[8] The non-significant effect for male migrants may be due to our small sample size. It may also be caused by the strong patriarchal system prevailing in the area. Indeed, while men and women have strictly the same legal land rights, including the right to inherit, since the enactment of the 1996 INRA law, in actual practice the view continues to prevail that it is more important for a husband than for a wife to secure their land rights in the former's community of origin. Consequently, in the presence of a tight budget constraint households will more easily give precedence to the husband's land claim.

associated income. In other words, the idea that long spells of unemployment, because they entail low opportunity costs of labor, mitigates the cost of maintaining community membership and safeguarding inheritance, does not seem to apply well to a context of rural–urban (rather than rural-rural) migration.

Obviously, we cannot claim to have established causal relations between our dependent and explanatory variables. The effect of communal taxation might be confounded with that of other variables which differ between ayllus and ex-haciendas and might have a significant impact on the benefits of land inheritance. While we are able to control for some crucial variables, such as distance to the community of origin and family wealth (the two most important factors stressed by historians), we cannot rule out the existence of other significant omitted variables. Regarding the above two control variables, historians have argued that the colonizers chose to establish haciendas in less remote and more fertile land areas. If ayllus are thus more remote than ex-haciendas, the liquidity constraint operating in the former could just arise from the presence of significantly higher transaction costs. In this regard, it is fortunate that we have precise information about the amount of time needed to connect the destination location of each migrant and the family farm. This variable is more precise than measures of physical distance which ignore heterogeneity in the transportation means used. Furthermore, we have collected several measures of wealth including land size, land quality, and the number of sheep owned by the parents. This information allows us to control for the potentially higher benefits associated to landownership in the setup of ex-haciendas.

The restricted size of the sample, a consequence of the multi-faceted nature of the question under investigation, is another important drawback of the empirical analysis. It makes the study of heterogeneous effects especially difficult. Our empirical foray should therefore be viewed as a descriptive exercise that has enabled us to uncover thought-provoking and apparently counter-intuitive correlations for which a rigorous explanation will be proposed.

This being reckoned, we have collected two pieces of qualitative evidence that come in support of the mechanism behind our interpretation of the empirical evidence. They have been obtained from different actors. First, during our interviews in La Paz and El Alto, migrants, those from ayllu communities in particular, cited the high costs associated to landownership as the main reason behind their decision to forego land inheritance. Second, in a big meeting of chieftains from the Bolivian Altiplano in 2008, we heard representatives of ex-hacienda communities clearly express their dismay in the face of the noxious effects of migration. After stressing that migrants are often unwilling to fulfill communal duties and to bring their private landholdings under cultivation, they announced their intent to approach national authorities and ask them to consider the possibility of transforming the legal status of their communities from ex-hacienda to ayllu. The idea was to acquire the legal power to reimpose rules constraining the migrants to behave in ways compatible with the prosperity of their native communities. In essence, this meant a reversion from individual land titles to a corporate form of landownership.

In the following section, we shed light on our paradoxical finding: the interests of unsuccessful migrants may be harmed when they come from communities endowed with strong collective institutions and equality concerns. Because the interdependence between migration and inheritance decisions adds considerable complexity to the issue at hand, we need to write a rather intricate model capable of providing a consistent story for the paradox observed in ayllu communities but not in ex-haciendas.

3. A theory of migration and inheritance under corporate land ownership

3.1. The setup and the game structure

The central question to be elucidated is the following: under which conditions do ayllu communities, where corporate ownership of land (in the sense that access to land in a community is conditional upon membership) prevails, decide to charge so high a tax that unsuccessful migrants are deprived of inheritance? To be able to analyze it in a framework where migration is endogenous to access to inheritance, a number of simplifying assumptions are necessary at the level of the broad setup. First, we adopt a principal – agent setup in which the agents are children facing two decisions – whether to migrate and whether to pay the community tax-, and the principals are family heads who choose the tax level. Prior to migration, all the families have identical size and land endowment so that they necessarily agree on the tax which is uniform across the whole community.[9] By considering a representative family unit, we assume away all problems of aggregation of heterogeneous choices regarding the tax. An alternative way of circumventing the aggregation problem is by positing that the family is a clan or kinship network that coincides with the community and has a single authority at the top. Because the assumption of identical family units is admittedly strong, we will discuss how in communities where an assembly attended by all the family heads makes decisions democratically (one man one vote), family heterogeneity would affect the community tax level. This will be done after we have worked out the complex mechanics of the model.

Second, the tax is set by family heads at a uniform level. This is in contrast to the strategic bequest theory of Bernheim et al. (1985), which assumes that parents have perfect information about the income level of their children and decide the share of bequest deserved by each child in the light of this information and the attention provided. Parents are thus able to “finely tune” the bequest shares accruing to their children. However, the assumption of perfect information may not be realistic in migration situations where children are able to manipulate information in order to decrease their obligations vis-à-vis their family or community (McKenzie et al., 2013; Ambler, 2015; Michels, 2019b). True, community members can sometimes overcome this type of problem by relying on information networks at the destination (Chort et al., 2012). If not possible, they will probably be compelled to set a uniform

[9] We can alternatively assume that family units have varying size and land endowment but their land per capita ratio is identical. Under constant returns to scale, their situation would be identical and, therefore, they would choose the same taxation level.

attention level, which can be viewed as minimal obligations that migrants must meet in order to maintain their land access rights (Hoddinott, 1994). The latter solution best fits our context where (1°) parents have a poor knowledge of the incomes and even jobs of the migrant children, and (2°) urban networks do not fill the information gap by providing information (see Michels, 2019b for evidence).

We thus look at a representative family (or household) belonging to a rural community composed of k families. Each family is composed of 1 parental couple (called the head) and a set of children N of size n.[10] We consider two periods of time $t \in \{1, 2\}$. At the beginning of the first period, the n children decide whether to stay in their village v or to migrate to the city c. The subset of migrant children is of size m and is noted $M \subset N$. When taking the migration decision, children know that they might subsequently lose access to family land. Migration lasts 1 or 2 periods depending on the level of earnings drawn on the urban labor market, where high or low wage employments are randomly attributed at the beginning of each period. Faced with this uncertainty, some migrants may wish to avail themselves of the opportunity of returning to his/her village of origin if they have a bad draw on the urban labor market at the beginning of the second period. However, they are only entitled to return migration if they have paid the communal tax, X, in the first period. The communal tax is used to finance a local public good, G, consumed in the same period. The subset of migrants who paid the tax inside a family unit, called the contributing migrants, is of size pm where p is the proportion of contributing migrants. Among them, only those who had a bad draw on the urban labor market at the beginning of the second period will actually return to their community. Migrants who were unable or unwilling to pay the community tax in period 1 are denied this possibility.

Let us now describe the timing of the model in more detail:

Period 1:

1. At the beginning of period 1, the level of the communal tax for period 1, X, is set by the family head.
2. Each of the n children decides whether to migrate or not, anticipating that they will have to pay X if they want to maintain their access to land.
3. Migrants, $M \subset N$, observe their first period urban wage, w_1^i, $i = L, H$, and decide whether to pay X. If they do so, they belong to the set of contributing migrants who are eligible to return migration in period 2.
4. The family head and the remaining $(n - m)$ children share equally the income derived from the first period's farm production and consume the public good, G, financed by the tax proceeds obtained from the contributing migrants.

Period 2:

1. Migrants observe their second-period urban wage, w_2, and contributing migrants decide whether to avail themselves of their right to resettle in the native community. This determines the set of returnees..
2. The agricultural income of the second period is shared equally among the family head and on-the-farm children, including the returnees.

Note that while our principal–agent set-up is close to the strategic bequest model of Bernheim et al. (1985), it also differs from it in some important respects. First, we endogenize the migration decision, positing that children can anticipate the (uncertain) effects of migration on the availability of the return option. Second, contributions, which are set at a uniform level, are used to finance a local public good consumed by all residents. The whole community is therefore able to benefit from the successful migration experience of some of its members whereas in the bequest theory migrants pay individualized remittances to their own parents.

3.2. The utility functions

We assume that the agents' utility is additively separable across periods and they discount the future by a factor $\delta \in [0, 1]$. In each period, the agents' utility depends on their location $\{v, c\}$, v standing for village and c for city. Inside the village or community in period 1, agents derive utility from land and from the local public good, which is a flow of services, potentially attached to land but not necessarily. To reflect the higher cost of fulfilling communal duties for migrants, we assume that only the latter bear the costs of the public good. We also assume that the level of the tax, X, is positive ($X \geq 0$), implying that the parents may not offer monetary incentives to their migrant children in order to induce them to leave the family.[11] Finally, the children who decided to remain within their native community (family) automatically accept their due share of the family land upon which their daily livelihood depends. Consequently, they play no active role in the model.

Formally, in period 1, the utility level of a child staying in the village is given by:

$$u_{v1} = \frac{Q(.)}{1 + n - m} + \beta pmX$$

[10] The assumption of a continuum of children is justified by the fact that rural households are not nuclear families. Their average size in our sample is eight members. While most adult children leave their parental home upon marriage, they generally continue to work together on the (jointly held) family land until their parents' death.

[11] This assumption is in tune with our empirical material which shows that migration is almost always financed by the migrants themselves. Parents do not typically cover migration expenses. This said, migrants often rely on their family network upon arrival at the migration destination. Thus, most migrants (68%) stayed with a family member upon arrival in the city and 60% of those working for an employer found their first job through the family network.

The first term is the utility of using family land. Its numerator is the total output of the family farm, $Q(.)$, which depends on a (fixed) amount of land and on the total labor input applied to it. Its denominator is the total number of members entitled to an (equal) share of the output, that is, the family head and those children who stayed on the farm (that is, the total number of children, n, minus the number of migrants, m). We adopt the convenient assumption that farm production, $Q(.)$, is constant, which implies that the labor input is also constant (since the amount of land is fixed), regardless of the number of returning migrants. This assumption, made for the sake of simplicity, has been extensively discussed in a rather old literature dealing with disguised unemployment (Nurkse, 1953; Lewis, 1954; Sen, 1960; Berry and Soligo, 1968; Bliss and Stern, 1982).[12] It is admittedly strong, yet what matters for our purpose is that it conveys a sensible idea, namely that in a context of land scarcity farmers suffer a loss of individual income when a family member returns from migration. More conventional income-leisure preferences (with leisure a normal good) would also yield the desired outcome but the income loss would be smaller.[13]

The second component of u_{v1} stands for the public good benefit, assumed to be linear in the aggregate value of tax contributions (the farm income and the public good are substitutes). The number of contributors is equal to the number of taxpayers inside a family unit, pm, times the number of families composing the community, which we denote by k. The aggregate value of the taxes is therefore $pmkX$, where k (> 1) is constant while p, m, and X are endogenous.

The two components of u_{v1} are weighed: the implicit weight attached to the farm output is set to unity and that attached to the public good is given by γ with $0 < \gamma < 1$. Since the second component is thus written $\gamma pmkX$, it features two constant parameters which, for the sake of commodity, we collapse into a single composite parameter $\beta = \gamma k$, whose value can be smaller or larger than one. It will turn out that $\beta = 1$ is a critical value determining important results of the model. When this becomes clear, we will discuss the role of β and its two components.

In the city, the utility of a migrant i during period 1 depends positively on the current wage, net of subsistence consumption expenditures (assumed to be given), which we label $w_1^j \in \{w_t^L, w_t^H\}$, and negatively on the communal tax in the event that it is being paid:

$$u_{c1,i\notin P} = w_1^j$$
$$u_{c1,i\in P} = w_1^j - X$$

Wages are randomly assigned at the start of each period and the expected utilities are given by:

$$Eu_{m1,i\notin P} = (1-\pi)\,w_1^L + \pi.w_1^H$$
$$Eu_{m1,i\in P} = (1-\pi)\,w_1^L + \pi.w_1^H - X$$

where π corresponds to the probability for a migrant to find a highly paid job (with wage w_t^H) in any period. This probability is assumed to be identical in the two periods, which implies that the probability to find a good job in period 2 is independent of the realized state in period 1.[14] Even though the second-period urban wage is random and return migration can be seen as a form of insurance, agents are risk neutral. Although simplifying, this assumption is legitimate: the fallback option sets a lower bound on the migrant's second-period income (utility), which both reduces the variability and increases the mean of second-period income (utility). This effect is present in the model and suffices to produce a demand for insurance with desirable properties.[15]

In period 2, among the migrants who have a bad draw on the urban labor market, only those who paid the communal tax in period 1 are entitled to return to the community and cultivate a portion of the family land. Formally, in period 2, the migrants' utility is given by

$$Eu_{m2,i\notin P} = (1-\pi)\,w_2^L + \pi.w_2^H$$
$$Eu_{m2,i\in P} = (1-\pi)\,u_{v2} + \pi.w_2^H$$

with

$$u_{v2} = \left(\frac{Q}{1+(n-m)+p.m(1-\pi)}\right)$$

[12] From the literature, we learn that output remains invariant after the departure of one or more household members only when there is weak preference for leisure. Assuming constant returns to scale, household members then respond to the departure of one sibling, which causes per capita land availability and marginal labor productivity to increase, by raising their effort levels so as to exactly compensate the loss of the migrant's labor effort. As a result, total output, which depends on labor only (A is fixed), remains constant, and individual income increases. The same reasoning applies, *mutatis mutandis*, to the situation in which a member returns from migration and per capita land availability declines: individual income then decreases.

[13] With a standard utility function, when the land scarcity constraint is tightened as a consequence of return migration, family members respond by decreasing their individual effort level to such an extent that their individual income declines. Because the percentage decrease in individual effort is smaller than the increase in labor effort caused by the presence of one additional worker, total labor input L and total output $Q = Q(A, L)$ rise. Under weak preference for leisure, total labor input and total output are constant, causing the fall in individual income to be even more important. It will be actually easy to infer the direction in which our results should be adapted if Q were to vary according to the more conventional assumption.

[14] The frequency with which the migrant children are paid their wage income and make their tax payment is left outside the model. Employers could for example "advance" the wage of the worker at the beginning of each sub-period either in cash or in kind (lodging, food, ...) and work out the net income owed to the worker at the end of each of those subperiods.

[15] The term insurance will be used in the paper for legibility, but we acknowledge that this use is slightly abusive under risk neutrality. Insurance must be understood in the sense of benefits from a fallback option, which is the main purpose of return migration when migration fails.

where the denominator of u_{v2} is the total number of residents in the community in period 2, that is, the family head, the remaining children, $n - m$, and the migrant children who paid the tax and had a bad draw at the start of period 2, $p.m.(1 - \pi)$ with $0 \leq p \leq 1$. In defining Eu_{m2}, we focus attention on the insurance benefits of maintaining rights over family land, so that X can be viewed as a risk premium.[16]

Furthermore, we assume that all the services of the public good are consumed during period 1, so that the only benefit obtained by contributing migrants consists of the fallback option of resettling in the community during period 2. If future public good consumption would be an additional benefit expected by the migrants, there would be the possibility that all contributing migrants choose to return to the family farm in period 2. Such a prediction would not match the facts. Assuming away future public good benefits is not empirically groundless since the public good largely consists of collective events that are more or less instantaneously consumed. Finally, we assume that a migrant who receives a high wage in period 2 never decides to return to the family farm. If it were not true, a child would never opt for migration. We thus limit our attention to situations where land is sufficiently scarce to make migration potentially attractive (A is small enough).

We can now turn to the principal's problem. The family head, denoted f, is selfish and risk-neutral. If he were altruistic, he would never tolerate a situation in which the least successful (migrant) children would be deprived of their inheritance, which is the paradox we want to resolve. The assumption of risk neutrality considerably simplifies the analysis while, as will be explained later, the direction in which it influences the results can be predicted.

Like for the children, the utility of the family head is additively separable across periods and he uses the same discount factor. Similar to non migrant children, s/he derives utility from land and from the local public good, yet s/he retires from work in period 2. That makes him fully dependent on the children for his livelihood in that period. We assume that he obtains an income only if at least one child works on the family farm in period 2.[17]

Formally:

$$Eu_{f,m<n} = u_{v1} + \delta u_{v2}$$
$$Eu_{f,m=n} = u_{v1} + \delta (1 - \mu^n) u_{v2}$$

where μ is the probability that a particular migrant does not return to the community, so that $(1 - \mu^n)$ is the probability that at least one migrant returns. To make the problem interesting, we assume hereafter that there are at least two children in the family ($n \geq 2$).

3.3. The migrant children's problem: to pay the communal tax or not?

We solve the model backwards and start with the migrants' decision to pay the communal tax in period 1 upon observing their current wage. At this stage of the game, the set of migrants, M, and the level of the communal tax, X, are considered as given. Migrants pay the tax if the expected benefit, the value of the fallback option, exceeds the (certain) cost, which we call *the participation condition*:

$$X \leq (1 - \pi)\,\delta \left(\frac{Q}{1 + (n - m) + p(1 - \pi)m} - w_2^L \right) = \bar{X} \tag{1}$$

where $\bar{X}$ is the threshold value of X above which a migrant refuses to pay the tax and therefore loses her/his membership status in the community. Obviously, this condition is meaningful only if $\bar{X} > 0$, implying that $u_{v2} > w_2^L$, where u_{v2} is endogenous (it depends on the number of residents in the community in period 2, itself determined by the number of returnees, $p(1 - \pi)m$).

It is evident that $d\bar{X}/dA > 0$; $d\bar{X}/dm > 0$; $d\bar{X}/dw_2^L < 0$; $d\bar{X}/dn < 0$; $d\bar{X}/dp < 0$. All these results are according to intuition: the larger the land area and the higher the number of migrants in the family, the higher the maximum acceptable value of the tax; the higher the wage of a badly paid job in urban locations, the higher the total number of children in the family, and the higher the proportion of migrants who have paid the tax, the smaller that critical value. On the other hand, $d\bar{X}/d\pi$ cannot be signed.

To condition (1), we must add a budget constraint:

$$w_1^i \geq X,\ i = L, H \tag{2}$$

where, we recall, w_1^i is measured after subtracting subsistence consumption in the city in any period.

Migrants pay the tax if and only if both (1) and (2) are satisfied. If $X > w_1^L$, in particular, migrants who had a bad draw in period 1 cannot afford to pay the communal tax.

[16] There are other potential benefits, but we have chosen to ignore them in order to keep the problem as simple as possible. No additional insights would be gained by allowing for additional utility components.

[17] This assumption might appear rather strong, yet what matters for our purpose is that it conveys the idea that the parents cannot survive on the family farm at old age if all their children live in the city. In this case they would have to move to the city themselves, a prospect which they deeply fear, as our interview material has revealed.

3.4. The children's problem: to migrate or not?

Every child must decide whether to migrate or stay with their parents on the family farm. We model this decision as though all the children take it simultaneously. This approach allows us to simplify an already complex framework (children internalize the cost of maintaining land bequest rights) at a low cost. Our main interest lies in the number of children who decide to migrate (m out of n), not in the questions of the identity of the migrating children and the sequence in which they leave their native community. Still, the condition describing the migration decision is more complex than conventional expressions because in our model the children take account of X.

Two scenarios are especially interesting to discuss. The inclusive scenario occurs when the participation and budget conditions, (1) and (2) are satisfied for both types of migrants, those with a good and those with a bad draw in period 1. The exclusive scenario is observed when (1) is satisfied but (2) is violated for migrants with a bad draw. The scenarios where the participation condition (1) is not satisfied are less insightful and therefore transferred to Online Appendix 3.

The inclusive scenario

Calling X_I the equilibrium amount of the tax that achieves the inclusive outcome; Eu^I_{m2}, the expected second-period utility of a migrant child under the inclusive scenario and Eu^I_{v2}, the expected second-period utility of a child who works on the family farm under the same scenario, the condition for migration is:

$$\pi \left\{w^H_1 - X_I + \delta Eu^I_{m2}\right\} + (1-\pi)\left\{w^L_1 - X_I + \delta Eu^I_{m2}\right\} \geq Eu^I_{v1} + \delta Eu^I_{v2} \tag{3}$$

$$where\ Eu^I_{v1} = \frac{Q}{1+n-m_I} + \beta m_I X_I;\ Eu^I_{v2} = \frac{Q}{1+n-m_I\pi}$$

$$and\ Eu^I_{m2} = (1-\pi)\, Eu^I_{v2} + \pi w^H_2$$

The LHS is the expected income of a migrant while the RHS is the expected income of a non-migrant. Note that, by definition, $p = 1$ in the inclusive scenario since the participation and budget conditions are satisfied for all migrants, all of them pay the tax but only those with a bad draw period 2 return to the family farm.

exclusive scenario

With X_E the equilibrium tax level that achieves the exclusive outcome and Eu^E_{v2} the second-period expected utility of a child who lives in the community, the condition for migration under the exclusive scenario is:

$$\pi \left\{w^H_1 - X_E + \delta\left[(1-\pi)\, Eu^E_{v2} + \pi w^H_2\right]\right\} + (1-\pi)\left\{w^L_1 + \delta\left[(1-\pi)\, w^L_2 + \pi w^H_2\right]\right\}$$

$$\geq Eu^E_{v1} + \delta Eu^E_{v2} \tag{4}$$

$$where\ Eu^E_{v1} = \frac{Q}{1+n-m_E} + \pi\beta m_E X_E$$

$$and\ Eu^E_{v2} = \frac{Q}{1+n-m_E\,(1-(1-\pi)\pi)}$$

Under this scenario, and unlike under the previous one, migrants with a bad draw in both periods 1 and 2 are compelled to remain in their urban location in period 2 since only the migrants with a good draw in period 1 are able to pay the tax. Thus, under the exclusive scenario, $p = \pi$. Compared to the inclusive scenario, the amount of the public good produced is smaller for a given contribution X.

Under both scenarios, unfortunately, it is impossible to derive an explicit expression for the equilibrium number of migrants. However, it is easy to show that there exists an interval of X_i values such that $0 < m^*_i < n$ for $i = I, E$ (Appendix B). Furthermore, using the Implicit Function theorem, we can show that $\delta m^*_i / \delta X_i < 0$ for $i = I, E$. Whichever the scenario considered, the optimal number of migrants is decreasing in the level of the communal tax. Note that for the sake of simplicity, we will assume in the following that urban wages are identical across the two periods: $w^j_1 = w^j_2$ for $j = H, L$.

3.5. The family head's problem: setting the level of the tax

We can now turn to the problem of the family head. His utility depends upon the number of children who decided to migrate. Three situations, called regimes, are possible: two regimes, labeled a and c, refer to the two polar cases, $m_i = n$, and $m_i = 0$, for $i = I, E$, while regime b corresponds to the intermediary case $0 < m^i < n$. We write the head's utility function in three parts, labeled Eu^a_{fi}, Eu^b_{fi}, and Eu^c_{fi} (for $i = I, E$), depending upon which regime applies:

$$Eu^a_{fi} = \left[Q + \beta p_i n X_i\right] + \delta\left[1 - (\mu_i)^n\right]\frac{Q}{1 + p_i\,(1-\pi)\,n}\ if\ m_i = n;\ i = I, E \tag{5}$$

$$Eu^b_{fi} = \left(\frac{Q}{1+n-m_i} + \beta p_i m_i X_i\right) + \delta\frac{Q}{1 + \left(n - m_i\right) + p_i\,(1-\pi)\, m_i} \tag{6}$$

$$if\ 0 < m_i < n;\ i = I, E$$

$$Eu^c_{fi} = (1+\delta)\frac{Q}{n+1}\ if\ m_i = 0;\ i = I, E \quad (7)$$

where the probability that a child does not return to the community is $\mu_I = \pi$ under inclusion and $\mu_E = 1-\pi(1-\pi)$ under exclusion.

It is evident that $Eu^b_{fi} > Eu^c_{fi}$: the head will never set X_i such that all children are encouraged to stay on the family farm. Hence there exists an upper bound on the value of X_i. Next, we observe that Eu^a_{fi} is monotonically increasing in X_i, while the opposite is true for Eu^b_{fi} (see the proof in Appendix C). The border point between Regimes a and b is thus a global maximum (see Appendix B Eqs. (14) and (16) for the derivation of the corresponding threshold values of X_i). These properties hold whether the head chooses the exclusive or the inclusive scenario. Together with the corresponding liquidity constraint, the two global maxima, which we henceforth call the optimal Inclusion-Yielding Tax (IYT) and the optimal Exclusion-Yielding Tax (EYT) are written:

$$\tilde{X}_I = \frac{(1+\delta)\pi w^H + (1-\pi)w^L - [1+(1-\pi)n+\pi\delta]\frac{Q}{1+(1-\pi)n}}{1+\beta n} \quad (8)$$

$$X_I \le w^L$$

$$\tilde{X}_E = \frac{(1+\delta)\pi w^H + (1-\pi)\theta w^L - [1+\delta+(n-\delta)\Pi]\frac{Q}{1+\Pi n}}{\pi(1+\beta n)} \quad (9)$$

$$X_E > w^L$$

where the probability that a child has a good draw in period 1 followed by a bad draw in period 2 is denoted by $\Pi = \pi(1-\pi)$.

Furthermore, comparing the limit values of the head's utility in the neighborhood of $\tilde{X}_i$ for $i = I, E$, we find that $lim_{X \underset{<}{\to} \tilde{X}_i} Eu^a_{fi} < lim_{X \underset{>}{\to} \tilde{X}_i} Eu^b_{fi}$.[18] This implies that the optimal choice of the family head belongs to Regime b and that all the children except one are encouraged to migrate. Hence the following lemma:

Lemma 1. *The optimal choice of the family head is a tax level X set in the left neighborhood of the point separating Regime a ($m = n$) from Regime b ($0 < m < n$). At equilibrium all children except one are therefore induced to migrate. This holds true under both the inclusive and the exclusive scenarios.*

We also easily verify that under both scenarios, the optimal value of X_i increases with w^H and w^L whereas it decreases with Q and β. These findings are according to intuition. First, a rise in the wages on the urban labor market, w^H and w^L, enhances the incentive to migrate so that the head can extract larger tax contributions without discouraging migration. Second, when conditions inside the community are improved either because farm production is larger or the value of the public good is higher, the rewards for staying put are increased and the head must reduce the tax to induce some children to migrate. Finally, the effects of a variation in π or n cannot be signed unambiguously.[19]

From an inspection of Eqs. (8) and (9), it is impossible to say which optimal value of X exceeds the other: $\tilde{X}_I \gtreqless \tilde{X}_E$. However, by writing the explicit condition for $\tilde{X}_I < \tilde{X}_E$, we can gain useful insights which are summarized in Lemma 2 (see Appendix D for a proof and a discussion).

Lemma 2. *The EYT may be higher or smaller than the IYT at equilibrium. The former, more intuitive result, EYT>IYT, is obtained when the urban employment prospects are sufficiently attractive in the sense that w^H and/or w^L are sufficiently large relative to Q, and when π is not too low.*

Before addressing the central question of this paper, that is, to determine whether the parents have an interest in setting X in such a way that the budget constraint is violated for unsuccessful migrants, a third lemma needs to be stated:

Lemma 3. *At equilibrium, when the participation constraint is satisfied, the aggregate amount of the public good is always larger under inclusion than under exclusion.*[20]

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[18] This follows from the fact that $X \to \tilde{X}_i \Longleftrightarrow m \to n$ so that the limit value of U^b_i becomes:

$$\lim_{X \underset{>}{\to} \tilde{X}_i} U^b_i = \left(Q + \beta np\tilde{X}_i\right) + \delta\frac{Q}{1+p(1-\pi)n}\ i = I, E$$

When the above is compared to $lim_{X \underset{<}{\to} \tilde{X}_i} U^a_i$, it is immediately evident that the former value exceeds the latter.

[19] Regarding n, the ambiguity arises from the fact that two forces run into opposite directions: on the one hand, a higher number of children raises the level of the public good (hence the family head must lower X to induce children to migrate) and, on the other hand, it increases the number of claimants on farm output Q (with the opposite implication). The case of a variation in π is even more complex, because (almost) every term in the expressions for $\tilde{X}_I$ and $\tilde{X}_E$ are affected.

[20] To show this, we define the amount of the public good under inclusion and exclusion as $G_I = pmk\tilde{X}_I$ and $G_E = \pi pmk\tilde{X}_E$, respectively. By multiplying the RHS of (8) by nk, and the RHS of (9) by πnk, we obtain the difference between G_I and G_E, which can be transformed algebraically after using (8) and (9). We

The intuition is rather straightforward. If the participation condition is satisfied, all migrants would prefer to keep land in their community of origin since they are ready to pay the required tax. Yet, under the exclusive scenario migrants with a bad draw on the urban labor market are not able to safeguard their land rights. The expected utility of migration is consequently higher under the inclusive scenario than under the exclusive scenario. Since the equilibrium number of migrant children is the same under both scenarios, it follows that the expected utility of staying within the village must also be higher under the inclusive scenario than under the exclusive scenario. Hence, the head must provide a larger amount of public good under inclusion in order to keep the option of staying in the community sufficiently attractive for one child.

3.6. Equilibrium analysis: delimiting the possible cases

Let us first note that there is a single case in which the family head sets the tax at such a high level that the participation condition (1) is violated: when m_i is close to n ($n - m_i < \delta$) and β, the value of the public good is very low. In this case, the head chooses to deprive all the migrant children of their inheritance rights (see the proof in Online Appendix 3). In all the other instances, he chooses a tax that satisfies the participation condition. To sort out these remaining cases, we compare $\tilde{X}_I$ and $\tilde{X}_E$ to w^L which is assumed to be positive lest urban migrants with a bad draw should be unable to make a living. We then have six possible cases to consider depending upon whether $\tilde{X}_I$ exceeds $\tilde{X}_E$. However, in the light of Lemma 2, the cases where $\tilde{X}_I > \tilde{X}_E$ do not appear to be relevant to the context of poor and remote outmigration areas in which land is of low quality and subsistence hard to earn (Q is small relative to w^H). Their treatment is therefore relegated to Online Appendix 2.

The three following cases can then arise depending upon whether the equilibrium values of the EYT and IYT are higher or smaller than the low wage net of subsistence cost:

$$Case\,1:\;\; \tilde{X}_E > \tilde{X}_I > w^L;$$

$$Case\,2:\;\; \tilde{X}_E > w^L \geq \tilde{X}_I;$$

$$Case\,3:\;\; w^L \geq \tilde{X}_E > \tilde{X}_I$$

Case 2 is the canonical case where both the inclusive and exclusive equilibria are internally consistent in the following sense: the equilibrium value of the EYT is such that it exceeds the net income available to unsuccessful migrants while the equilibrium value of the IYT is smaller than this amount and is therefore affordable for those migrants. Cases 1 and 3 are cases of internal inconsistency in the sense that the budget constraint stated in (8) or (9) is violated. In Case 1, the optimal inclusive equilibrium cannot be reached because the unconstrained optimal tax under inclusion exceeds what an unsuccessful migrant can pay (a fortiori, the tax under exclusion is also unaffordable for such a migrant). In Case 3, the unconstrained optimal tax under exclusion is not large enough to deter an unsuccessful migrant from paying it.

In the following discussion, we do not consider Case 3, which is irrelevant in our context since w^L must be unrealistically high to obtain it. (Its study is shifted to Appendix H.) We also focus our attention on the situation closest to reality, namely the situation obtained when $\tilde{X}_I$ and $\tilde{X}_E$ are everywhere positive and the main concern of the parents is therefore to discourage migration with a view to retaining (one of) their children rather than to nudge them to leave the community.[21] The precise conditions under which $\tilde{X}_I$ and $\tilde{X}_E$ are everywhere positive and under which Cases 1, 2 (and 3) succeed each other are worked out in Appendix E. Less realistic settings in which these conditions are violated are analyzed in Online Appendix 1.

3.7. Equilibrium analysis: choosing between exclusion and inclusion

We start with the canonical case, labeled Case 2, in which both the inclusive and exclusive equilibria are internally consistent. Because of its importance for a good understanding of the logic driving our model, this case is presented in some detail below.

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then get:

$$\tilde{G}_I - \tilde{G}_E = \beta n\left(\tilde{X}_I - \pi \tilde{X}_E\right) = \frac{\delta(1-\pi)^2 nk}{1+\beta n}\left[\frac{Q(1+n)}{\psi} - w^L\right] \tag{10}$$

$$where\ \psi = [1 + (1-\pi)n]\,[1 + \pi(1-\pi)n],$$

This expression is positive when the participation condition holds: under that condition, the total amount of the public good is higher under inclusion than exclusion even when the tax is lower under the former.

[21] In other words, we are interested in situations where children are motivated to migrate although maintaining inheritance rights is costly, even when w^L is close to zero.

3.7.1. Case 2

We compare $Eu_f(\tilde{X}_I)$ and $Eu_f(\tilde{X}_E)$ defined as follows:

$$Eu_f(\tilde{X}_I) = \left(Q + \beta n \tilde{X}_I\right) + \delta \frac{Q}{1 + (1-\pi)n}$$

$$Eu_f(\tilde{X}_E) = \left(Q + \beta n \pi \tilde{X}_E\right) + \delta \frac{Q}{1 + (1-\pi)\pi n}$$

These two expressions are directly obtained from Eu^a_{fi}, recalling that $m_i \to n$ when $X_i \to \tilde{X}_i$ for $i = I, E$, while $p_I = 1$ (all migrants pay the tax) and $p_E = \pi$.

Bearing in mind that $G_I - G_E = \beta n \left(\tilde{X}_I - \pi \tilde{X}_E\right)$, the difference between $Eu_f(\tilde{X}_I)$ and $Eu_f(\tilde{X}_E)$ is equal to:

$$\Delta_2 = Eu_f(\tilde{X}_I) - Eu_f(\tilde{X}_E)$$

$$= (G_I - G_E) + \delta \left[\frac{Q}{1 + (1-\pi)n} - \frac{Q}{1 + (1-\pi)\pi n}\right] \quad (11)$$

While the sign of the first term on the RHS of (11) is positive by virtue of Lemma 3, the sign of the second term is obviously negative (during period 2, the family land (output) is shared among fewer children under exclusion since unsuccessful migrants do not return to their native community). The sign of Δ_2 therefore depends on the relative magnitudes of the two effects, the *public good effect* and the *output dilution effect*. This ambiguity reflects the trade-off between the cost and benefit of inclusion compared to exclusion: the cost is reflected in the greater dilution of farm domestic output (in period 2) while the benefit corresponds to the larger public good obtained when every migrant child contributes.

To uncover the conditions under which Δ_2 can be signed, let us work out (11) after replacing $G_I - G_E$ by its value given in (10) as derived in footnote 20. After some algebraic manipulations, this expression can be written simply as:

$$\Delta_2 = \frac{n\delta(1-\pi)^2}{1+\beta n}\left[\frac{Q}{\psi}(\beta - 1) - \beta w^L\right] \quad (12)$$

$$= \frac{n\delta(1-\pi)^2}{1+\beta n}\left[\beta\left(\frac{Q}{\psi} - w^L\right) - \frac{Q}{\psi}\right]$$

$$\text{where } \psi = [1 + (1-\pi)n][1 + \pi(1-\pi)n]$$

It is immediately apparent that $\Delta_2 < 0$, so that exclusion is preferred, when $\beta \le 1$ or $w^L > Q/\psi$. When these conditions are violated, the exclusive equilibrium can still prevail if $(\beta - 1)Q/\psi < \beta w^L$. Proposition 1 states these results:

Proposition 1. *In the canonical case where the inclusive and exclusive equilibria are both internally consistent:*

(i) The family head chooses the exclusive strategy if $\beta \le 1$, or $w^L > Q/\psi$, where $\psi = [1 + (1-\pi)n][1 + \pi(1-\pi)n]$. If these two sufficient conditions are violated, the relevant condition is $\beta w^L > (\beta - 1)Q/\psi$.

(ii) The family head opts for the inclusive strategy if $\beta w^L < (\beta - 1)Q/\psi$, which implies $\beta > 1$ as a necessary condition.

In words, exclusion obtains if the value of the public good is low, so that the output dilution effect dominates the public good effect, or if the value of the fallback option, that is, the return to work effort on the family land, is small compared to the urban wage obtained by unsuccessful migrants.[22] The intuition behind the latter condition is that the output dilution effect is strong when land scarcity makes marginal productivity of labor effort low on the family farm. Hence accommodation of unsuccessful migrants would be quite difficult.

Finally, we must verify that the condition for exclusion is a feasible outcome within the domain of the case considered. We find that Q must be relatively small compared to w^H (see Appendix F), which is not a very restrictive condition.

3.7.2. Case 1

Under Case 1, the inclusive equilibrium is no more internally consistent: the unconstrained equilibrium value of X_I, $\tilde{X}_I$, violates the budget constraint of migrants with a bad draw in period 1. The two possible choices available to the head are then: (i) to reduce the level of the IYT to $X_I^B = w^L$, so that the budget constraint binds; or (ii) to raise the tax so as achieve the optimum value of the EYT, $\tilde{X}_E$.

Proposition 2 summarizes the results obtained in this case (see Appendix G for the proof).

Proposition 2. *When the inclusive equilibrium is internally inconsistent and the exclusive equilibrium is internally consistent, the head may still choose to preserve the inheritance rights of all the children by setting $X_I^B = w^L$. However, s/he will do so only if (i) w^L is sufficiently high, (ii) w^H is sufficiently low, and (iii) $1 + \beta n > (1-\pi)\theta = (1-\pi)[1 + \delta(1-\pi)]$.*

[22] Regarding the first condition, bearing in mind that $\beta = \gamma k$, a lower value of the public good can stem from two different sources: a smaller weight attached to it in the child's utility function, or a smaller size of the community that reduces the amount of the public good produced. When these two effects combined are so strong as to cause γk to be smaller than one, exclusion is the family head's preferred strategy.

The central message to draw is the following: when w_L is very low, the inclusive scenario is very costly for the family head. On the one hand, contributions to the public good – equal to w^L – are very low. On the other hand, the second-period farm output has to be shared among a maximum number of family members. Both the public good effect and the output dilution effect work thus against the inclusive outcome. When w^L gets close to $\tilde{X}_I$, the inclusive option becomes attractive provided that the preference for the public good is sufficiently strong (βn is sufficiently high). Turning to the role of w^H, when its value is very high the incentives to migrate are very strong. As a consequence, the family head is able to extract a high level of taxes from the migrants, yet, only under exclusion since the tax level is constrained by w^L under inclusion. Clearly, inclusion is very costly when w^H is high.

We can now embark upon a comparative static analysis of variations in the key parameters of the model. Discussing the effects obtained will allow us to propose interpretations that shed light on the meaning of the three propositions above.

3.8. Comparative statics

In the following analysis, we focus on the setting where $\gamma k > 1$, since with $\gamma k < 1$ only exclusion is possible over the whole domains of Cases 1 and 2. We start with the impact of w^L, which is a pivotal variable in our model: it is featured in the migration decision, the profitability condition and the budget constraint. In addition, it plays a key role in defining the boundaries separating the Cases. We then proceed by analyzing the impact of variations in γ, and finally discuss together the effects of other variables. Note that the discussion involves traveling inside and across Cases 1 and 2.

EFFECT OF A VARIATION IN w^L

From Propositions 1 and 2, we infer the possibility of the following successions of outcomes in the domains of Cases 1 and 2:

Sequence 1: exclusion over the whole domain covering Cases 1 and 2;

Sequence 2: exclusion over Case 1 succeeded by inclusion over Case 2;

Sequence 3: exclusion followed by inclusion inside Case 1, succeeded by inclusion over Case 2;

Sequence 4: exclusion followed by inclusion inside Case 1, succeeded by exclusion over Case 2;

Sequence 5: exclusion followed by inclusion inside Case 1, succeeded by inclusion and then exclusion inside Case 2;

Sequence 6: exclusion inside Case 1 succeeded by inclusion and then exclusion again inside Case 2.

The central results that emerge from the above sequences are summarized in Proposition 3.

Proposition 3. *In many of the possible sequences of outcomes obtained with $\beta > 1$, the relationship between w^L and the outcome is non monotonous. The inclusive outcome is preferred for intermediate values of w^L while the exclusive strategy is always preferred for low values and may be preferred for high values. Under no scenario can the inclusive equilibrium prevail over the whole range of w^L values.*

To illustrate the mechanisms underlying Proposition 3, we limit ourselves to Sequence 5, the most complete among the six above sequences. As noted above, the choice between exclusion and inclusion involves two forces: the public good effect and the output dilution effect. The latter always works in favor of exclusion within the domain covered by Cases 1 and 2 since the farm output is always shared among fewer family members under that scenario.

When w^L is close to the subsistence level, we are under Case 1 and both the public good and the output dilution effects work against inclusion. Not only are contributions to the public good very small under inclusion (close to zero), but farm output in period 2 must be shared among a maximum number of family members.[23] Exclusion is thus preferred by the head. As w^L rises inside the domain of Case 1, and provided that the preference for the public good is sufficiently strong, the aggregate amount of the public good may become greater under inclusion than under exclusion.[24] Therefore, the above two effects run into opposite directions and inclusion may well become more attractive than inclusion.[25] This is true only up to a certain level, though. If w^L increases further and Case 2 comes to prevail, the inclusive equilibrium will be disrupted once $w^L > Q/\psi$. While the aggregate amount of public good is higher under inclusion at equilibrium, a catching up process occurs as w^L rises. As a matter of fact, an increase in w^L raises the migration incentives, enabling the family head to impose a higher tax on the migrants. This applies to both scenarios, but the effect is more pronounced under exclusion because w^L only affects the second-period income of the migrants under the exclusive scenario.

If w^L continues to increase, a point will necessarily be reached (at $w^L = Q/\psi$) from which the public good effect ($G_I - G_E$), which works against exclusion, becomes so small as to be outweighed by the output dilution effect, which works against inclusion. From that point onward, the exclusive scenario is again preferred by the head.

EFFECT OF A VARIATION IN β, WITH $\beta > 1$

A decrease in β, whether it stems from a lower weight assigned to public good consumption (γ), or a smaller size of the community (k), or both, favors exclusion. Within Cases 1 and 2, a decline in β reduces the domain of inclusion compared to exclusion (see

[23] When w^L is close to zero, it is furthermore possible that all children decide to migrate under inclusion since the costs of maintaining land rights, and consequently the level of the public good in the community, are then negligible.

[24] An increase in w^L allows the head to extract a larger amount of tax under both scenarios, yet the tax increase is not symmetric. Under inclusion, the tax increases at a constant rate determined by w^L, whereas under exclusion it increases at a rate equal to $\frac{(1-\pi)\theta}{\pi(1+\beta n)}$, as is evident from (9). When $\frac{(1-\pi)\theta}{\pi(1+\beta n)} < 1$, the tax increase is larger under inclusion, thereby enhancing the attractiveness of that strategy.

[25] The strategy reversal from exclusion to inclusion will occur once w^L comes close to $\tilde{X}_I$.

Appendix I for the proof).[26] A decrease in β lowers the value of the public good and enhances the importance of the family farm output, which makes the exclusive outcome more desirable.[27]

Before turning our attention to other comparative-static effects, a remark deserves to be made. In much of the existing economic literature, the safeguarding of inheritance rights is conditioned by the amount of voluntary individualized remittances rather than imposed uniform contributions to a local public good. Interestingly, the case where remittances are identical between children of the same family can be analyzed with the help of our model. We just need to set $k = 1$ (the community is reduced to a single family), so that $\beta = \gamma < 1$. Under this assumption, as we know, exclusion is the only possible equilibrium. The intuition is straightforward: since there is no genuine community-level public good, the family head is mainly interested in the component of his income derived from family farm production. Since this means that the output dilution effect is his/her main concern, s/he opts for an exclusive strategy. Hence the following proposition:

Proposition 4. *If the tax takes on the form of uniform remittances rather than uniform contributions to a community-level public good, the exclusive equilibrium is the only possible outcome.*

From the above proposition, we may infer that when individual remittances by migrants are added to their contributions to a local public good, the probability of inheritance exclusion is increased.[28]

EFFECT OF A VARIATION IN w^H

The effect of the wage obtained by successful migrants is equally non-ambiguous: an increase in w^H causes an enlargement of the area where the exclusive equilibrium prevails. The intuition, here, is the following: as w^H increases, the migration prospect improves and the family head is able to impose a higher tax without modifying the equilibrium number of migrants. If w^H is low enough to fall into the domain of Case 1, an increase in w^H will stimulate the provision of the public good but only under the exclusion scenario. This is because under the inclusion scenario the head is constrained to set the tax at the level just equal to w^L. A rise in w^H thus favors exclusion under Case 1. Under Case 2, by contrast, it has the effect of increasing symmetrically the amount of public good provided under both scenarios, so that neither the exclusive nor the inclusive scenario is favored. Finally, a rise in w^H causes a shift in the boundaries separating the different cases, and this shift enlarges the domain of exclusion (see Appendix I).

EFFECT OF A VARIATION IN Q

The effect of a variation in domestic production, Q, is again unambiguous: an increase in Q narrows down the space of exclusion. If Q is very low and we are under Case 2, a rise in Q involves two forces: the public good effect and the output dilution effect which run in opposite directions. Concerning the former, an increase in Q reinforces the incentive to stay on the family farm: the head then responds by decreasing the amount of the public good (which s/he achieves by lowering the tax) so as to restore the migration incentive back to the initial level. The decrease is stronger under exclusion because the family farm output is shared among fewer people.[29] On this count, the inclusive outcome becomes more advantageous. The second effect runs in the opposite direction: an increase in Q raises the weight of the family farm output in the head's utility and, since second-period family farm output per capita is lower under inclusion than under exclusion, this effect works in favor of exclusion. Because the former effect dominates the latter, the probability of inclusion increases with Q. If Q becomes high enough to fall into the domain of Case 1, a rise in Q continues to increase the weight of family farm output in the head's utility in the same way as under Case 2. Exclusion is consequently favored. But the public good effect becomes stronger still. As a matter of fact, an increase in Q decreases the amount of public good provided but only under exclusion. The reason is that the IYT (inclusion-yielding tax) is already below its optimal level. Since the public good effect again dominates the output dilution effect, inclusion is enhanced by a rise in Q.[30]

OTHER EFFECTS

Finally, it is impossible to derive any clear result about the effects of variations in π and n, which go into several directions and the net outcome of which depends on the initial values of π or n. Such indeterminacy is not really surprising since π is present at every stage of the model. It enters into the conditions for the migration decision, the decision to pay the tax (in the first period), and

[26] Note that a fall in β also affects the value of the frontier between Case 1 and Case 2 in such a way that the domain of Case 1 is enlarged (see Appendix I). This would increase the domain of inclusion if the inclusive outcome within Case 1 is followed by exclusion over the whole domain of Case 2. Yet, this is not true of Sequence 5 where the domain of inclusion encompasses the frontier between Case 1 and Case 2.

[27] Note that there is also a second, less important effect at work: a decrease in β dampens the incentives to stay inside the community, to which the family head responds by increasing the amount of the public good so as to keep a sufficient number of children (that is, one child) from migrating. Under Case 1, this effect will run in the same direction as the main effect and favor exclusion. Indeed, the head will exclusively raise the amount of public good under exclusion since he is constrained to set the tax at a level just equal to w^L under inclusion. As a result a decrease in β will increase the public good provision only under exclusion, thus favoring the latter strategy. Under Case 2, however, this secondary effect favors inclusion and hence runs in the opposite direction of the main effect. The fact is that under this case, the head is able to increase the level of the public good under both scenarios, but the increase will be larger under inclusion than under exclusion simply because the level of the public good is higher under that scenario. However, the secondary effect is dominated by the main effect, so that a decrease in β also promotes exclusion under Case 2.

[28] In our sample, migrant children sent an average of 374 bolivianos (one week of earnings) per year. This low level, however, conceals wide variations: 5 percent of our sample thus remitted more than one month of earnings while 10 percent sent less than 40 Bolivianos. In addition to these unconditional transfers, most migrants also supported their parents when they suffered a negative income shock (42% supported their parents in case of illness and 33% in case of a drought).

[29] There are three other less important mechanisms behind the public good effect which are detailed in Appendix D.

[30] Here again, there are other, more complicated effects resulting from the shift of the boundaries separating the different cases.

the decision to return or not to the family farm (in the second period). These various effects run into opposite directions.[31] As for the role of n, a higher number of children opens the possibility of larger contributory payments sent from the migration destination. At the same time, it raises the likelihood that there will be more return migrations in the second period, thereby increasing the pressure on the family land. The probability to migrate is also affected since this pressure is taken into account when the profitability of migration is assessed by the children.

Our last proposition summarizes the effects of the model parameters other than w^L:

Proposition 5. *The exclusive equilibrium is more likely to prevail over the inclusive equilibrium if β, or Q is small, or if w^H is high. The effects of π and n are indeterminate*

3.9. Remarks and extensions

The model is based on a number of assumptions. A first assumption is that the tax helps finance a public good. It has been relaxed in the discussion leading to Proposition 5.

A second assumption is risk-neutrality, especially regarding the family head. If s/he is risk-averse, our results are affected in a predictable manner. On the one hand, a risk-averse head would be more eager to keep one child on the family farm and would therefore attach a great weight to Regime c (no child migrates) relative to Regime a (in which all children migrate). This effect favors exclusion. On the other hand, a risk-averse head would like to avert the possibility of excessive return migrations, which would again tilt his/her preference in favor of the exclusive strategy compared to what would happen under risk-neutrality.

A third assumption is the independence of the probabilities of having a good draw in the two periods. Assume, on the contrary, that these probabilities are interdependent in the sense of being positively correlated. Thus, migrants with a good job in the first period have a higher chance of finding (or keeping) a good job in the second period. Knowing that an unsuccessful migrant child in the first period would be more likely to be unsuccessful in the second period and, therefore, more willing to return to the family farm if that possibility exists, the family head would try to limit this possibility by adopting an exclusive rather than an inclusive strategy. The problem is more tricky than it thus appears, however. Indeed, the migration decision itself will be affected by the interdependence of the probabilities and, moreover, the profitability condition (whether it is worth for the migrant to pay X) will now differ between successful and unsuccessful migrants. This condition would then become more difficult to ignore since in the new setup it would be more likely to be binding for the successful migrants.

Finally, we have assumed that member families are identical. In reality, we know that some families are better endowed with land than others. Our comparative statics shows that wealthy families will set a lower tax and opt for an inclusive inheritance strategy with a higher probability than would poorer families. The two types of families are therefore expected to disagree about the (uniform) tax level to be chosen in the community assembly. Two points need to be brought here. First, as we have seen in Section 3, we observe actual exclusion of poorer migrants in the traditional communities of the Bolivian Altiplano. This suggests that the tax level was set at a rather high level in these communities, thus apparently discarding the view that the choice of the richer families has prevailed. Second, if we had to allow for heterogeneous land endowments in our model, we would also have to permit that other variables than land differ between rich and poor families. In particular, the costs of migration are plausibly smaller for the former (say, because they are facing fewer liquidity constraints), and their children are arguably more educated. The effects of these wealth-dependent characteristics would be to raise the level of the optimal tax for the richer families. In other words, when account is taken of these characteristics, it is not clear any more that rich families would wish to set the tax at a lower level than poor families.

4. Conclusion

This paper has been triggered by the observation that the customary rule of equal inheritance may be modified in response to migration opportunities. In the Bolivian Altiplano, more specifically, we have observed that poor or unsuccessful migrant children may be more vulnerable to the risk of losing their right of inheritance to a share of the family land, which deprives them of an important source of social protection against bad luck on the labor market at the migration destination. This paradoxically happens in the context of a corporate land ownership system in which land access is conditional on membership status and that status is itself conditional on the payment of a community tax set at an uniform level for all migrants. Such a system is observed well beyond Bolivia, not only in other Latin American countries but also in Sub Saharan Africa and Asia.

To provide a reliable story about why in such a context poor and unsuccessful migrants may be excluded from land inheritance, we have written a model whose main novelty lies in the fact that the migration decision is endogenized. We confirm that rational family heads may set the community tax at such a level that unsuccessful migrants will not be able to pay it. Moreover, the conditions under which the exclusive equilibrium happens are not restrictive. Because the community tax is allocated to the production of local public goods, the unequalizing effect caused by the discrimination of unsuccessful migrants contrasts with an equalizing effect of the tax inside the community of (remaining) members.

[31] To illustrate, for a given level of X, the probability that migrant children will be able to afford the tax during the first period increases with π. Yet, on the other hand, the probability that they may have a bad job draw during the second period is correspondingly reduced, thereby diminishing their need to return to the family land. The probability of return migration is thus both higher and lower than before the change in π. In addition, the decision to migrate is positively influenced by a rise of π.

Some analytical results are complex in the sense that they point to non-monotonous relationships. In particular, as the urban wage in the event of a bad draw rises from an initially low level, the exclusive and inclusive equilibria may succeed each other in varied ways depending upon the parameter configurations. The exclusive equilibrium may thus be established for comparatively low and comparatively high values of that wage, and the inclusive equilibrium for intermediate values. What stands out is that in the various possible successions of equilibria the exclusive strategy tends to be more prevailing than the inclusive strategy so that the research question is somewhat overturned: it is inclusion rather than exclusion that needs to be explained.

For other parameters which play a role in the model, more straightforward results are obtained. Parents are more likely to prefer the exclusive to the inclusive strategy if: (i) the weight that they attach to the public good produced with the help of the migrants' contributory payments is lower, (ii) the size of the community of origin is smaller, (iii) the amount of output produced in the family farm is smaller; and (iv) the wage received by migrants in the event of a good draw on the urban labor market is higher. Linked to (i), the exclusive strategy is chosen by the parents if uniform remittances rather than uniform contributions to a local public good is the form taken by payments conditioning inheritance rights for migrants.

Finally, effects (iii) and (iv) point to important welfare and policy implications. First, while increased productivity of agriculture tends to favor inclusion, the opposite is true of patterns of economic growth yielding growing wages in the urban formal (modern) sector. In other words, urban growth unaccompanied by rural development may increase the vulnerability of unsuccessful migrants. Second, greater inequality in the urban labor market, reflected in lower wages in cases of a bad draw and higher wages in cases of a good draw, favors exclusion with the effect of further deepening inequality between rural migrants.

These results offer new insights that enrich our understanding of the economics of rural–urban migration by drawing attention to some of its indirect or side effects. In particular, they show the importance of looking at the situation in both the formal and informal segments of the urban economy if we are to make a correct assessment of the ability of rural–urban migrants to safeguard their fall-back option in their native community. Rather than appearing as being simply forced or goaded to return to their place of origin, unsuccessful migrants come out as doubly unfortunate in the sense that they are deprived of access to both good jobs in the city and to family land in the countryside. To counter this disequalizing effect, policies designed to reduce the wage gap within the urban sector, such as those promoting education and professional training (the path followed by a country like Taiwan, for example), may have the indirect beneficial effect of maintaining the inheritance rights of unsuccessful migrants. Here is a new feature of inclusive growth which has been so far largely ignored by economists in spite of its relevance.

Appendix A. Definitions

A *Scenario* indicates the type of inheritance strategy adopted by the parents (exclusion or inclusion).

A *Regime* denotes the type of migration pattern chosen by the parents (whether all children migrate, no child migrates, or at least one child migrates and at least one stays in the community).

A *Case* indicates whether the optimal cargo (under either exclusion of inclusion) violates the migrant's budget constraint.

A *Sequence* denotes the order in which inclusive and exclusive equilibria succeed to each other inside and through the Cases.

A *Setting* refers to an instance in which at least one of the non-negativity constraints on the EYT and IYT are binding

Appendix B. Existence of an interior solution for m_i

The conditions on X_i that yield corner solutions, $m_i = 0$ or $m_i = n$ for $i = I, E$, vary depending on whether we are in the inclusive or exclusive scenario.

Under the inclusive scenario, the conditions are directly obtained by substituting $m_I = 0$ or $m_I = n$ in (3), and extracting the threshold value of X_I:

$$m_I = 0 \; if \; X_I \geq (1+\delta)\pi w^H + (1-\pi)w^L - (1+\pi\delta)\frac{Q}{1+n} \tag{13}$$

$$m_I = n \; if \; X_I \leq \frac{(1+\delta)\pi w^H + (1-\pi)w^L - [1+(1-\pi)n+\pi\delta]\frac{Q}{1+(1-\pi)n}}{1+\beta n} \tag{14}$$

Similarly, under the exclusive scenario, after substituting $m_E = 0$ or $m_E = n$ in (4), we find:

$$m_E = 0 \; if \; X_E \geq (1+\delta)w^H + \frac{(1-\pi)}{\pi}\theta w^L - \frac{1+\delta(1-\Pi)}{\pi}\frac{Q}{1+n} \tag{15}$$

$$m_E = n \; if \; X_E \leq \frac{(1+\delta)\pi w^H + (1-\pi)\theta w^L - [1+\delta+(n-\delta)\Pi]\frac{Q}{1+\Pi n}}{\pi(1+\beta n)} \tag{16}$$

$$where \; \theta = 1+\delta(1-\pi); \; \Pi = \pi(1-\pi)$$

It is easily verified that the RHS of (13) is strictly larger than the RHS of (14). The same holds true when we compare the RHS of (15) and (16). Therefore, there exists an interval of X_i values such that $0 < m_i < n$ for $i = I, E$.

Appendix C. Global maximum of X_i

It is directly evident from Eq. (5) that Eu^a_{fi} increases with X_i for $i = I, E$. The relationship between Eu^b_{fi} and X_i is less straightforward since Eu^b_{fi} contains X_i and m_i (which varies with X_i). Note however that, under the inclusive scenario (the budget constraint is satisfied so that $p = 1$), the RHS of (3) is identical to Eu^b_{fI}. Therefore, we can rewrite Eu^b_{fI} as being equal to the LHS of (3) since the LHS and RHS are equal at equilibrium. After a few algebraic manipulations, the expected parental utility under Regime b in the inclusive scenario can be written as :

$$Eu^b_{fI} = (1+\delta)\,\pi w^H + (1-\pi)\left[w^L + \delta \frac{Q}{1+n-m_I\pi}\right] - X_I$$

Bearing in mind that m^*_I is decreasing in X_I, it becomes clear that Eu^b_{fI} is monotonically decreasing in X_I.

The above reasoning applies, *mutatis mutandis*, to the exclusive scenario (the budget constraint is violated for poor migrants). Using (4), we get:

$$Eu^b_{fE} = (1+\delta)\,\pi w^H + (1-\pi)\left[(1+\delta(1-\pi))\,w^L + \delta\pi \frac{Q}{1+n-m_E\mu_E}\right] - \pi.X_E$$

The functions Eu_{fI} and Eu_{fE} are thus discontinuous at the frontier between Regimes a and b: they monotonically increase till their frontier value is reached, respectively $\tilde{X}_I$ and $\tilde{X}_E$, above which they monotonically decrease.

Appendix D. Conditions for $\tilde{X}_I < \tilde{X}_E$

Whether the EYT, $\tilde{X}_E$, will exceed the IYT, $\tilde{X}_I$, depends on the level of the parameters of our model. Indeed, while the denominator is higher in $\tilde{X}_I$ than in $\tilde{X}_E$, we are not able to rank the numerator values. At first sight, this ambiguity looks strange as we expect the price of exclusion to exceed the price of inclusion, that is, the price that would enable all migrants to meet their cargo obligations. The mystery nevertheless vanishes as soon as we bear in mind that parents take the migration incentive of their children into account when they set the tax level. If the profitability condition is satisfied, the incentives to migrate are higher under inclusion than under exclusion. All migrants would indeed prefer to maintain their land rights in the community but some are prevented from doing so under the exclusive scenario, making migration less appealing under this scenario. Since the optimal number of migrants is identical under both scenarios, to counter the smaller benefits of migration under the exclusive scenario the parents must decrease the incentives to remain in the community. Towards that end, they reduce the amount of the local public good provided, making it lower than under inclusion. Note that since fewer migrants are contributors under exclusion, this does not necessarily imply that the equilibrium tax will also be lower under that scenario. Whether $\tilde{X}_I < \tilde{X}_E$ will depend on the values of our key parameters.

Formally,

$$\tilde{X}_I < \tilde{X}_E \Longleftrightarrow$$

$$w^L > Q\frac{1+\delta(1-\pi)+n(1-\pi)(1+\pi+n\pi+\delta)}{(1-\pi)(1+\delta)\,[1+(1-\pi)n]\,[1+(1-\pi)\pi n]} - \frac{\pi}{1-\pi}w^H \tag{17}$$

Note that, when π tends towards zero, it is always the case that (17) is violated: $\tilde{X}_I > \tilde{X}_E$. This result follows from the necessity to satisfy the profitability condition (1).[32] This means that the intuitive outcome according to which the equilibrium price of exclusion exceeds the equilibrium price of inclusion never occurs when the employment prospects in urban labor markets are very poor. On the contrary, as π tends towards 1, the intuitive outcome $\tilde{X}_I < \tilde{X}_E$ is obtained provided that $(1+\delta)\,w^H > Q$.[33] This outcome can also be obtained for values of π smaller than one provided that w^H is sufficiently large relative to Q.[34] Finally, it is straightforward to see that the outcome $\tilde{X}_I < \tilde{X}_E$ is more likely to be obtained if w^L is sufficiently large.

The intuition behind these results is as follows. When w^H increases, the incentive to migrate is improved whether the prevailing scenario is exclusive or inclusive. Moreover, the degree of improvement is identical between the two scenarios. To keep the same number of migrants as before, parents must compensate the increase in w^H by proportionately increasing the incentive to stay inside the community. The way to do this consists of raising the level of the public good consumed locally. Since there are fewer contributors under the exclusive scenario, the tax level must be raised to a larger extent under this scenario.

The effect of an increase in w^L is more complex since a variation of w^L affects migration incentives asymmetrically. A rise of w^L increases the migration incentive under both scenarios yet more under exclusion than under inclusion. Indeed, w^L enters in the second-period utility of migrants only under exclusion since a migrant child who had a bad draw in the two consecutive periods is then unable to return to his community and is thus forced to rely on the low wage. Under this scenario, any increase in the low wage therefore represents a better return on migration not only in the first but also in the second period. Such a second-period effect

32 When π tends towards 0, inequality (17) simply becomes: $w^L > Q(.)$. However, since the profitability condition (1) imposes that $w^L < Q(.)/1+n$ when π tends towards 0, the condition for $\tilde{X}_I < \tilde{X}_E$ is impossible to satisfy, hence $\tilde{X}_I > \tilde{X}_E$.

33 This is easily seen by multiplying both the LHS and the RHS of inequality (17) by $(1-\pi)$ and, then, calculating the limits when π tends towards 1.

34 It can easily be shown that the first derivative of the RHS of (17) with respect to π is negative if w^H is sufficiently large relative to $Q(.)$.

is not present under inclusion since the migrant is then able to use his fall-back option in the event of a bad draw in the second period. A rise in w^L will thus increase the migration incentive to a greater extent under exclusion than under inclusion, prompting the parents to raise the optimal tax accordingly. This effect is further enhanced by the smaller number of contributors. Note that it is immediately evident from (8) and (9) that $d\tilde{X}_E/dw^L > d\tilde{X}_I/dw^L$.

The mechanism underlying the effect of a change in Q is even more complicated because four effects come into play. First, an increase in Q enhances the incentive to stay in the community. To induce the optimal number of children to migrate the parents decrease the level of the public good provided in the community. This decrease will be bigger under exclusion since the family output is shared among fewer family members. As a result, the higher Q the lower $\tilde{X}_E$ compared to $\tilde{X}_I$. Second, since there are fewer contributors to the public good under exclusion, the ensuing tax decrease will be even more important. The third effect runs in the opposite direction. Migrants who had a good draw in period 1 and a bad draw in period 2 will return to work on the family land in the second period. A rise in Q will raise their second-period income, thereby improving their migration incentive. This improvement will be stronger under exclusion because the family land will then be shared among fewer siblings in period 2 . The tax level will therefore increase more under exclusion. Yet, it is easy to show that the first effect outweighs the latter, which is weighed down by a probabilistic parameter. The final effect concerns migrants who had a bad draw in two consecutive periods. Their migration incentives are positively affected through an increase of the value of their fallback option. However, this happens only under inclusion since migrants with a bad draw in the first period are not able to maintain their land rights under the exclusive scenario. The consequence is that the level of public good, and therefore the tax level, will be raised only under inclusion. The last effect therefore runs in the same direction as the former two effects: the higher Q the higher $\tilde{X}_I$ compared to $\tilde{X}_E$.

Appendix E. Sequence 5

The definitions of Cases 1, 2 and 3 suggest that, if a ranking of these cases in terms of w^L is possible, Case 1 ought to be succeeded by Case 2, and Case 2 by Case 3. The former shift takes place when w^L becomes greater than $\tilde{X}_I$ yet remains smaller than $\tilde{X}_E$, and the latter when w^L becomes greater than both $\tilde{X}_I$ and $\tilde{X}_E$. Let us first define the threshold value that separates Cases 1 and 2. It is obtained by substituting (8) in the condition $w^L = \tilde{X}_I$:

$$w^L_{1,2} = \frac{(1+\delta)\,\pi w^H - \frac{[1+(1-\pi)n+\delta\pi]Q}{1+(1-\pi)n}}{\pi + \beta n} \tag{18}$$

The second threshold, which defines the border between Cases 2 and 3, is obtained by substituting (9) into the condition $w^L = \tilde{X}_E$, which yields:

$$w^L_{2,3} = \frac{(1+\delta)\,\pi w^H - \frac{[(1+\delta)+(n-\delta)\Pi]Q}{1+\Pi n}}{\pi(1+\beta n) - (1-\pi)\,[1+\delta(1-\pi)]} \tag{19}$$

We can show that both $w^L_{1,2}$ and $w^L_{2,3}$ exist in the space where $w^L > 0$, so that $\tilde{X}_I$ and $\tilde{X}_E$ exist in the domain where $w^L \geq 0$, when $\pi(1+\beta n) > (1-\pi)\,[1+\delta(1-\pi)]$. When $w^L = 0$, (8) is equal to:

$$\frac{(1+\delta)\pi w^H - [1+(1-\pi)n+\pi\delta]\,\frac{Q}{1+(1-\pi)n}}{1+\beta n} \tag{20}$$

Therefore, when $w^L \geqq 0$, the condition $\tilde{X}_I \geq 0$ requires that the above expression is positive (since $\tilde{X}_I$ increases with w^L). In turn, this implies a fortiori that:

$$w^L_{1,2} = \frac{(1+\delta)\,\pi w^H - [1+(1-\pi)\,n+\delta\pi]\,\frac{Q}{1+(1-\pi)n}}{\pi+\beta n} > 0$$

To see this, first note that the numerator of $w^L_{1,2}$ is positive since it is actually higher than the numerator in (20) which is strictly positive. As the denominator is also positive, the whole expression is positive in the whole domain.

Furthermore, since $\tilde{X}_E > \tilde{X}_I$, the condition $\tilde{X}_I > 0$ when $w^L = 0$ implies that $\tilde{X}_E > 0$ if $w^L = 0$. Formally, by substituting (9) in $\tilde{X}_E > 0$ we have:

$$\frac{(1+\delta)\pi w^H - [1+\delta+(n-\delta)\Pi]\,\frac{Q}{1+\Pi n}}{\pi(1+\beta n)} > 0$$

This implies a fortiori that the numerator of the second threshold, $w^L_{2,3}$, is also positive. The sign of the ratio itself therefore depends on the sign of the denominator, that is,

$$w^L_{2,3} = \frac{(1+\delta)\,\pi w^H - \frac{[(1+\delta)+(n-\delta)\Pi]Q}{1+\Pi n}}{\pi(1+\beta n) - (1-\pi)\,[1+\delta(1-\pi)]} > 0$$

$$if\ \pi(1+\beta n) > (1-\pi)\,[1+\delta(1-\pi)]$$

This positive threshold value is higher than $w^L_{1,2}$ since $w^L_{2,3}$ is at the intersection between $\tilde{X}_E$ and w^L while $w^L_{1,2}$ is at the intersection between $\tilde{X}_I$ and w^L and $\tilde{X}_E > \tilde{X}_I$.

We can conclude that all three cases exist in the space where $w^L > 0$ and that Case 1 will be succeeded by Case 2, and Case 2 by Case 3, if $\tilde{X}_I$ is positive when w^L is equal to zero and $\pi(1+\beta n) > (1-\pi)\theta$ (with $\theta = 1+\delta(1-\pi)$). This corresponds to Sequence 1.1. On the other hand, if the first condition is met but not the second, only Cases 1 and 2 exist in the domain where $w^L > 0$, and this defines Sequence 1.2.

Appendix F. Case 2

Under Case 2, the condition to have an exclusive equilibrium is:
$w^L > (\beta - 1)\, Q/\beta\psi$ in some part of the interval of w^L values belonging to that case (see Proposition 4).

Provided that the denominator and the numerator of $w^L_{2,3}$ are both positive, and bearing in mind the definition of $w^L_{2,3}$, the combined condition writes:

$$(\gamma k - 1)\, Q/\beta\psi < w^L < w^L_{2,3} = \frac{(1+\delta)\,\pi w^H - \xi Q}{\pi(1+\beta n) - (1-\pi)\theta},$$

$$where\ \xi = \frac{(1+\delta) + (n-\delta)\Pi}{1+\Pi n};\ \Pi = \pi\,(1-\pi)\,;\ \theta = 1 + \delta(1-\pi)$$

It is easily verified that the interval exists for certain values of the parameters. Therefore, three possibilities arise under Case 2:

$$If\ \frac{(\beta-1)\,Q}{\beta\psi} < w^L_{1,2},\ exclusion\ prevails\ over\ the\ whole\ domain;$$

$$If\ w^L_{1,2} < \frac{(\beta-1)\,Q}{\beta\psi} < w^L < w^L_{2,3},\ inclusion\ is\ succeeded\ by\ exclusion;$$

$$If\ \frac{(\beta-1)\,Q}{\beta\psi} > w^L_{2,3},\ inclusion\ prevails\ over\ the\ whole\ domain.$$

Appendix G. Case 1

Under Case 1, the price of exclusion is higher than the price of inclusion, yet the inclusive equilibrium is not internally consistent (the budget constraint for unlucky migrants is violated). The two possible choices available to the parents are (i) to reduce the tax level so that the budget constraint binds; and (ii) to raise it so as achieve the optimum exclusion price. In other words, the comparison is between $Eu_f(X^B_I)$ and $Eu_f(\tilde{X}_E)$, where $Eu_f(X^B_I) = Eu_f(w^L)$ denotes the parental utility obtained when unlucky children are just able to pay the tax. The utility differential, labeled Δ^1 is written:

$$\Delta^1 = Eu_f(X^B_I) - Eu_f(\tilde{X}_E) \tag{21}$$

$$where\ Eu_f(X^B_I) = \left[Q + \beta n X^B_I\right] + \delta(1-\pi^n)\frac{Q}{1+(1-\pi)n}$$

We can then write:

$$\Delta^1 = \beta n\left(w^L - \pi \tilde{X}_E\right) + \delta\left[(1-\pi^n)\frac{Q}{1+(1-\pi)\,n} - \frac{Q}{1+\Pi n}\right] \tag{22}$$

It is easy to see that the second term of Δ^1 is negative by virtue of the fact that $\pi < 1$ (bear in mind that $\Pi = \pi\,(1-\pi)$). The sign of the first term is ambiguous, however. Let us begin the analysis by looking at the extreme case where $w^L \to C$, so that $X^B_I \to 0$. It then follows that the first term is also negative and $\Delta^1 < 0$. In words, when the income of unsuccessful migrants in the first period is close to the subsistence level, it is never in the interest of the parents to allow these children to maintain their land inheritance rights.

Let us now look at what happens when w^L exceeds 0 by a sensible margin. A necessary condition for $\Delta^1 > 0$ is that the first term in (22) increases monotonously with w^L ($\tilde{X}_E$ does not rise as fast as w^L) so that it eventually exceeds the second (negative) term. From inspection of (9), this is seen to happen if:

$$(1-\pi)\,[1+\delta\,(1-\pi)] = (1-\pi)\,\theta < 1 + \beta n, \tag{23}$$

which implies, in particular, that the weight attached to the public good is sufficiently high. Note, in particular, that, when $\beta > 1$, (23) is automatically satisfied (since $n > 2$ and $1 < \theta < 2$).

Let us now rewrite (22) after substituting the value of $\tilde{X}_E$:

$$\frac{\beta n}{1+\beta n}\left\{[(1+\beta n) - (1-\pi)\,\theta]\, w^L - (1+\delta)\,\pi w^H + \frac{B}{\beta n}\frac{Q}{\psi}\right\} \tag{24}$$

where

$$B = [(\beta n - \delta) + \beta n\,(n-\delta)\,\Pi]\,[1+(1-\pi)\,n] + \delta\,(1+\beta n)\,(1-\pi^n)\,(1+\Pi n)$$

Provided that (23) is satisfied, the sum of the first two terms in the above equation becomes positive above a certain level of w^L. Moreover, if $\beta n > \delta$, it follows that $B > 0$ and, therefore, the last term is also positive.[35] It can therefore be the case that Δ^1 becomes positive if the third term is not too large, that is, if w^H is not too high.

We have thus established that the inclusive outcome is a feasible equilibrium. What remains to be checked is that the condition for an equilibrium reversal can be satisfied within the domain of the case considered.

[35] It is easy to show that (23) implies $\gamma n k > \delta$ *if* $\delta > 1/(2+\pi)$, a condition that is automatically satisfied if $\pi > 1/2$.

The only possibility to have an inclusive equilibrium under Case 1 is when $\Delta^1 > 0$, and the associated threshold value of w^L belongs to the domain of Case 1. Bearing the definition of $w^L_{1,2}$ in mind, we write:

$$\frac{(1+\delta)\,\pi w^H - \frac{B}{\beta n}\frac{Q}{\psi}}{1+\gamma nk-(1-\pi)\,\theta} < w^L < \frac{(1+\delta)\,\pi w^H - \tau Q}{\pi+\beta n},$$

$$where\ \tau = \frac{1+(1-\pi)\,n+\delta\pi}{1+(1-\pi)\,n}$$

The lower bound corresponds to the condition $\Delta^1 > 0$ and has been derived by using (24). The upper bound establishes the condition $w^L < \widetilde{X}_I$ by using (8). It can be verified that the above interval exists for some values of our parameters.[36] We can therefore conclude that under Case 1 the exclusive equilibrium is either succeeded by the inclusive equilibrium as w^L goes above the lower threshold, or it prevails throughout the whole range of w^L values pertaining to that case.

Appendix H. Case 3

Under Case 3, the exclusive equilibrium is internally inconsistent (unlucky migrants could pay $\tilde{X}_E$). The parents can then choose between the inclusive equilibrium, $\tilde{X}_I$, and the exclusive strategy in which the budget constraint is just violated. The latter strategy is written: $X_E^B = w^L + \varepsilon$, where ε is infinitely small since parental utility is monotonously decreasing to the right of $\tilde{X}_E$ (see Lemma 1).

First note that X_E^B can belong to either Regime b (some children migrate and some stay in the family farm) or Regime c (no child migrates). Bearing in mind condition (15) that defines the threshold value of X_E for Regime c, we can state the condition under which X_E^B belongs to Regime c:

$$[(1+\theta)\pi-\theta]\,w^L \geq (1+\delta)\pi w^H + \pi\varepsilon - \frac{1+\delta\,(1-\Pi)\,Q}{1+n}$$

Assuming that the above condition is satisfied, we can write Δ^3 as follows:

$$\Delta^3 = Eu_f(\tilde{X}_I) - Eu_f(X_E^B) = \left\{ Q + \beta n\tilde{X}_I + \frac{\delta Q}{1+(1-\pi)n} \right\} - \frac{Q}{n+1}(1+\delta)$$

It is immediately evident that the above expression is always positive (the first term is greater than the fourth term), implying that parents always prefer to set an “inclusive tax”.

If condition (15) is violated, X_E^B belongs to Regime b, and Δ^3 is equal to:

$$\Delta^3 = Eu_f(\tilde{X}_I) - Eu_f(X_E^B) = \left\{ Q + \beta n\tilde{X} + \frac{\delta Q}{1+(1-\pi)n} \right\} \tag{25}$$

$$-\left\{ \frac{Q}{1+n-m_E} + \beta m_E\pi\left(w^L+\varepsilon\right) + \frac{\delta Q}{1+n-m_E+(1-\pi)\pi m_E} \right\}$$

It is impossible to derive an explicit expression for Δ^3 as defined in (25) since m_E depends upon X and the parameters of the model, and there is no way of specifying an explicit function for m_E. However, we can see that, if w^L is small enough to be close to $w^L_{2,3}$, then $X_E^B \longrightarrow \tilde{X}_E$, and

$$\lim_{X_E^B \underset{>}{\longrightarrow} \tilde{X}_E} \Delta^3 = Eu_f\left(\tilde{X}_I\right) - Eu_f\left(\tilde{X}_E\right)$$

If that limit expression is negative, we know that there exists a switching point below which the exclusive equilibrium is preferred (see our analysis of Case 2).

Furthermore, using the Implicit Function theorem, we show below that $d\Delta/dw^H < 0$, $d\Delta^3/d\beta > 0$ and $d\Delta^3/dQ > 0$. In other words, exclusion under Case 3 becomes more likely as w^H increases and when β or Q decreases.

To obtain the derivatives of Δ^3 with respect to w^H, Q, and β, we need first to compute the derivatives of m_E with respect to these parameters. Using (4) and replacing X_E by $w^L+\varepsilon$, we get:

$$(1+\delta)\,\pi w^H + (1-\pi)\,\theta w^L + \frac{\delta\pi\,(1-\pi)\,Q}{1+n-m_E\mu_E} - \pi(w^L+\varepsilon)$$

$$= \frac{Q}{1+n-m_E} + \pi\beta m_E X_E + \delta\frac{Q}{1+n-m_E\mu_E}$$

Let us call H the following expression:

$$H = (1+\delta)\,\pi w^H + (1-\pi)\,\theta w^L - \frac{\delta(1-\Pi)Q}{1+n-m_E\mu_E}$$

$$-\frac{Q}{1+n-m_E} - \pi(1+\beta m_E)(w^L+\varepsilon) = 0$$

[36] Bear in mind that the condition for inclusion, $(1-\pi)\,\theta < 1+\beta n$ (see Proposition 5), is automatically satisfied inside Sequence 1.

Consequently, we find:

$$\frac{dH}{dm_E} = -\frac{\delta(1-\Pi)^2 Q}{(1+n-m_E\mu_E)^2} - \frac{Q}{(1+n-m_E)^2} - \pi\beta(w^L+\varepsilon) < 0$$

$$\frac{dm_E}{dw^H} = -\frac{\frac{dH}{dw^H}}{\frac{dH}{dm_E}} > 0;\ \frac{dm_E}{d\beta} = -\frac{\frac{dH}{d\beta}}{\frac{dH}{dm_E}} < 0;\ \frac{dm_E}{dQ} = -\frac{\frac{dH}{dQ}}{\frac{dH}{dm_E}} < 0$$

In a second step we can compute the derivatives of Δ^3 with respect to w^H, Q, and β. We have :

$$\Delta^3 = \left\{ Q + \beta n\tilde{X}_I + \frac{\delta Q}{1+(1-\pi)n} \right\}$$
$$- \left\{ \frac{Q}{1+n-m_E} + \beta m_E \pi \left(w^L+\varepsilon\right) + \frac{\delta Q}{1+n-m_E(1-\Pi)} \right\}$$

Note that the second term of this equation is identical to the RHS of (4). Using this equivalence and substituting $\tilde{X}_I$ as given in (8), we can rewrite Δ^3 as:

$$Q + \beta n \left\{ \frac{(1+\delta)\pi w^H + (1-\pi)w^L - \frac{[1+(1-\pi)n+\pi\delta]Q}{1+(1-\pi)n}}{1+\beta n} \right\} + \frac{\delta Q}{1+(1-\pi)n}$$
$$-(1+\delta)\,\pi w^H - (1-\pi)\,\theta w^L - \delta\pi\,(1-\pi)\,\frac{Q}{1+n-m_E\mu_E} - \pi(w^L+\varepsilon)$$

We thus have:[37],

$$\frac{d\Delta^3}{dw^H} < 0;\ \frac{d\Delta^3}{d\beta} > 0;\ \frac{d\Delta^3}{dQ} > 0$$

We have thus established that the exclusive outcome will prevail in some part of the domain if $Lim\,\Delta^3 < 0$. However, it will be succeeded by the inclusive equilibrium. There are other conditions under which the same outcome may arise but we cannot express them in simple analytical form. What is guaranteed is that the sequence goes from exclusion to inclusion.

When the inclusive equilibrium is internally consistent but the exclusive equilibrium is not, the head can still opt for exclusion if $\beta < 1$, and w^L is small enough to be close to $\tilde{X}_2$ and high enough to exceed Q/ψ, where $\psi = [1+(1-\pi)\,n]\,[1+\pi\,(1-\pi)\,n]$ These are sufficient conditions, however.

The main message is as follows: when w^L is very high, the head must set the tax, X_E^B, at such a high level that every child would want to stay in the community. If w^L is small enough to be close to $\tilde{X_E}$, the number of migrants is close to $n-1$, the optimum. Furthermore, if w^L is large relative to Q/ψ and $\beta < 1$, we know from Proposition 1 that exclusion is the preferred outcome.

Appendix I. Comparative static effects on the domains of the cases

In Sequence 1, we observe exclusion over the entire domains of Cases 1 and 2. We write this sequence as (E, E). Once we look at what happens under Case 3, we see that it is actually part of two wider sequences, $G1$ and $G2$. In $G1$, exclusion prevails over the whole domain of Cases 1 and 2 *and inclusion over the whole domain of Case 3*. This wider sequence, (E, E, I), in which exclusion is obtained for $w^L \in [0, w^L_{2,3}]$, is henceforth labeled Sequence G1 (where G stands for more General). In $G1$, the domain under which we observe exclusion increases with $w^L_{2,3}$. Note, moreover, that

$$w^L_{2,3} = \frac{(1+\delta)\,\pi w^H - \frac{[(1+\delta)+(n-\delta)\Pi]Q}{1+\Pi n}}{\pi(1+\beta n) - (1-\pi)\,[1+\delta(1-\pi)]}$$

from which we find that[38]

$$\frac{dw^L_{2,3,}}{dQ} < 0;\ \frac{dw^L_{2,3}}{dw^H} > 0;\ \frac{dw^L_{2,3}}{d\beta} < 0$$

In words, exclusion increases with w^H and decreases with Q and β.

In $G2$, which we write (E, E, EI), exclusion over Cases 1 and 2 is followed by exclusion and then inclusion within Case 3. In $G2$, exclusion again increases with w^H and decreases with Q and β (see Case 3).

37 This is because $\Delta^3 = -\frac{(1+\delta)\pi w^H}{1+\gamma nk} + \frac{(1-\pi)\pi[\gamma nk-(1+\gamma nk)\theta]w^L}{1+\gamma nk} - \pi(w^L - C + \varepsilon) + \frac{[1+(1-\pi)n]\left[1+n-m_E(1-\Pi)-\delta\Pi\right]+\delta\left[1+n-m_E(1-\Pi)\right]+\delta\gamma nk(1-\pi)\left[(1-\pi)+(n-m_E)(1-\Pi)\right]}{(1+\gamma nk)[1+(1-\pi)n]\left[1+n-m_E(1-\Pi)\right]} Q(.)$

38 In our context we have $\pi(1+\gamma nk) > (1-\pi)\,[1+\delta(1-\pi)]$, and the sign of the first two derivatives is straightforward to find. The sign of the third derivative is:

$$\frac{\delta w^L_{2,3}}{\delta\gamma k} = \frac{-n\pi}{[\pi(1+\gamma nk)-(1-\pi)\theta]^2} \left[(1-\pi)\,\theta C + (1+\delta)\,\pi w^H - \frac{[(1+\delta)+(n-\delta)\Pi]\,Q(.)}{1+\Pi n} \right] < 0,$$

since a positive value of $\tilde{X_E}$ when $w^L = 0$ implies $(1+\delta)\pi w^H - [1+\delta+(n-\delta)\Pi]\,\frac{Q(.)}{1+\Pi n} > 0$.

Turning to Sequence 2, we know that it obtains when exclusion under Case 1 is succeeded by inclusion under Case 2. This is (E, I), which belongs to two wider sequences, $G3$ and $G4$. In $G3$, we have (E, I, I): exclusion in Case 1 is succeeded by inclusion over Cases 2 and 3, implying that exclusion is observed for $w^L \in [0, w^L_{1,2}]$. The domain under which we observe exclusion therefore increases with $w^L_{1,2}$.

Furthermore, since

$$w^L_{1,2} = \frac{(1+\delta)\,\pi w^H - \frac{[1+(1-\pi)n+\delta\pi]Q}{1+(1-\pi)n}}{\pi + \beta n}$$

and

$$\frac{dw^L_{1,2}}{dQ} < 0;\ \frac{dw^L_{1,2}}{dw^H} > 0;\ \frac{dw^L_{1,2}}{d\beta} < 0$$

exclusion expands with w^H and decreases with Q and β.[39]

The conclusion is exactly the same for Sequence $G4$, (E, I, EI), where exclusion in Case 1 is succeeded by inclusion over Case 2 and exclusion is followed by inclusion inside Case 3. Indeed, the effects on $w^L_{1,2}$ go in the same direction as those observed for Case 3.

Let us now considering Sequence 3, (EI, I), where exclusion is followed by inclusion inside Case 1, to be succeeded by inclusion over Case2. It is part of two wider sequences labeled $G5$ and $G6$. In $G5$, (EI, I, I), exclusion is followed by inclusion inside Case 1, succeeded by inclusion over Cases 2 and 3. Let us define R as the threshold value, in terms of w^L, that separates exclusion from inclusion within Case 1:

$$R = \frac{(1+\delta)\,\pi w^H - BQ/\psi\beta n}{1+\beta n-(1-\pi)\,\theta}$$

In this context, we observe exclusion for $w^L \in [0, R]$, and the domain under which we observe exclusion therefore increases with R. Since

$$\frac{dR}{dQ} < 0\ if\ B > 0;\ \frac{dR}{dw^H} > 0;\ \frac{dR}{d\beta} < 0,$$

we can conclude that exclusion increases with w^H and decrease with Q and β.[40]

The conclusion is again exactly the same for Sequence $G6$, (EI, I, EI), where exclusion is followed by inclusion inside Case 1 (exclusion for$w^L \in [0, R]$ within the domain of Case 1) to be succeeded by inclusion over Case 2 and by exclusion followed by inclusion over Case 3. As a matter of fact, the effects on R go in the same direction as those observed within Case 3.

The next step is to look at Sequence 4, (EI, E), where exclusion is followed by inclusion inside Case 1, succeeded by exclusion inside Case 2. It is part of two wider sequences, $G7$ and $G8$. In $G7$, (EI, E, EI),exclusion is followed by inclusion inside Case 1, to be succeeded by exclusion over Case 2, followed by exclusion and then inclusion inside Case 3. In $G7$, exclusion is observed for $w^L \in [0, R] \cup [w^L_{1,2}, w^L_{2,3}]$. In $G8$, (EI, E, I), exclusion is followed by inclusion inside Case 1, to be succeeded by exclusion over Case 2, and then inclusion over the whole Case 3. Under both $G7$ and $G8$, exclusion increases with w^H and decreases with Q if the distance between R and $w^L_{1,2}$ decreases with w^H and increases with Q. This holds true irrespective of the sequence within Case 3 since the effects on $w^L_{2,3}$ go in the same direction as those observed for Case 3.

We find that

$$\frac{dR}{dw^H} = \frac{(1+\delta)\pi}{1+\beta n-(1-\pi)\,\theta} > \frac{dw^L_{1,2}}{dw^H} = \frac{(1+\delta)\pi}{\pi+\beta n}$$

since $\pi + \beta n > 1 + \beta n - (1-\pi)\,\theta$. Exclusion thus increases with w^H.

Moreover, it comes out that:

$$\frac{dR}{dQ} = \frac{-B/\psi\beta n}{1+\beta n-(1-\pi)\,\theta} < \frac{dw^L_{1,2}}{dQ} = \frac{-\frac{[1+(1-\pi)n+\delta\pi]}{1+(1-\pi)n}}{\pi+\beta n}$$

This is because:

$$R = \frac{(1+\delta)\,\pi w^H - BQ/\psi\beta n}{1+\beta n-(1-\pi)\,\theta} < w^L_{1,2}$$

$$with\ w^L_{1,2} = \frac{(1+\delta)\,\pi w^H - \frac{[1+(1-\pi)n+\delta\pi]Q}{1+(1-\pi)n}}{\pi+\beta n}$$

39 Concerning the third derivative, we have:

$$\frac{\delta w^L_{1,2}}{\delta\gamma k} = \frac{-n}{(\pi+\gamma nk)^2}\left[(1-\pi)\,C + (1+\delta)\,\pi w^H - \frac{[1+(1-\pi)\,n+\delta\pi]\,Q(.)}{1+(1-\pi)\,n}\right] < 0$$

since a positive value of $\tilde{X}_I$ when $w^L = 0$ implies $\frac{(1+\delta)\pi w^H - [1+(1-\pi)n+\pi\delta]\frac{Q(.)}{1+(1-\pi)n}}{1+\gamma nk} > 0$.

40 We have $\frac{\delta R}{\delta\gamma k} = \frac{-n}{(1+\gamma nk-(1-\pi)\theta)^2}\left[(1-\pi)\,\theta C + (1+\delta)\,\pi w^H - BQ/\psi\right]$. Moreover, we know that G will be positive even if $C = O$ since Δ^1 is negative for values of $w^L \leq 0$ irrespective of C. This implies that $(1+\delta)\,\pi w^H - BQ/\psi \geq 0$ and, consequently, $(1-\pi)\,\theta C + (1+\delta)\,\pi w^H - BQ/\psi \geq 0$.

As a result, since $\pi + \beta n > 1 + \beta n - (1-\pi)\theta$, we can deduce that

$$-BQ/\psi < -\frac{[1+(1-\pi)n+\delta\pi]Q}{1+(1-\pi)n}$$

We can therefore conclude that exclusion decreases with Q. Concerning β, if we observe inclusion over the whole domain of Case 3, exclusion decreases with a rise in β if the distance between $w^L_{1,2}$ and $w^L_{2,3}$ is reduced (bear in mind that R has been shown to be decreasing with β). We have:

$$\frac{dw^L_{1,2}}{d\beta} = \frac{-n}{(\pi+\beta n)}\left[w^L_{1,2}\right];$$

$$\frac{dw^L_{2,3}}{d\beta} = \frac{-n\pi}{\pi(1+\beta n)-(1-\pi)\theta}\left[w^L_{2,3}\right]$$

Since $w^L_{1,2} < w^L_{2,3}$ and since $\frac{1}{(\pi+\beta n)} < \frac{\pi}{\pi(1+\beta n)-(1-\pi)\theta}$, it follows that $\frac{dw^L_{1,2}}{d\beta} > \frac{dw^L_{2,3}}{d\beta}$. Therefore, exclusion decreases with β.

But, if we observe exclusion followed by inclusion within Case 3 (Sequence $G8$), we are not able to show the effect of β on exclusion since it is impossible to compute an explicit form for the switching point within Case 3.

Next, we look at Sequence 5, (EI, IE), where exclusion is followed by inclusion inside Case 1, succeeded by inclusion and then exclusion inside Case 2. It belongs to two wider sequences, $G9$ and $G10$. In $G9$, $(EI, IE$,EI), exclusion is followed by inclusion inside Case 1, succeeded by inclusion and then exclusion inside Case 2 and by exclusion and then inclusion inside Case 3. We thus observe exclusion for $w^L \in [0, R] \cup [(\beta-1)Q/\beta\psi, w^L_{2,3}]$.

We have shown above that R and $w^L_{2,3}$ increase with w^H. Because $(\beta-1)Q/\beta\psi$ is independent of w^H, we can conclude that exclusion increases with w^H. We have also shown that R and $w^L_{2,3}$ decrease with β and Q. Since $(\beta-1)Q/\beta\psi$ increases with β and Q, exclusion decreases with a rise in β and Q.[41]

The conclusion is again exactly the same for Sequence $G10$, $(EI, IE$,I), where exclusion is followed by inclusion inside Case 1, to be succeeded by inclusion and then exclusion inside Case 2, and finally by inclusion over Case 3 (since the effects on $w^L_{2,3}$ go in the same direction as those observed for Case 3).

Finally, Sequence 6, (E, IE), where exclusion inside Case 1 is followed by inclusion and then exclusion inside Case 2, belongs to two wider sequences, $G11$ and $G12$. In $G11$, (E, IE, I), exclusion over Case 1 is succeeded by inclusion and then exclusion inside Case 2, followed by inclusion inside the whole of Case 3. That is, exclusion is observed for $w^L \in [0, w^L_{1,2}] \cup [(\beta-1)Q/\beta\psi, w^L_{2,3}]$. We see that exclusion increases with w^H and decreases with Q and β if the distance between $w^L_{1,2}$ and $(\beta-1)Q/\beta\psi$ decreases with w^H and increases with Q and β. This also holds true for $G12$, (E, IE, EI), where exclusion over Case 1 is succeeded by inclusion and then exclusion inside Case 2, followed by exclusion and then inclusion inside Case 3. This is because since the effects on $w^L_{2,3}$ go in the same direction as those observed for Case 3. We have shown above that $w^L_{1,2}$ increases with w^H. Because $(\beta-1)Q/\beta\psi$ is independent of w^H, we can conclude that exclusion increases with w^H. We have also shown that $w^L_{1,2}$ decreases, and $(\beta-1)Q/\beta\psi$ increases, with β and Q. As a result, the scope of exclusion is reduced as the values of these two parameters become higher.

Appendix J. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.jce.2023.07.001.

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[41] Note that $\gamma k > 1$ is a necessary condition to observe these relationships.

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