Agricultural Production and Conflict Refugee Status: Quasi-Experimental Evidence from a Policy Intervention Programme in Rwanda*

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Abstract

This study uses Rwandan household survey data to evaluate the impact of conflict-induced migration on agricultural productivity, as well as to assess the effect of the Rwandan government's housing and land redistribution policy. The hypothesis that the policy improved output by a pure resource effect is tested against a human capital spill-over effect hypothesis. Time differentials in the implementation of the policy across villages are used to assess its impact, despite the absence of repeated cross-sections. The findings suggest that the policy was successful in raising migrants' agricultural production, mainly by increasing access to land. No evidence is found in favour of an increase in returnees' productivity in policy areas, although returnees in these areas are found to benefit from having access to agricultural extension services.

1 Introduction

An impressive body of literature has recently emerged on the topic of civil conflicts, their causes, and the linkage between peace and a country's socioeconomic performance. This research suggests the existence of a positive relationship between economic under-performance and the likelihood of civil strife (Collier 2003). The incidence of civil conflict is particularly strong in African

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substistence economies. However, the impact of civil strife on agricultural productivity at the household level in LDCs has not been tackled in the literature. The present study argues that this is an important feature to take into account when assessing the cost of civil strife on subsistence economies, as their economy consists mainly of subsistence agricultural households, and aggregation of wealth indicators at the macroeconomic level fails to account for this. Such households seldom have access to credit and live mostly on auto-consumption, hence having virtually no impact on consumption and credit figures. However, as they represent in most cases the major part of the population, long term economic performance is tied to their activities.

Rwanda has experienced sustained waves of ethnic violence since 1959, with a climax in the intensity of killings in 1994. These episodes of civil strife lead to massive population displacements, either within Rwandan borders, or in the border countries. As the Rwandan conflict has lasted for over thirty years, some of the displaced were left in camps without economic prospects for long periods of time. In some cases, only their children, born in camps, ever returned to Rwanda. This study argues that these long periods of inactivity may have negative impacts on productivity, either through skill depreciation, or by discouraging and leaving scars on this part of the population. Therefore, it is of interest to try and isolate the impact of this potential loss of human capital on returnees' agricultural productivity relative to stayers', which would contribute to assessing the economic cost of conflict at a microeconomic level.

In Rwanda, land has a critical role in society, insofar as most households' survival depends on it. The legislation defining and enforcing access to land in Rwanda is complex and has undergone numerous changes over the past decades[1]. Conflict-induced waves of displacement after 1994 resulted in a land and housing crisis, which threatened to trigger more violent outbursts. Indeed, the population density in Rwanda is one of the highest in the world, and these migrations put more strain on the demand for land. In 1997, a policy was implemented by the government aimed at reducing land-related tensions. Policy-makers also hoped that this redistribution exercise would lead to increased agricultural productivity, by grouping plots and encouraging the use of more intensive methods of cropping. The chosen pattern of settlement to be implemented was to agglomerate houses within already existing Rwandan villages, hence creating less scattered versions of the traditional Rwandan communes, the so-called 'imidugudu', the Kinyarwanda word for agglomeration. Imidugudu inhabitants would then be allocated a parcel of land within large fields, which were not necessarily positioned side-by-side with the settlement. This plan was mainly motivated by security issues, as the government believed the size of the new settlements would deter rebel groups from attacking. Given the government was faced with a tight budgetary constraint, the policy was first implemented in some villages, with the aim to extend it nationwide when possible. Hence, at the time of data collection, both policy and non-policy areas were surveyed. These time differentials in the

[1] Explaining and summarising all these changes is not the aim of this study, and would only be superfluous in this setting. However, for a comprehensive report on the topic, cf. Andre (Andre 1998).

implementation of the policy are used to assess its impact, despite the absence of repeated cross-sections, by employing a 'quasi-experimental' difference-in-difference analysis to compare the economic performance of those affected by the policy and those not.

The first section gives some background historical information on Rwanda, the villagisation policy, and proposes general motivations for this study. In the second part, a brief review of the literature in related topics is presented. The third part describes a general agricultural household model, and a theoretical discussion on its potential application in the study of Rwandan households. The data and the variables of interest are introduced in a fourth section. Finally, we present the empirical results, consisting of an overall appraisal of the impact of conflict-induced migration and the villagisation policy on agricultural productivity, first using a simple difference model specification, then through a difference in difference identification strategy.

2 The Rwandan case

Rwanda has experienced sustained waves of ethnic violence since its independence was proclaimed in 1959. In 1994, the extremist Hutu militia, partly helped by the military forces, committed a genocide against the minority ethnic group, the Tutsis, and moderate Hutus. These episodes of civil strife lead to massive population displacements, and part[2] of the population was stranded in refugee camps, either within Rwandan borders, or in the border countries, Burundi, the Democratic Republic of Congo (DRC), Tanzania, and Uganda. Finding reliable information on the intensity of the displacements that occurred in 1959 is virtually impossible, since no precise records were held. A working-paper by the Rwandan National Office for Population (ONAPO) reports 300 000 (Bucagu 2000). However, this same source quotes that over a million pre-1994 refugees have returned to Rwanda after 1994, which include children and grand-children of the 1959 refugees.

After the genocide, the Rwandan Patriotic Front (RPF), principally formed of Tutsis who had been exiled in Uganda in the late 1950s or early 1960s, formed a transitory government. Fearing retaliation from the new government, most of the perpetrators of the killings fled into Hutu refugee camps on the DRC border with Rwanda. In 1996 the RPF, still in power in Rwanda, lead an assault on these camps, encouraging Tutsi and Hutu refugees to return to Rwanda. Genocide perpetrators seized the opportunity to return to Rwanda hidden in the mass of refugees. Once back, they committed further killings and persecutions in the Northwest of the country (in Ruhengeri particularly). In turn, these assaults caused the national army to deploy in these areas, leading to renewed displacements. Thus, the housing and land access crisis deteriorated further, touching genocide refugees, old case load refugees, and more recently displaced people.

[2] Some estimations suggest that half of the population was thereby displaced (Bucagu 2000).

In an interview with Jeune Afrique L'Intelligent (Ouazani 2004), Donald Kaberuka, Rwandan minister of finance and economic planning, declared that the genocide cut the GDP by 65%, and that the average annual revenue per person in Rwanda was of US$300 in 2004. However, he also expressed his belief that:

> [Rwanda's] performance should serve as a model and a cause for hope to all African countries recovering from a conflict or a civil war[3].

One of the government's interventions is the villagisation policy, which aimed at providing a sustainable economic solution to the flows of migrants that returned to Rwanda after 1994, and to reduce the likelihood of conflict resurgence.

2.1 The Policy

Originally, the policy of 'villagisation' targeted the genocide survivors and OCL refugees who returned in large numbers after 1994 to find their land had been stolen, or their dwelling destroyed, or both. In 1993, the Arusha Agreements, ratified by the ANC, specified that migrants returning to Rwanda after 10 or more years of exile were not entitled to claim their property back. Whereas this regulation left no room for legal claims over land on the OCL refugees' part, it did not foresee the renewed 1994 ethnic troubles, and the waves of migration it triggered. Hence, as the genocide survivors came back to Rwanda, they often found their land and houses had been occupied, sometimes even by genocide perpetrators. This situation created tensions, and in 1996, the government became concerned that a second wave of terror would emerge. Moreover, most OCL refugees were homeless and land-less, living in plastic shelters on the roads of Rwanda, a situation unsustainable in the long run.

Hence, the government decided to implement a land redistribution and housing relocation policy that would target the whole refugee population. Although avoiding tensions by relocating refugees seemed a sound idea, this decision was the starting point of a controversy over the respect of human rights in rural Rwanda. Human Rights Watch questions the legitimacy of the villagisation policy, arguing that most displacements induced by the implementation of the policy were made against civilians' wishes, and even, in some cases, with the use of force (Moussalli 2001). However, some papers presented in 1999 during the Rwandan Initiative for Sustainable Development argue that the implementation of the villagisation policy was vital to Rwandan socioeconomic welfare (Palmer 1999).

The expected socioeconomic outcome of the policy was three-fold. Firstly, the policy was expected to raise migrants' agricultural output, other things being equal, by increasing their access to land. Secondly, by grouping imidugudu

[3] This sentence was translated from French into English by the author, hence any errors or misinterpretations are hers. The original text is as follows:
"Notre performance devrait constituer un modèle et un motif d'espoir pour tous les pays africains sortant d'un conflit ou d'une guerre civile."

inhabitants' parcels of land together, the government hoped to facilitate the use of more mechanised production techniques, and to improve productivity through scale economies. For instance, a more clustered pattern of settlement, when coupled with access to public goods such as agricultural extension services[4], could be productivity enhancing both by facilitating the access to these infrastructure, and by making the use of tools more profitable when shared by several households. It was also believed that this method of agglomeration would induce more skill spill-overs to occur across OCL, NCL and stayers, that would help reduce economic inequalities within and across groups. Eventually the authorities hoped to encourage the formation of labour markets within these enlarged versions of traditional villages, by promoting hired labour on larger farms rather than family workers on small plots.

Potential drawbacks of the policy are the following. Increasing the distance between producers' house and their land parcels could lower agricultural productivity, as farmers would be reluctant to cultivate areas that could not be watched closely, and thus highly vulnerable to theft or sabotage (Andre 1998). Secondly, grouping returnees together in agglomerated settlements within already existing villages could create a 'ghetto effect', hence offsetting the aforementioned expected positive skill spill-over effect across groups. Particularly, imidugudu settlers belong in majority to the Tutsi ethnic group. This could condition their integration with stayers, and security may become more precarious. Hence skill spill-overs across returnees and stayers may not occur at all. The threat of renewed ethnic tensions could in turn harm agricultural production, by inducing households to undercultivate their land[5].

2.2 A Bigger Picture?

The impact of massive displacements of population, whether forced or not, on a developing economy is of particular interest nowadays, as numerous lower developed countries undergo civil conflicts or natural disasters, and coping with waves of refugees is a major source of concern. Indeed, human rights related issues are often raised by international organisations over decisions such as where to house people stranded by such events while repatriation to their initial place of residence is still impossible, and, when return is eventually allowed, how to ensure this happens in the best conditions.This study takes conflict, displacement, and return as given, that is, as exogenous shocks affecting a part of the population. However, the fact that returnees and stayers may hold different characteristics is accounted for. Having only a one-period cross-section does not allow to test for the direction of causality between holding different observable characteristics and being a migrant. However, controlling for these characteristics in

[4] An agricultural extension service is a sort of cooperative in charge of improving exploitation techniques, mainly by providing seeds and tools, or by helping farmers with parcel management.

[5] Indeed, when introducing uncertainty on yield, or unenforced property rights, in a simple producer programme, one can easily derive that agents would invest less in their production and save more than in a world without risk, all other things equal.

subsequent regression models should allow for unbiased estimates, although the nature of the data used does not allow to control for unobserved heterogeneity.

3 Background Literature

Although an important body of literature has recently emerged to try to identify causes and measure the cost of civil conflict, most of these contributions were either made at a macroeconomic level, or, when at a microeconomic level, postulating structural models and testing them using limited data sources. This study fills a gap in the literature in the field in that it uses survey data to measure the impact of conflict at a microeconomic level, and assess a conflict resolution land redistribution policy in post-war Rwanda.

Collier (2003) provides an extensive documentation on the existence of a 'conflict trap', using mainly macroeconomic cross-sectional data to isolate patterns of economic development in developing countries having experienced, or still enduring, civil strife, looking at measures of level of human capital as well as pure economic indicators.

Among studies using macroeconomic data, Ali (2000) provides an economic outlook of the economics of civil strife in Africa, whereas Bates (2000) investigates the relationship between ethnicity and development. An insight into the Burundian conflict is given by Ngaruko and Nkurunziza (2000). A seminal contribution in the realm of the comparative economics of civil conflict is Abadie and Gardeazabal (2003), in which they estimate a counterfactual value of the Basque Country's economic outcome, had it experienced no civil conflict, to propose a measure of the economic cost of the conflict.

Empirical contributions in conflict microeconomics are constrained by data scarcity. A theoretical microeconomic model of conflict outburst is proposed by Caselli and Coleman (2002), whereas Bhavnani and Backer (2000) illustrate the differences in the intensity of killings across Rwandan and Burundian civil conflicts, based on a game theoretical model of punishment across ethnics. Deininger (2003) derives and tests a model of civil strife and public investment using Ugandan survey data, suggesting the existence of a positive correlation between lack of public investment and the likelihood of civil strife. Verwimp (2003) uses longitudinal individual data[6] to assess the economic status of genocide perpetrators in post-war Rwanda, and finds that lack of land is one of the main determinants, apart from ethnicity, of participation in killings. However, these microeconomic contributions do not offer any evaluation of the economic cost of conflict, and neither do any of them assess a conflict resolution policy.

Since this study takes conflict-induced migration as a proxy to measure the impact of conflict on agricultural households, it is necessary to briefly comment

[6] However, this pre-genocide survey data does not contain precise information on household agricultural output, but only adresses the issue of occupational status and access to land. Hence it would be of no use in the context of this paper. The data used in Verwimp's study is longitudinal in the sense that the same households were visited after 1994, and genocide participation was then surveyed.

on the existing literature on the economics of migration. Most recent developments include the New Economics of Labour Migrations (NELM), whereby the migration decision is made at the household level, as opposed to earlier studies which took the individual as the primary unit of the decision-making process. Taylor and Martin (2001) provide an exhaustive review of the economics of migration, introducing the NELM. Rozelle et al. (1999) implement a NELM framework to assess the impact of remittances from rural-to-urban migration of some household members on the household agricultural yield in rural China. As migration is taken as endogenously determined by the expected value of household potential agricultural output, estimating these effects requires the use of the 3SLS estimation technique.

This paper also relies on contributions outside the economics of conflict literature to document the search for identification of a policy impact on a treatment group using one-period cross-section data. Field (2002) assesses the impact of a land titling policy on squatters' labour supply in Peru, using a one-period cross-section survey data. The identification strategy used in the present study is inspired by this work.

4 Model

4.1 Agricultural Household Models

Agricultural household models are used in development microeconomics as an alternative to the standard consumer's and producer's programmes, especially in subsistence economies. For instance, postulating that individuals are maximising their utility with respect to their labour supply and consumption is not very realistic in a context where labour markets are quasi-inexistent, and where households are mainly subsistence agricultural households, i.e. simultaneously producing and consuming. Therefore, modelling microeconomic behaviour in this framework entails solving a household utility maximisation problem simultaneously with its profit maximisation programme.

Considering a multiple-crop environment, let households maximise their utility as follows:

$Max\ U = U(X_1, X_2, ..., X_n, X_L)$

$s.t.\ Y = \sum_{i=1}^{L} p_i X_i$

with n consumption goods X_i (own and others), L denoting leisure, and $\{p_i\}_{i=1}^{L}$ their corresponding prices. Full income is also given by:

$Y = p_L T + \sum_{l=1}^{M} q_l Q_l - \sum_{i=1}^{I} q_i V_i - p_L L + E$

where T is the household's time endowment; Q_l output for each produced crop $l = \{1, \ldots, M\}$, and corresponding price $\{q_l\}_{l=1}^{M}$; V_i non-labour variable production inputs, $i = \{1, ..., I\}$, and corresponding price $\{qi\}_{i=1}^{I}$; L labour demand; E exogenous income.

The household implicit multi-crop agricultural production function is given by:

$G(Q_1, \ldots, Q_M, V, L, K_1, \ldots, K_O) = 0$

where $\{K_s\}_{s=1}^{O}$ are the fixed production inputs. In this framework, testing for an increase in migrants' productivity can be done by allowing for $G(.)$ to vary across groups.

In the original model (Singh, Squire & Strauss 1986), fixed inputs are land, physical capital such as tools, family labour, and any other inputs which can be considered inelastic to the level of output reached over the considered period of analysis. The data exhibits values that are in line with this assumption. The proportion of households who declared having bought a parcel during the year is only 4% of the sample, and the total purchase of capital input over the year represents only 21% of the overall mechanical tool ownership. Moreover, these tools consist of 'incompressible' inputs[7] for 99.2%, and their consumption is assumed to be fairly inelastic to agricultural output.

It follows that variable inputs are those likely to be sensitive to variations in the level of production over the same period. These inputs are mainly hired labour and seeds. Hence, estimating the model's reduced form will require dealing with the endogeneity issue arising from these variable inputs. However, the demand for hired labour in the data has a median value of 0 for corresponding annual expenditure, with an average of US$3 concentrated on 25% of the sample. Hence hired labour is not taken into account in this analysis, in the absence of a valid instrument variable[8]. Seeds however are included in the specification, as over 50% of surveyed households declared having bought some over the period. The instrument variable used in the subsequent regression model is the level of seed consumption at the commune level, as it is likely to be uncorrelated to the indivdual error term, but is partially correlated with household seed consumption, once the other exogenous variables are controlled for (Wooldridge 2002, chap.5).

Exogenous income E consists of any income not related to household on-farm activity. However, whether income from household off-farm labour supply should be included needs clarifying, insofar as the assumption of separability between on-farm and off-farm labour supply decisions has not been made explicit. Indeed, if these decisions are perfectly separable, i.e. should the household decide to allocate its labour to on-farm and off-farm activities simultaneously, then income from selling labour is determined exogenously from the level of agricultural production. In the Rwandan case, off-farm employment is scarce, as a general lack of capital and investment puts a strain on industries' growth. As a result, off-farm labour markets are highly constrained on the demand side, making households' outside options scarce. Rwandan households also experience a tight constraint on land, whereby the amount of land held by a family in most cases does not allow for self-sufficiency, and makes a part of the family labour supply redundant to on-farm activities. Hence it is reasonable, following Sen (1996) to assume that households are in situation of surplus labour on the on-farm labour market. It follows that off-farm labour supply would in most

[7] So called incompressible inputs are as follows: hoe, machete, hatchet, sickle, pick, spade, rake.

[8] Moreover, when included as a covariate in the regression model, the null of no explanatory power for the individual test of parameter significance cannot be rejected.

cases be positive. This is putting the off-farm labour market in a situation of excess labour supply, hence accompanied by involuntary off-farm unemployment. In the data, 86.6% of adults declared being involved in on-farm activities, for an average per adult member of 23 hours worked per week, whereas 13.1% declared having an off-farm remunerated occupation, for an average of 1 hour worked per adult member per week. Adjusting these figures to an hypothetical 100% participation rate in each sector yields an average of 26.6 hours worked per adult member per week in the on-farm sector, and an average 7.6 hours per adult per week in the off-farm sector, both well below a notional full-time employment schedule of 35-40 hours a week[9]. This suggest that the assumption of excess labour supply in both sectors is satisfied in the data. Given these circumstances, the separability assumption between off-farm income and agricultural production is likely to hold, hence allowing for the agricultural household model to be solved recursively, although all decisions are made simultaneously by the household (Singh et al. 1986)[10].

Households are price-takers on the market for produced and non-produced goods, as well as on the on-farm and off-farm labour markets.

The estimated system is the following:

$$\begin{cases} Q = \alpha_1 + \beta_1' Z_1 + \delta_1' V + \gamma_1'(T-L) + \lambda' K + \partial' E + \varepsilon_1 \\ V = \alpha_2 + \beta_2' Z_2 + \delta_2' \Gamma + \mu Q + \varepsilon_2 \end{cases}$$

with: $Q = \sum_{l=1}^{M} q_l Q_l$, multiple-crop household agricultural yield, Z_1 are exogenous household characteristics, V the only variable input considered, seeds, $(T-L)$ family on-farm labour supply, K other fixed input (land), E exogenous income (income from selling labour, transfers, letting land), Z_2 some exogenous variables, Γ vector of IV. This system can be estimated using two-step instrumental variable estimation. Subject to identification, interacting all independent variables with dummies for migration status, policy status, and an interaction term would then capture any differentials in productivity, other things equal, across returnees and stayers in policy and non-policy areas. The identification strategy and the results are discussed in section 6.

4.2 Migration and production

In this framework, it is important to establish that the household migration decision and agricultural output are independent if the impact of migration status on productivity is to be assessed.

In a New Economics of Labour Migration (NELM) framework, the individual migration decision is made at the household level, and determined by the implicit on-farm wage compared to the expected outside option wage. However, this

[9] Note that this does not in any way contradict the surplus labour assumption made above. Indeed, this assumption only implies that *"(...) part of the labour force in this peasant economy can be removed without reducing the total amount of output produced (...)"* (Sen 1966). Therefore it does not imply that agents will choose to over-allocate labour to their on-farm activity.

[10] In the case where the household chooses a corner solution, e.g. sells all it produces, and is price taker on all markets, then decisions are not separable anymore, and the system cannot be solved recursively.

presupposes two things. Firstly, it requires that labour markets are reasonably active in urban areas, although a non zero level of urban unemployment would only impact on the migration decision by lowering the expected outside option wage. Secondly, it implies that agents are free to move, which is not so in the Rwandan case, as rural to urban migrations are highly controlled and regulated by the authorities. Indeed, it is forbidden to move to an urban area without holding a job offer *ex ante* (Bucagu 2000). Hence, labour migrations in Rwanda are mainly restricted to public service jobs or highly qualified positions, which are the only ones advertised at a national level. This possibility is ignored in this analysis. Hence, this allows us to consider return migrations as being exogenous in the Rwandan case.

5 The data

5.1 General Description

The data used in this analysis is the National Rwandan Household Living Conditions Survey, which surveyed over 6400 households across all twelve Rwandan prefectures in 2000-01. The questionnaire consists of 12 sections, some of which are at the individual level, and some at the household level. This gives a comprehensive set of variables regarding employment, education, migration and agricultural production and consumption.

Both rural and urban households were surveyed, in all prefectures: 5271 households were visited in rural areas, and 1149 in the urban ones. However, given the scope of this analysis, both urban households and rural households holding a non-agricultural business are omitted. This reduces our sample, after removing outliers[11], to some 4900 households, spread out quite evenly[12] in 11 prefectures[13]. The survey design is clustered at the commune level, and 440 rural communes were visited across 11 prefectures[14].

The sampling procedure was designed by the World Bank, and the corresponding report (Scott 1997) indicates that households were selected in the following way. First, the survey collectors visited each primary sampling unit, and undertook a global census of the population[15] in each of these units. The households surveyed were then randomly drawn from these lists. However, this survey is the most comprehensive on Rwanda to date containing information on households' agricultural production.

[11] All observations that declared aberrant values for prices of crops, produced quantities with respect to the available size of land declared, and amounts transferred or received.

[12] Indeed, each prefecture represents between 8.08% and 9.56% of the sample.

[13] One of the 12 prefectures mentioned earlier consisted of Kigali, the capital of the country, a completely urban environment.

[14] A table containing the number of communes visited in each prefecture, and the average population size and sample size within these communes in presented in section A of the Appendix.

[15] There is however no indication of whether or not migrants living in precarious shelters are included in the sample.

5.2 Variables of Interest

5.2.1 The agricultural production variable

Rwandan households are mostly multiple-crop producers, which is consistent with the fact that their on-farm activity consists of subsistence agriculture. Hence, a selection issue would arise from restricting the analysis to only one type of crop, and this would complicate and restrict the analysis to an undesirable extent.

The issue of how to measure household agricultural production is much discussed in the literature. Generally, even if the quantities produced of each crop are observed, estimating the total value of yield is made difficult by the absence of a price index for each commodity at a reasonably disaggregated level. In the survey data, an estimation by the household of the value of its annual harvest of each crop is used. As is often the case in this type of survey, prices are not observed at the commune level. Relying on the prices declared by households in survey data is not recommended, as measurement error is reputedly high. However, this is the most straightforward way to approximate a multi-crop agricultural production variable, and the one implemented in this study. Hence, the issue of what level of aggregation should be used to a build price for each crop is to be addressed. Indeed, averaging values across households allows for lower levels of error, in the sense that, if one believes the measurement error component to be a well-behaved white noise, it is more likely to cancel out over large numbers of observations than over few. Deaton (1997, chap.2.2) argues that prices are likely to be correlated at the village level, due to neighbourhood effects, such as homogeneity in land quality. Hence, choosing the commune level as the unit of aggregation would seem a reasonable compromise. However, comparing households' price estimation at the commune level, striking disparities are observed in commodities prices within communes, which seems unlikely to reflect the real level of prices. Comparing values within prefectures yields better results. Hence this is the level of aggregation opted for to build the agricultural production variable used in this study.

More sophisticated approaches have been suggested to indirectly estimate prices on agricultural markets. For instance, shadow price estimation, which relies on a profit maximisation framework to induce the price level in equilibrium. The implementation of this methodology was rejected in this study, for two main reasons. First, it can be argued that, because the proportion of households who declared having sold a portion of their production is insignificant, the relevancy of studying this problem implementing a highly structural agricultural household model to estimating prices is unclear, as most households would choose to consume their own product at the corner solution. Second, the outside option for the representative household's labour supply decision is virtually non-existent in most communes, as a very low proportion of households in paid employment is observed. This is in line with reports on the Rwandan economic situation, which describe the quasi-inexistence of labour rural markets as a salient characteristic. Hence, most households would also be found

to allocate family labour at the corner solution, i.e. to allocate their labour to on-farm work only. Another implication of these circumstances on this study is that wages are typically unobserved at a disaggregated level. Hence, there seems to be little prospect for a shadow price estimation in this framework.

5.2.2 Policy variable

The information contained within the data on the villagisation policy is quite scarce, and essentially consists of an entry in the communal level questionnaire:

> "Has the commune built imidugudu since 1994, and, if yes, how many, and which were the two main sources of financing?"

However, the information contained about the number of imidugudu in the commune is often not exploitable, as 40% of the answers were 'do not know'. Moreover, the number of houses each of these imidugudu contains is unobserved. The information enclosed on which body funded the construction work is not detailed[16] enough to allow precise analysis, and was ignored in this study. Subsequently, a sole dummy variable must be relied on for the presence of imidugudu at the commune level to assess the policy at a household level. If anything, this would underestimate the policy effect, since among the post-1994 returnees who could not be included in the programme, most are found to be homeless, and very few could retrieve their former land and house (Andre 1998, and RISD 1999), hence the motivation of the policy in the first place. Under the reasonable assumption that this fraction of homeless returnees living in villages subject to the policy are on average worse off than those who retrieved their land, and since the former consist of a larger population than the latter, the estimates of the policy effect are more likely to be downward biased. Hence the results presented in this study are based on an intent-to-treat analysis, whereby all post-1994 returnees living in communes where imidugudu were built could expect to be included in the programme when allowed by material concerns.

Although masses of working papers were written about the villagisation policy by international organisations (e.g. OCHA, the World Food Programme, Human Rights Watch), most of them deal with the human rights aspect of the policy, or with the sustainability of the settlements, and do not necessarily offer a thorough description of the policy. However, Oxfam GB and the Rwandan Initiative for Sustainable Development (RISD) organised in 1999 a workshop on "Land Use and Villagisation in Rwanda", their main report is relied on in the following description of the policy (RISD 1999). Four main issues arise from this.

First, the report claims that in some cases villagers were asked to rebuild their habitation, whereas in other places the organisation in charge would make the beneficiaries participate in the work, and in other cases the construction

[16] The answers allowed to this question where (percentage quoted as first main source/percentage quoted as second main source) : voluntary contributions (64%/32%), association of nationals (5%/12%), government (1%/7%), NGOs/International organisations (30%/49%).

work would be assumed by the agency. In turn, such disparities in the implementation of the policy could induce differentials in the quality[17] of shelters, and hence on households' health, welfare, and, where participation in the construction work was solicited, on labour supply. This heterogeneity may highly depend on which agencies were in charge of the construction of imidugudu, and hence controlling for the identity of the agency in charge would possibly help get around this problem. However, such information is not available. The RISD report also indicates that, despite release of specific guidelines as to the implementation of the policy (in 1997 by MINITRAPE[18]), the construction process had then already started, and few communes adhered to these rules. In the absence of data capturing these issues, all regressions are run including prefectures dummies[19], to try and capture spatial heterogeneity. There may be some systematic cross-commune differences that could induce regression coefficients to vary across communes, although not much can be done about this given the nature of the data.

Another issue raised by the RISD with respect to the implementation of the villagisation policy are environment-related concerns. Since imidugudu sites were mostly built on uncultivated areas, and since the construction work itself required timber, their construction entailed extensive tree-cutting. Subsequently, the policy tended to reduce access to firewood, both for those living in imidugudu and those leaving in other types of habitation within villages subject to the policy. Lack of firewood might affect agricultural productivity, particularly by affecting health, and hence on-farm labour supply. Deciphering the extent of the impact of the policy on socioeconomic indicators through this particular channel is not tackled in this study, although its potential importance is acknowledged.

Another concern arising from the settlement of these agglomerations on forest land is its impact on wildlife. Specifically, the mountainous forests in the Northwest of Rwanda are home to endangered mountain gorillas. The extension of human settlements in these parts can be expected to exacerbate the strains on the gorillas. In the long run, this could lead to the extinction of the species, which would of course be undesirable for the planet's welfare overall. Such disaster could also affect the economy of the country by reducing the flow of tourists. In turn, this would have a negative impact on the Rwandan economic performance in the long-run by reducing prospect for off-farm employment in the tourism industry, or in the conservation-related sector. This study does not in any way account for these long-term effects, although some branch of the literature in the economics of migration does look into this issue (Taylor & Martin 2001, cf. Bislborrow, as quoted in the former reference).

[17] No information is held however as to whether shelters built by agencies were of a better quality than those built by the future inhabitants. However, one can easily assume that agencies had access to better construction materials, and better construction-related skills, and hence produced houses of a higher quality than those built by returnees.

[18] MINITRAPE stands for Ministry of Public Works, Energy, and Water (Ministere des Travaux publics, de l'Energie, et de l'Eau).

[19] Except for the estimation of the raw differences and difference-in-difference, as shown in table 5.

5.2.3 Conflict-induced migration variable

Identification Issues A section of the survey identifies the migration status[20], and, where applicable, the place of previous residence, the date of arrival in the current residence, period of time spent in the previous residence and occupation while there, and reason for migrating to the current residence of all household members above the age of 15. This only relates to the most recent migration. This is quite restrictive, particularly in the case of returnees, since only the date of return and the reason of their return were surveyed, and no information was recorded with regard to the first migration, i.e. the potentially conflict-induced displacement. However, the clustered pattern of departures[21] and returns in 1994 and in the 1970s suggest that most migrations that occurred after 1994 correspond to returns from conflict-induced exiles (fig.1). As the questionnaire allows for an estimation of the previous migration date, it potentially permits to discriminate between OCL and NCL refugees. However, most OCL refugees who returned to Rwanda after 1994 were the children and even grandchildren of those who fled ethnic persecutions in the late sixties and early seventies. Hence, it is not very clear whether the years spent abroad are precise enough to infer what type of returnees each household member belongs to. A descriptive analysis of the data indicates that about 60.7% of the post-1994 migrants spent between 0 and 5 years in their previous residence, which would indicate they belong to the post 1994 genocide refugees. The implied date of departure (fig.1) among post-1994 migrants and across communes subject or not to the villagisation policy provides results in line with the historical facts, as it showed two peaks in the distribution, one in 1994, and one around 1975. The peak around the mid-seventies suggests that the post-1994 OCL returnees were mainly children of those who fled Rwanda in 1959, and who were often born in exile. Hence having a peak around 1975 simply indicates that the mode of the second generation year of birth is 1975, since the question on which we base our approximation is the time spent in the previous place of residence by the migrant. However, the fact that the 1994 peak is very narrow is in line with the idea that, as the genocide started, massive and sudden displacements of population occurred. Overall, these two nearly overlapping plots tend to indicate that, OCL and NCL are in similar proportions across the populations of migrants living in imidugudu, and those living in non-policy areas. Hence, if there was a selection process at stake in the access to a shelter and to land within imidugudu, then migrants were not sorted according to their migration date.

The distributional patterns of post-1994 migrants' return date across policy and non-policy regions is more varied, as shown in the corresponding kernel density estimation graph (fig.2 and tab.1). Indeed, whereas migrants who are subject to the policy returned mainly after 1996, those who are not returned

[20] By migration status is implied the answers to the question: "Have you ever lived in another residence for more than one month?".

[21] The date of departure is inferred as follows: {Date Arrived in current residence} - {Time spent in previous residence}.

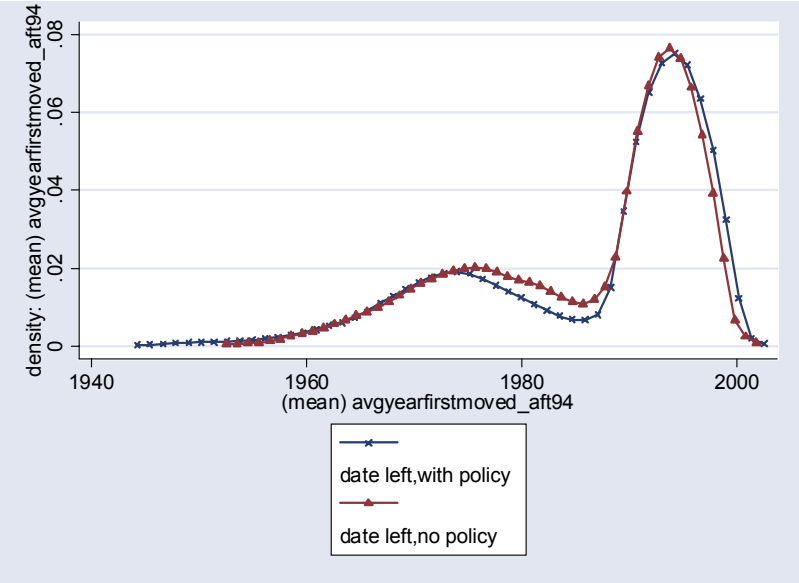

Figure 1: Kernel density estimate of year post-1994 migrants left the country.

mainly before 1996. Two explanations to this observation may be suggested. First, as the policy came into application in 1996, it aimed at coping with the exacerbated land and housing crisis, itself triggered by the 1996 Rwandan military campaign in DRC to make refugees return, and the efforts of diverse international organisations in charge of refugee camps to make as many as possible return to Rwanda. This would explain why the post-1996 wave of refugees was more likely to benefit from the policy, thus directed upon their return into existing or to be imidugudu settlements. Hence the differences in the time distribution of returns across policy and non-policy areas as exposed in table 1 are not surprising altogether. Moreover, refugee camps were put together to accommodate people fleeing diverse waves of inter-ethnic violence between 1959 and 1994. Hence, in a given camp, refugees were usually all from the same wave of conflict-induced migration. Showing that the pattern of returns in time is smooth within the same group of migrants, OCL or NCL, and across policy and non-policy areas, would corroborate this assumption. Looking at the graph representing the distribution of NCL migrants' returns in time, one notices how the policy and non-policy plots cross at several points before and after 1996, and follow a same trend (fig.3), although differences are significant in all years, except those after 1998 (tab.1). Similarly, the kernel density plot for the OCL refugees indicates analogous patterns of returns across policy and non-policy communes, in time (fig.4), and differences are not significant (tab.1).

A second explanation to the disparities in the distributions of migrants'

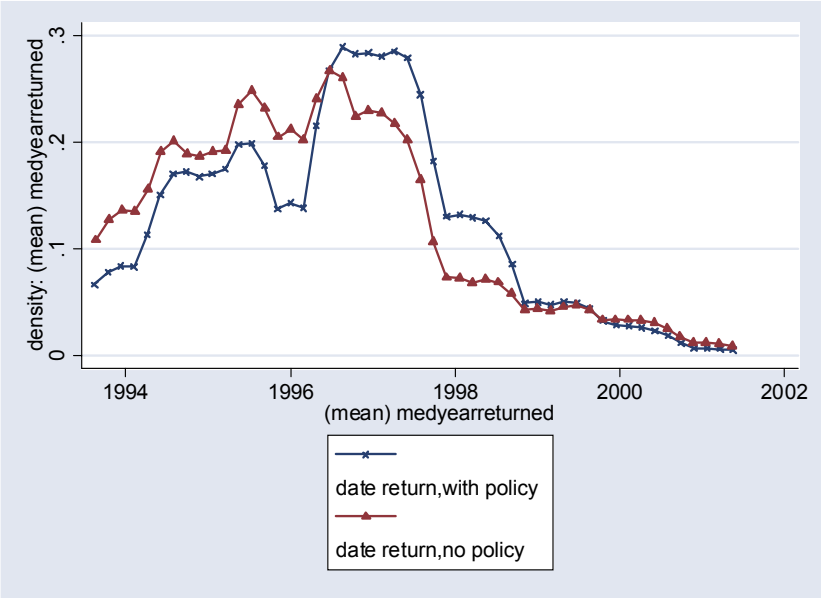

Figure 2: Kernel density estimate of year post-1994 migrants returned to Rwanda.

return in time across policy and non-policy communes could be that a self-selection mechanism took place, by which post-1996 returnees, made aware of the land redistribution policy and of its spatial distribution, chose specifically to settle into communes where imidugudu villages were built, or planned to be. However, should this selection process be based on observable characteristics, controlling for these characteristics would ensure unconditional independence, and allow for unbiased estimates. This identification issue is tackled in section 6.1.

Internally Displaced People in Rwanda at the time of survey collection The status of migrants at time of data collection is of great interest as most of those who did not return to their original place of residence bear the status of Internally Displaced People (IDP). This status is delivered by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), and, although the international community is not legally bound to provide help to IDP, it is encouraged to do so. It is for national governments to ensure IDP's security and well being, although there exist no international organisations to enforce the completion of this obligation. Hence, knowing whether some of the households surveyed have the status of IDP could ensure more precise empirical estimation by allowing to control for it econometrically, which is not allowed by the data used here. However, it is likely that virtually none of them were considered

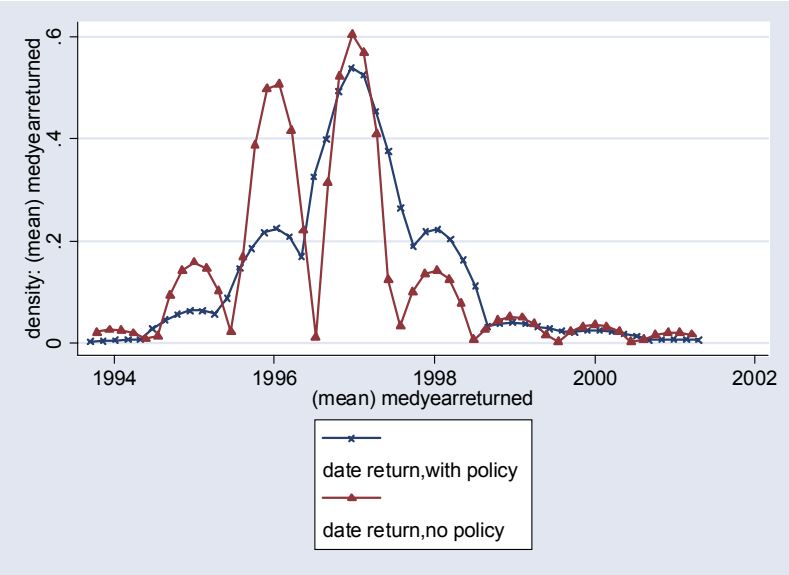

Figure 3: Kernel density estimate of year genocide refugees returned to Rwanda.

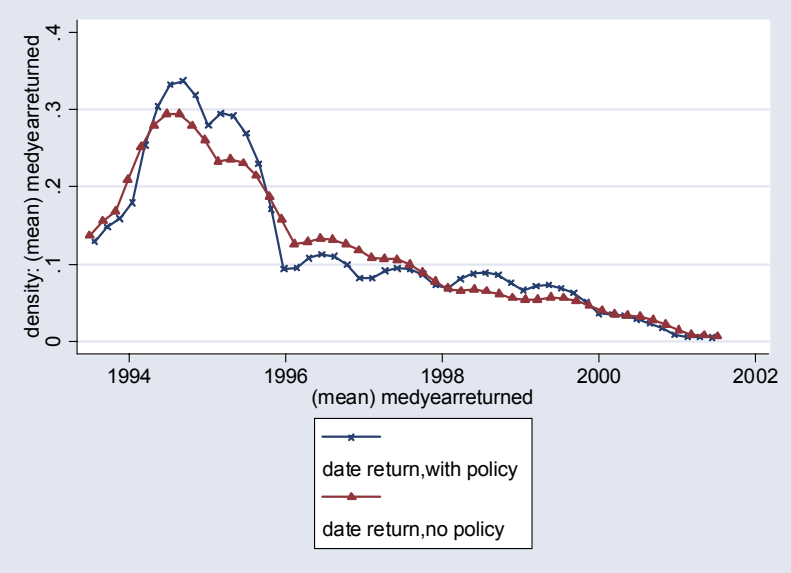

Figure 4: Kernel density estimate of year old case load refugees returned to Rwandan (among those returned after 1994 only).

Proportion per period (mean dev.)	***All Migrants***			***OCL Migrants***			***NCL Migrants***		
	Policy	*No Policy*	*|t| of diff.*	*Policy*	*No Policy*	*|t| of diff.*	*Policy*	*No Policy*	*|t| of diff.*
returned < 90	0.2 (0.4)	0.4 (0.5)	8.6	N\A	N\A	.	N\A	N\A	.
%returned in 91-94	0.1 (0.2)	0.1 (0.2)	2.4	0.2 (0.3)	0.3 (0.4)	2.5	0.0 (0.0)	0.0 (0.0)	0
returned in 95	0.1 (0.2)	0.1 (0.2)	2.7	0.3 (0.4)	0.3 (0.4)	1.9	0.1 (0.1)	0.1 (0.2)	3.4
returned in 96	0.1 (0.2)	0.1 (0.2)	0.8	0.1 (0.2)	0.1 (0.2)	0.3	0.2 (0.3)	0.3 (0.4)	4.9
returned in 97	0.2 (0.4)	0.1 (0.2)	6.7	0.1 (0.2)	0.1 (0.2)	0.2	0.5 (0.5)	0.4 (0.5)	2.2
returned in 98	0.1 (0.2)	0.0 (0.1)	9.1	0.1 (0.1)	0.1 (0.1)	1.6	0.2 (0.3)	0.1 (0.1)	4.6
returned after 1998	0.1 (0.1)	0.1 (0.1)	2.9	0.1 (0.2)	0.1 (0.2)	1.1	0.0 (0.1)	0.0 (0.0)	4.6

Table 1: Percentages of returnees in policy and non-policy areas per date of return (standard errors in brackets).

internally displaced people (IDP) at time of survey collection. Indeed, in a 2000 report on the situation of IDP in Rwanda (Linde 2000), the OCHA estimates the number of IDP in Rwanda at 6340, who seem to be regionally clustered, and whose situation would be due either to having been evicted from illegally occupied land, or to some natural disaster. Hence, although the data does not allow for an identification of IDP, potential errors thus made are considered negligible. However, and despite the efforts put forward by the government in orchestrating land redistribution and villagisation policy, some 370 000 of these families are still in a situation of vulnerability (Linde 2000). This study proposes to identify the channels through which deprivation could be improved, by isolating the determinants of subsistence agricultural households' yield.

6 Empirical Analysis

6.1 Identification

Evaluating the impact of the imidugudu policy on post-1994 migrants would ideally require the use of a two-period cross-sectional data or, even better, a longitudinal data, with one wave of observations before the policy implementation, and one after. Unfortunately, such data is not available for Rwanda. However, relying on the spatial differentials in the patterns of policy implementation allows to differentiate returns to inputs across returnees and stayers, and across policy and non-policy areas, to isolate the effect of the policy on

the migrants' population. Such difference-in-difference (DID) approach requires that observations be independent, non-identically distributed (Wooldridge 2002, chap.6) across treatment and control groups, and across policy and non-policy areas. Assuming that observations are independent across policy and non-policy areas seems realistic, and the assumption that observations are non-identically distributed is not restrictive in the least.

The issue of selection across treatment and control groups, i.e. across migrants and stayers, is resolved as conflict-induced migration is considered exogenous, and hence determined independently from all observable and unobservable household characteristics. However, the issue of self-selection into the programme, whereby returning households would decide whether to move to a policy area or not, needs to be addressed. Although some arguments were presented earlier in favour of the assumption that no selection occurred on the basis of patterns of migration across years, this evidence is not robust to potential sorting conditioned by observable and unobservable characteristics[22]. Should such selection process be at stake, failing to control for it would cause the estimates of the policy effect on the treated to be biased. However, as shown by Rubin (1977), conditioning the outcome variable on the characteristics on which the self-selection process is based would then ensure that the estimated programme effect on the treated is unbiased[23]. This is also referred to as the unconfoundedness assumption in Rubin's seminal contribution.

Let P_i the policy status variable, whereby P_i takes value 1 where a household is included into the programme, and 0 where not. Let $Q_i^m(1)$ be the potential agricultural yield[24] of household i when benefiting from the programme, and $Q_i^m(0)$ the potential outcome for the same household if not benefiting from the programme, for any migration status $m \in \{r; s\}$, r denoting returnees, and s stayers. Households' potential agricultural yield depends on a set of observable characteristics X_i. Although it is arguable that outcome depends on some household unobserved characteristics, this possibility is discarded here, as the nature of the data does not allow to control for such effect. However, results obtained in this framework would be biased, should some unobserved characteristics be at play in the potential outcome determination.

Using the same notations as in section 4, and allowing for the implicit production function to vary across treatment and control groups, and across policy regimes, $Q_i^m(1)$ and $Q_i^m(0)$ can be written as:

$Q_i^m(1) = G_1^m(X_i)$

$Q_i^m(1) = G_0^m(X_i), \forall m \in \{m; s\}$

Assuming that returning households self-select into the programme on the

[22] Indeed, there is no evidence that the observed patterns of displacement could not be the consequence of a homogenous distribution of characteristics across returning households over the years.

[23] Most of the derivations here given are building on Wooldridge (2002) and Firpo (2004) .

[24] Here only potential agricultural yield is taken into account as a determinant of household decision to enter the programme, hence excluding potential income from selling labour. Although one could argue that potential off-farm income could play a role in the self-selection process, it is here ignored on the basis that labour markets are generally inactive in Rwanda (cf. discussion in section 4).

basis of their observed characteristics, they will do so on the basis of a cost-benefit analysis of their potential gain to enter the programme. Hence, denominating $U(.)$ their utility function, and $C_j(.)$ the incurred cost from choosing 'policy status' j, $\forall j \in \{0;1\}$, households would choose their policy status based on their potential agricultural yield expectation, as follows[25]:

$P_i = \mathbb{1}\{E[U(Q_i^r(1)) - U(Q_i^r(0))|X_i] - (C_1(X_i) - C_0(X_i)) \geq 0\}$

Thus potential agricultural earnings solely depend on X_i. It then follows that, controlling for X_i, the choice of benefiting from the policy will be independent of the household potential earnings. The characteristics X_i to be included in the specification are discussed in section 6.2.1.

Allowing for variations in the implicit agricultural production function $G_j^m(.)$, and hence estimating the impact of the policy on different groups, is done by interacting dummies for migration status, policy status, and an interaction dummy between migration and policy status, with household characteristics and production inputs when estimating the model reduced form[26].

Hence, the 'migration status impact' for all policy status j, $\forall j \in \{0;1\}$ is:

$\Delta Q_j^m - \Delta Q_j^s$

and the 'pure policy impact' is then:

$(\Delta Q_1^m - \Delta Q_1^s) - (\Delta Q_0^m - \Delta Q_0^s)$

Denoting a set of covariates $X = \{X_1, ..., X_N\}$, Γ its corresponding set of true regression coefficients, and a white noise error term u, and ignoring subscripts and superscripts for a few lines, with no loss of generality:

$Q = X\Gamma + u$

Differentiating totally and taking expectations:

$E(\Delta Q) = E(\Delta X)\Gamma$

Holding all covariates constant but one, say X_1 with no loss of generality, and denoting β its true regression coefficient :

$E(\Delta Q|X_2, ..., X_N) = E(\Delta X_1)\beta$

Introducing subscripts and superscripts into this expression and subtracting across migration status we get the partial expected migration status effect:

$E(\Delta Q_j^m - \Delta Q_j^s) = E(\Delta X_1)(\beta_j^m - \beta_j^s), \forall j \in \{0, 1\}$

Differencing this expression across policy sub-samples, we get the expected pure policy effect:

$E[(\Delta Q_1^m - \Delta Q_1^s) - (\Delta Q_0^m - \Delta Q_0^s)] = E(\Delta X_1)[(\beta_1^m - \beta_1^s) - (\beta_0^n - \beta_0^n)]$

and testing whether $[(\beta_1^m - \beta_1^s) - (\beta_0^n - \beta_0^n)]$ is significantly different from zero is equivalent to testing whether the policy had an impact, controlling for the migration status effect.

6.2 Descriptive Analysis

Having an idea of the distribution of households' characteristics and other variables of interest across migration and policy status would prove useful for the rest of the analysis, especially when discussing which variables to condition

[25] The indicator function $\mathbb{1}(F)$ is equal to 1 if F is true, and 0 otherwise.

[26] In subsequent econometric analysis, both OLS and two-step IV estimation (instrumenting for Seeds and all its interaction terms) are presented.

the outcome variable on. Hence, sample means and, whenever relevant, kernel densities distributions are estimated on the variables of interest, and their corresponding figures and comments are exposed below.

6.2.1 Households' characteristics and selectivity issues

Principally, that certain groups (RISD 1999) self-select into the programme is of concern. The sample means of households' characteristics (see table 2) suggests that there are indeed some significant disparities across migrants, according to whether or not their place of residence was subject to the policy. Significant differences in household characteristics are observed in marital status variables, whereby the proportion of married returning heads of households living in non-policy areas is smaller than this of stayers in the same areas. However, the proportion of returning heads of household living in partnership but out of marriage (the so-called 'free union') is significantly higher than that of their stayers' counterpart, and overall the proportions of heads living in partnership in and out of marriage is equivalent for both groups. Several reasons can be proposed to account for these disparities. Firstly, marrying is costly, and traditionally these costs are assumed by the bride and groom's elder relatives. However returnees have often been cut off from their families, hence providing an intuitive explanation to these disparities. Secondly, it may be that a larger part of returnees who were married before 1994 were widowed during the 1994 events, and then found a new partner after 1994, without being able to re-marry for administrative reasons. However, these disparities are not observed across returnees and stayers in policy areas, hence suggesting either that marital status played a significant role in a potential self-selection into the programme, or that the programme influenced marital status.

Looking at the age of the heads and at the average age of the household sample means, significant differences are observed between returnees and stayers in non-policy areas, returnees being on average younger, although not in policy areas. Age is exogenous with respect to policy status, but could be a determinant of marital status, hence suggesting that, if anything, age and marital status could have been at stake in the selection process. However, the sense of causality cannot be identified in cross-section data, and, in the absence of a valid instrument, the Durbin-Wu-Hausman test would not bring authoritative results. Hence, despite the risk of endogeneity between agricultural yield and marital status leading to biased estimates, dummies for marital status are included in all specifications, and coefficients on inputs are robust to changes in the covariates.

The sample means of the household size are significantly different across stayers and returnees in policy areas, returning households being on average larger than those of stayers. Again, household size may have been part of the determinants of a self-selection process, and hence size should be controlled for in the agricultural household model reduced form. Although some endogeneity may exist between agricultural yield and fertility decision, and hence bias regression

estimates, this effect it assumed negligible on a one-year horizon[27]. Moreover, the absence of disparities in children proportions across stayers and returnees, both in policy and non-policy areas, brings some support to this assumption.

Disparities are observed in the proportion of children enrolled in full time education (FTE) across returnees and stayers in non-policy areas, participation rates being higher for stayers' children. No significant differences are observed in policy areas. However, schooling decision is more likely to be endogenous to agricultural yield, and less likely to have been have been at stake in the selection process. Hence this characteristic is not included in the model covariates. The same arguments are used for the proportion of household members with any education. However, the educational attainment of those involved in the production process (producers and land holders) over the year is less likely to be endogenously determined, given the average age of on-farm producers is 21.3 years, with a minimum value of 14, and the average age of holders is 43 years, and should be included to control for human capital in the regression model. On average, returning heads of households are more educated than their stayer counterparts.

No significant differences in the incidence of ill-health across groups where observed, neither for adults, nor for children. Household's health is likely to be endogenously determined by household wealth, although holders' and producers' health should also influence agricultural yield. Hence omitting to control for these characteristics in agricultural output regressions would yield biased estimates. However, the information on health as available in the data only refers to the incidence of ill-health during the two weeks preceding survey collection. Thus, it is unlikely that illness over such a short period[28] could have affected the level of annual production, and ill-health is not included in the regressions.

Variables related to migration status such as years spent in previous residence, and the proportion of household members born in border countries exhibit significant differences in sample means across groups. The difference-in-difference is insignificant on years spent in previous residence, but significant on the proportion of adults born in border countries, suggesting that a significantly higher proportion of OCL migrants settled in policy areas relative to non-policy areas. This is confirmed by the regression coefficient on the dummy for OCL refugee when running a logit model of policy status on exogenous characteristics (cf. column 1 in tab.3).

[27] This does not take into account the possibility of agricultural yield being autocorrelated overtime, which would also introduce endogeneity in the regression model. The data, however, does not allow for this to be controlled for.

[28] That is, unless the illness is permanent. However, controlling for long-term illness would not be satisfactory either, as, assuming that level of production is autocorrelated across years, then unbiased estimates would still not be achieved. Note that inference on this issue could be drawn using the short-term (past two weeks) agricutural production that is recorded in the survey (Pitt & Rosenzweig, in Singh et al., 1986, chap.5). This however would cause more problems, such as the seasonality issue, that would be difficult to deal with given crops vary across households, and these crops have different seasonal patterns.

Table 2: Sample Means by migration and policy status

	No Policy			**Policy**			
	Returnees	Stayers		Returnees	Stayers		
Variable	Mean	Mean	diff.	Mean	Mean	diff.	DID
	(SD)	(SD)	t-stat	(SD)	(SD)	t-stat	t-sat.
Age HHH	41.8	45.6	-5.9	43.6	44.4	-1.0	-3.0
	14.9	15.4		14.5	14.6		
Avg. age	21.6	23.8	-5.1	22.4	22.7	-0.7	-2.7
	9.5	11.7		9.3	10.1		
Size	4.9	4.9	-0.3	5.2	4.9	2.7	-2.3
	2.2	2.2		2.4	2.1		
Yrs HHH spent	7.4	1.9	11.2	9.8	3.1	10.2	-1.5
in previous residence	12.3	6.7		14.3	8.3		
Avg. yrs HH	9.7	2.9	16.5	9.5	3.7	11.1	1.4
spent in previous residence	10.0	7.2		10.7	8.3		
Woman HHH	0.3	0.3	-3.6	0.3	0.4	-4.4	1.3
	0.0	0.0		0.0	0.0		
Widow HHH	0.2	0.3	-4.0	0.3	0.3	-3.4	0.2
	0.0	0.0		0.0	0.0		
Married HHH	0.4	0.5	-1.8	0.4	0.4	1.2	-2.1
	0.0	0.0		0.0	0.0		
Free union HHH	0.3	0.2	6.1	0.2	0.2	3.4	1.5
	0.0	0.0		0.0	0.0		
Prop. children in HH	0.4	0.4	-1.3	0.4	0.4	-2.9	1.4
	0.0	0.0		0.0	0.0		
Prop. of children	0.3	0.4	-3.2	0.4	0.4	-1.7	-0.7
in FTE	0.0	0.0		0.0	0.0		
Prop. of members	0.5	0.6	-2.1	0.6	0.6	0.0	-1.3
with any educ.	0.0	0.0		0.0	0.0		
Prop. of literate	0.5	0.5	3.2	0.5	0.5	-0.8	2.6
adults	0.0	0.0		0.0	0.0		
Health pb HHH	0.3	0.3	-0.5	0.4	0.4	0.1	-0.4
	0.0	0.0		0.0	0.0		
Prop. with health pb	0.3	0.3	2.9	0.3	0.3	2.2	0.1
	0.0	0.0		0.0	0.0		
Prop. children with	0.2	0.2	4.3	0.2	0.2	2.2	1.1
health pb	0.0	0.0		0.0	0.0		

Continued on next page...

... table 2 continued

Variable	No Policy			Policy			
	Returnees Mean (SD)	Stayers Mean (SD)	diff. t-stat	Returnees Mean (SD)	Stayers Mean (SD)	diff. t-stat	DID t-sat.
Prop. born in a border country	0.1 0.0	0.0 0.0	11.5	0.2 0.0	0.0 0.0	14.0	-3.9
Prop. adults born in a border country	0.1 0.0	0.0 0.0	8.8	0.1 0.0	0.0 0.0	10.8	-3.4
Prop. unemployed in previous residence	0.4 0.0	0.0 0.0	23.9 0.0	0.5 0.0	0.0 0.0	23.5	-1.3

Eventually, logit models are estimated, taking as outcome variables policy status and migration status, and results are presented in table 3. Overall, the results are in line with the observations made in table 2, except for the negative and significant coefficient on children proportion in the migration status equation. Indeed, that suggest that on average the proportion of children in returnees' household is smaller relative to stayers other things being equal, whereas the sample mean suggested no significant differences.

6.2.2 Access to land

The villagisation policy is combined with a land redistribution policy, and it is interesting to identify to which extent it affected different groups. Although a report by HRW (Moussalli 2001) claims that 66% of those who live in imidugudu are landless, whereas only 47% of them declared having been in possession of some land before they moved in the agglomerations, the sources used are not indicated. However only 4 observations of landless households are recorded in the data.

The villagisation policy primarily aimed at coping with the access to housing and land crisis exacerbated by the massive return of the old case load and genocide refugees. Hence it seems natural that the policy should target these groups. However, and as the Rwandan Initiative for Sustainable Development (RISD) points out concerning the selection procedure in the access to the programme:

> "(...) there were no systematic procedures set to ensure a uniform and fair selection." (RISD 1999, p. iv)

From table 4, three things can be inferred. First, on average, both stayers and returnees in policy areas are significantly better endowed than those in non-policy communes, whether looking at per adult or per household sample means. Second, in communes that did not benefit from the policy, differences in land allocation across returnees and stayers are insignificant. Finally, returnees' land

Logit (marginal effect)	*Imidugudu*	*Returnee*
Prop. child	0.030	-0.172
	(0.043)	(0.046)***
Prop. women	0.005	0.016
	(0.037)	(0.033)
Age HHH	0.006	-0.001
	(0.003)*	(0.003)
Woman HHH	0.010	-0.037
	(0.029)	(0.032)
Avg. age of HH	-0.001	-0.003
	(0.001)	(0.001)**
Married HHH	-0.029	-0.049
	(0.030)	(0.019)**
Prop. born in RWA	-0.065	-1.317
	(0.119)	(0.172)***
Educ. Attn of HHH	0.004	0.008
	(0.003)	(0.003)***
Avg. educ. Attn of HH producers	0.002	-0.001
	(0.002)	(0.002)
Prop. orphans in HH	0.057	0.016
	(0.024)**	(0.022)
Yrs HHH spent in previous residence	0.002	
	(0.001)*	
Arrived after 1994	-0.041	
	(0.038)	
OCL refugees	0.090	
	(0.051)*	
Prop. migrants in community	0.097	
	(0.134)	
More arrivals in commune after 94	-0.072	
	(0.127)	
More departures from commune after 94	-0.049	
	(0.124)	
No moves to/from commune after 94	-0.070	
	(0.134)	
School in commune before 94	-0.035	
	(0.064)	
Health centre in commune before94	0.056	
	(0.104)	
Road in commune before 94	0.107	
	(0.069)	
Water in commune before 94	-0.034	
	(0.053)	
Size		-0.000
		(0.005)
HHH has partner		0.096
		(0.043)**
Observations	4907	4907
* significant at 10%; ** significant at 5%; *** significant at 1%		

Table 3: Logit regression of marginal effects of household and commune characteristics on policy and migration status (standard errors in brackets)

	.	Post 1994 Returnees		Stayers		
		Average	*Std Dev*	*Average*	*Std Dev*	*|t|*
Number of plots within the HH	*All*	2.93	2.01	2.97	1.74	0.42
	No Imidugudu	3.08	2.28	2.95	1.69	0.81
	Imidugudu	2.76	1.62	3.05	1.86	2.40
	|t| diff & Diff-in-diff	2.85	--	1.55	--	2.09
Total area	*All*	0.82	0.85	0.69	0.94	5.21
	No Imidugudu	0.68	0.78	0.65	0.94	0.72
	Imidugudu	0.99	0.89	0.78	0.96	5.17
	|t| diff & Diff-in-diff	6.43	--	3.38	--	3.42
Total area per adult member	*All*	0.34	0.40	0.29	0.39	4.76
	No Imidugudu	0.30	0.40	0.27	0.38	1.63
	Imidugudu	0.39	0.40	0.33	0.42	3.48
	|t| diff & Diff-in-diff	3.92	--	3.73	--	1.41

Table 4: Sample means, t-stat of the difference across policy and migration status, and t-stat of the DID across migration status and across policy regime (all areas are expressed in hectares).

in policy areas is broken down into fewer parcels than it is both for returnees and stayers in non-policy areas, as well as stayers in policy areas.

Kernel density estimation are used to look into other moments of the distribution of land across groups.

Overall, in areas with policy, the amount of land available per adult is much larger in the case of returnees than in the case of stayers (fig.5), and dispersion is smaller. The dispersion of land allocation in non-policy areas does not differ across migrants and stayers. Comparing land access across communes subject to policy and communes without imidugudu within returnees and stayers (fig.6), stayers in policy areas are found to be slightly better off than their counterparts in non-policy areas, and dispersion is wider in non-policy areas.

These findings suggest that the land allocation policy had a positive impact on migrants' land endowments, and induced less unequal patterns of land distribution. However, quality of land is not accounted for. The value of parcel can be observed in the data for owned[29] properties only, but these values are very

[29] Not all households formally own a property right title, and this is due to the complicated legislation on land property rights in Rwanda. This is however not directly the subject matter of this study. For more reference on the subject, refer to Andre(Andre 1998) (1998).

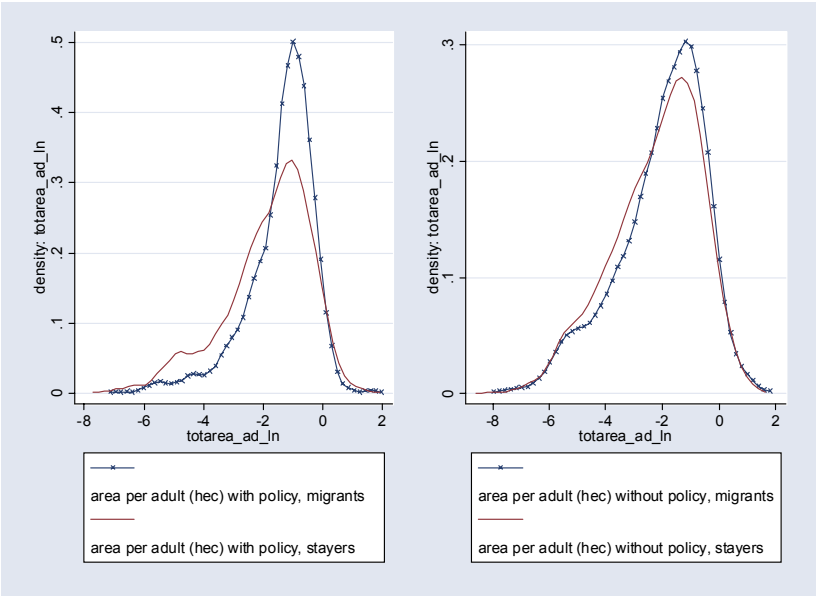

Figure 5: Kernel density estimates of the natural log of land per adult member. Results are presented by policy regime, and by migration status.

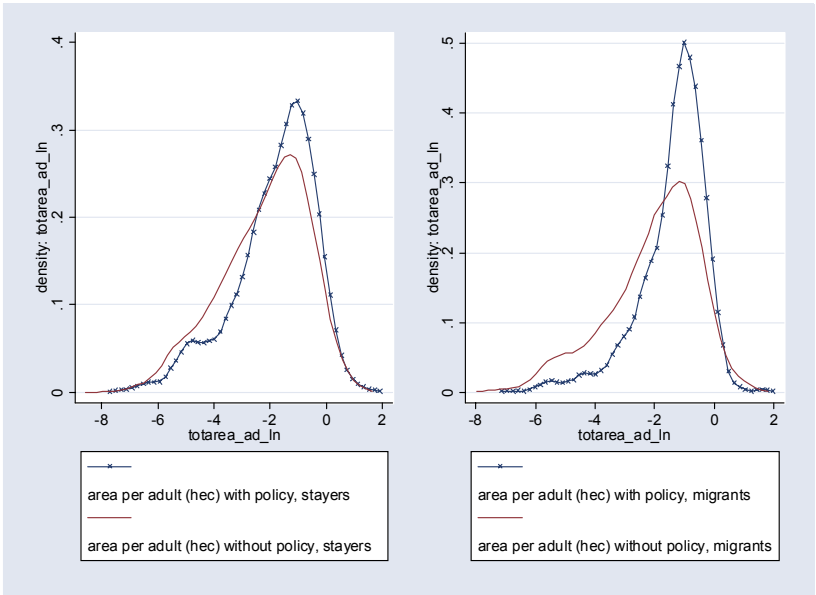

Figure 6: Kernel density estimates of the natural log of land per adult member. Results are presented by migration status, and by policy regime.

noisy[30], and therefore cannot be relied on to control for quality in regressions.

6.2.3 Agricultural Productivity

The main concern of this study is to measure whether there are differentials in agricultural productivity across migration stata, and across policy regimes. The average annual agricultural production per adult as estimated in this study is 11 810 Rwandan Francs (approximately US$36), and the median value is 16 900 Rwandan Francs (or US$51).

Kernel density estimates are presented in figures 7 and 8. In fig.7, the left-hand side graph illustrates the differences in the distribution of agricultural outputs within policy areas, and across stayers and post-1994 returnees. The mode of agricultural output for post-1994 refugees is higher than that of stayers within villages subject to the imidugudu policy. Moreover, the output distribution is more concentrated around the modal value for returnees than in that for stayers in communes with imidugudu. This fact may be explained by the land allocation patterns expose above. Hence it is also informative to look at output normalised by land, as is done in figures 9 and 10, commented below. The right-hand side of fig.7 shows production distribution within areas not subject to the villagisation policy. Differences across migration stata are attenuated in these areas.

Fig.8 looks into distributional differentials in households' agricultural output across migration stata, and across policy stata. Few disparities within stayers across policy and non-policy areas. If anything, stayers in policy areas seem to be doing better than those in non-agglomerated communes, and dispersion is similar across areas. However, looking on the right-hand side of fig.8, stark differences appear in the distribution of agricultural production within post-1994 migrants, across policy and non-policy areas Indeed, migrants living in villages where imidugudu were built experience higher levels of output per adult than those living in other places.

Another way to assess differentials in agricultural productivity across groups is to look at the production per adult member, normalised by the area of land available per adult in the household. The graphs thus obtained are exposed in figures 9 and 10. Comparing production per hectare by migration status and by policy status(cf. fig.9), shows that, whereas within non-policy areas productivity per hectare is similar across returnees and stayers (right-hand side graph), some disparities are observed across migration status in policy areas (left-hand side graph). Indeed, dispersion is smaller for returnees than for stayers. Hence, differentials in per hectare productivity are observed in policy areas only. Fig.8 compares productivity per hectare, controlling for migration status. This observation would tend to confirm that the policy had an inequality-reducing impact on returnees, although normalising production by cultivated area changes slightly the conclusions drawn from fig.7 and 8. Indeed, whereas the right-sand

[30] Particularly, huge variations were observed within villages. This is not very surprising since the Rwandan markets for land are moslty absent or inefficient, and hence the values declared by households can be considered notional measures rather than accurate ones.

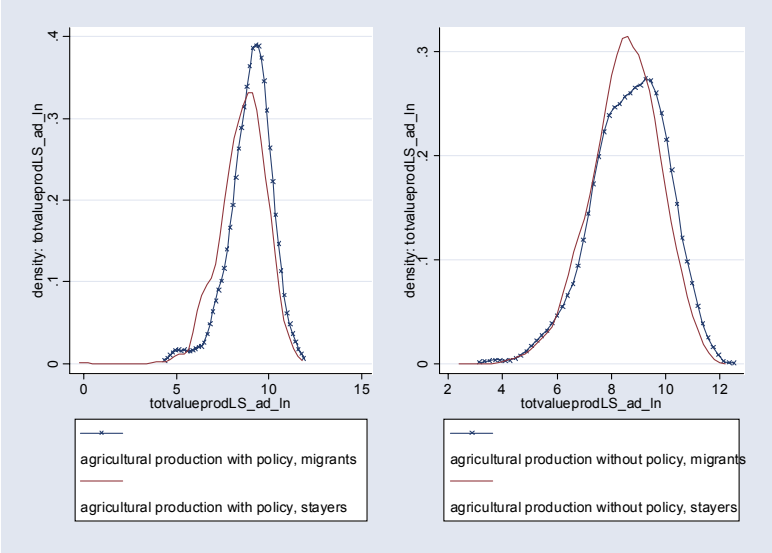

Figure 7: Kernel density estimates of the natural log of agricultural production per adult member. Results are presented by policy regime, and by migration status.

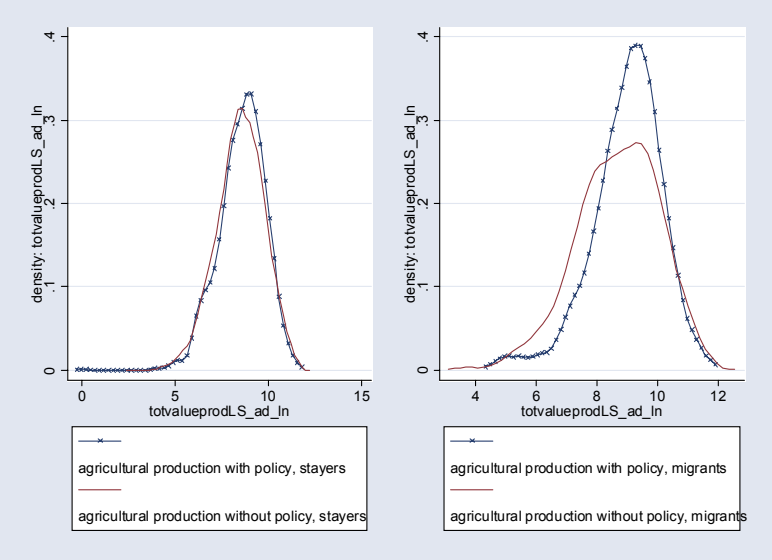

Figure 8: Kernel density estimates of the natural log of agricultural production per hectare of land, per adult member. Results are presented by migration status, and by policy regime.

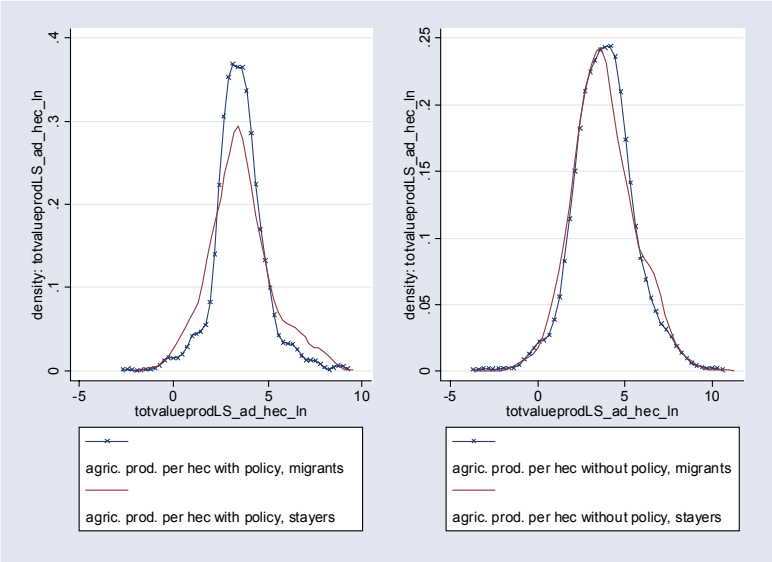

Figure 9: Kernel density estimates of the natural log of agricultural production per hectare of land, per adult member. Results are presented by policy regime, and by migration status.

part of fig.8 exhibited less concentration of the observations in the in lower values of the production for returnees in policy areas than in non-policy areas, fig.10 does not show such pattern. Conversely, the concentration of observations is higher in the upper range of the distribution for returnees in non-policy areas than it is for their counterparts in policy areas. This suggests that, although inequalities among returnees are reduced in policy areas, productivity per hectares is not higher in policy area. In the left-hand side of fig.9, where stayers and returnees' performance are compared within policy areas, observations are more concentrated around the modal value in the case of returnees. Moreover, looking at the right-hand side part of fig.9, no major distributional differences can be observed across returnees and stayers in non-policy areas, although the returnees' modal value is slightly to the right of the migrants'. This would suggest that no significant differentials in productivity exist in non-policy areas across migrants and stayers.

Although quite informative, the observations made on the basis of kernel densities are not satisfactory, insofar as this technique does not allow to control for other observable characteristics that are, as shown above, unequally distributed across space and migration status, and may condition agricultural output. An econometric approach, controlling for such factors, would allow for more holistic results.

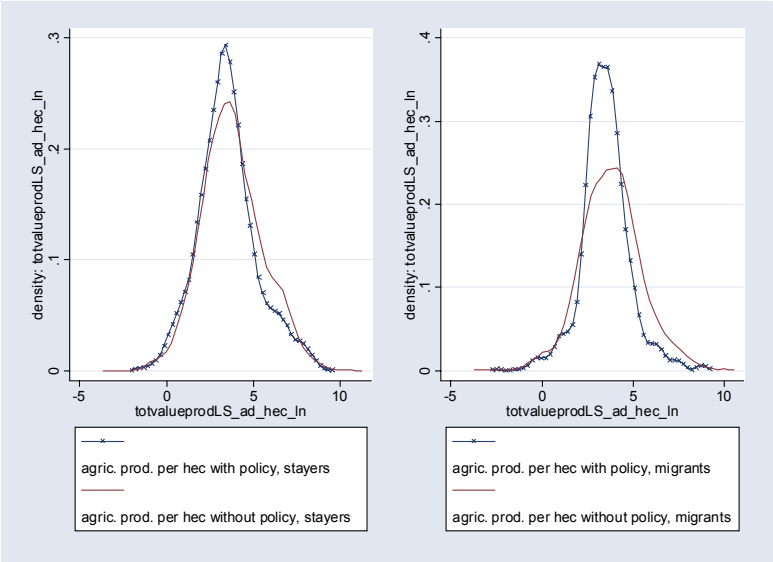

Figure 10: Kernel density estimates of the natural log of agricultural production per hectare of land, per adult member. Results are presented by migration status, and by policy regime.

6.3 Econometric Estimation

An index containing variable names and description is presented in appendix A.

6.3.1 Simple difference in difference estimation

Table 5 presents the regression output of the differences (cols. (1) & (2)), the raw difference-in-difference (DID) (col. (3)), and differences and DID introducing some controls (cols.(4)-(6)) in the natural log of output per adult within the household. The results presented in column (1) suggest that returnees are on average better off than stayers by 36.2%[31], whereas those in column (2) imply that households living in communes where the policy was implemented produced on average 27.2% more output than others. The raw DID suggests that returnees produced on average 17.9% more output that stayers, whereas the imidugudu policy did not have significant effect on stayers. However, the policy raised post-1994 migrants' output by on average 38.1%. Hence, in policy areas, migrants produced on average 56.1% more than stayers. These effects are quite large, and are robust to the inclusion of more controls. Indeed, the effects implied in columns (4) to (6) are even larger, with a DID coefficient implying production differentials for returnees in policy areas 20.9% larger, other things

[31] All effects implied by estimated coefficients on dummy variables are computed as suggested by Halvorsen & Palmquist's (1980).

Ln(tot. production per adult)	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Variables						
Arrived after94	0.309***	--	0.165*	0.400***	--	0.241**
	(0.070)		(0.096)	(0.088)		(0.109)
Imidugudu	--	0.241**	-0.021	--	0.253**	-0.007
		(0.100)	(0.137)		(0.102)	(0.137)
Arrived after 94_imidugudu	--	--	0.323**	--	--	0.340**
			(0.152)			(0.153)
Size	--	--	--	-0.029	-0.034*	-0.033*
				(0.018)	(0.018)	(0.018)
Yrs HHH spent in current residence	--	--	--	0.004	-0.001	0.004
				(0.003)	(0.003)	(0.003)
Yrs spent in previous residence _aft 94	--	--	--	-0.007	-0.000	-0.007
				(0.005)	(0.004)	(0.005)
Prop. from different prefectures	--	--	--	-0.071	-0.066	-0.104
				(0.117)	(0.120)	(0.121)
Age HHH	--	--	--	-0.012	-0.020*	-0.014
				(0.012)	(0.012)	(0.012)
Age HHH_2	--	--	--	0.000	0.000	0.000
				(0.000)	(0.000)	(0.000)
Avg. age HH	--	--	--	-0.001	-0.002	-0.002
				(0.005)	(0.005)	(0.005)
Woman HHH	--	--	--	-0.125*	-0.115	-0.132*
				(0.071)	(0.072)	(0.072)
*** p<0.01; ** p<0.05; *p<0.1; two tailed						

Table 5: Simple difference-in-difference specifications (dependent variable: natural log of annual household agricultural output per adultcols (1)-(3): no other controls)

being equal. The coefficient on migration status is also larger, with returnees producing on average 27.2% more than stayers in all areas. The fact that the coefficient on imidugudu is insignificant is in line with the description of the policy implementation, as it confirms that the programme had on average no impact on stayers.

However, the estimated coefficients on the dummy for whether a woman is the head of the household bears a negative coefficient, suggesting a decrease in output of on average 11.7% and 12.4%. This result is of interest as a large part of the literature is concerned with gender agricultural productivity gaps[32].

6.3.2 Assessing the impact of migration and policy status on agricultural productivity

Isolating the impact of migration status and policy regime on agricultural productivity is done by interacting all inputs, exogenous, and characteristics vari-

[32] For instance, Udry (2000) tests for Pareto efficiency of production factors allocation across spouses in agricultural households. He finds that allocation is not Pareto optimal, and that reallocating the best parcels of land to female spouses would be Pareto improving.

ables with dummies for migration and policy status. Table 6 presents the results both of the OLS estimation of the reduced form, and of the two-step IV estimation when instrumenting seed consumption (and all the interacted terms) with the commune level of seed consumption[33]. Other controls were included in the regression model apart from those printed in the table, such as dummies for prefectures, size, sex of the household, age, marital status of the head, different migration variables at the household and commune level, and concavity of production function is allowed by including squared input terms.

Table 6: Estimation results: simple differences (dependent: ln(annual household agricultural production per adult member))

Variable	**Migration**		**Policy**	
	OLS Coefficient (Std. Err.)	**IV Coefficient** (Std. Err.)	**OLS Coefficient** (Std. Err.)	**IV Coefficient** (Std. Err.)
On-farm LS	0.006	0.006	0.006	0.006
	(0.001)**	(0.001)**	(0.001)**	(0.001)**
On-farm LS_aft94	0.000	0.000		
	(0.001)	(0.001)		
On-farm LS_imid			0.001	0.001
			(0.001)	(0.001)
Seeds bought	0.037	0.090	0.033	0.087
	(0.004)**	(0.013)**	(0.004)**	(0.013)**
Seeds bought_aft94	-0.010	-0.003		
	(0.004)*	(0.009)		
Seeds bought_imid			-0.004	-0.003
			(0.005)	(0.009)
Tot. area_ad	0.901	0.742	0.917	0.739
	(0.099)**	(0.088)**	(0.102)**	(0.089)**
Tot. area_ad_aft94	0.170	0.092		
	(0.125)	(0.102)		
Tot. area_ad_imid			-0.025	0.034
			(0.116)	(0.096)
Avg. educ. Attn_producer	0.012	0.013	0.014	0.014
	(0.005)**	(0.005)**	(0.005)**	(0.005)**
Avg. educ. Attn_producer_aft94	0.006	-0.001		
	(0.009)	(0.009)		

Continued on next page...

[33] Using prefecture level seed consumption does not change the results.

... table 6 continued

Variable	Migration		Policy	
	OLS Coefficient (Std. Err.)	**IV Coefficient** (Std. Err.)	**OLS Coefficient** (Std. Err.)	**IV Coefficient** (Std. Err.)
Avg. educ. Attn_producer_imid			-0.004	-0.004
			(0.008)	(0.008)
Avg. educ. Attn_holder	0.034	0.024	0.034	0.024
	(0.007)**	(0.008)**	(0.008)**	(0.008)**
Avg. educ. Attn_holder_aft94	0.001	-0.008		
	(0.010)	(0.011)		
Avg. educ. Attn_holder_imid			0.005	-0.000
			(0.010)	(0.011)
Rents land	0.150	0.142	0.131	0.118
	(0.047)**	(0.049)**	(0.047)**	(0.051)*
Rents land_aft94	-0.140	-0.213		
	(0.091)	(0.100)*		
Rents land_imid			-0.055	-0.093
			(0.102)	(0.094)
Tot. rev from selling labour_ad	0.000	0.000	0.000	0.000
	(0.000)*	(0.000)*	(0.000)†	(0.000)
Tot. rev from selling labour_ad_aft94	-0.000	-0.000		
	(0.000)*	(0.000)†		
Tot. rev from selling labour_ad_imid			-0.000	-0.000
			(0.000)†	(0.000)
Prop. employee_hh	-0.598	-0.587	-0.470	-0.460
	(0.146)**	(0.131)**	(0.152)**	(0.135)**
Prop. employee_hh_aft94	0.279	0.262		
	(0.229)	(0.233)		
Prop. employee_hh_imid			-0.227	-0.194
			(0.251)	(0.226)
Agricultural extension service	-0.007	-0.017	0.021	0.023
	(0.063)	(0.040)	(0.069)	(0.042)
Agricultural extension service_aft94	0.172	0.206		
	(0.102)†	(0.084)*		
Agricultural extension service_imid			0.041	0.027
			(0.119)	(0.073)

Continued on next page...

... table 6 continued

Variable	Migration		Policy	
	OLS Coefficient (Std. Err.)	**IV Coefficient** (Std. Err.)	**OLS Coefficient** (Std. Err.)	**IV Coefficient** (Std. Err.)
Owns cattle	-0.302	-0.266	-0.326	-0.278
	(0.044)**	(0.042)**	(0.047)**	(0.043)**
Owns cattle_aft94	-0.074	-0.011		
	(0.072)	(0.067)		
Owns cattle_imid			0.024	0.039
			(0.066)	(0.059)
Output (sold) from livestock	0.008	0.001	-0.005	-0.005
	(0.006)	(0.006)	(0.002)**	(0.002)**
Output (sold) from livestock_aft94	-0.012	-0.006		
	(0.006)†	(0.006)		
Output (sold) from livestock_imid			0.003	-0.000
			(0.002)	(0.003)

Significance levels : † : 10% ∗ : 5% ∗∗ : 1%

Looking at the estimated coefficients on returns to inputs (land, and seeds), all signs are consistent with the theory, and all are significant. The coefficient estimate on on-farm family labour supply is positive and significant[34], which contributes to the argument that surplus labour does not necessarily imply that marginal productivity of labour should be zero (Sen 1966). However, the coefficients on the interaction terms are all insignificant, except for returnees' seed consumption in the OLS specification, which is negative and significant at the 5% level, implying that, all other things being equal, a one unit increase in seed consumption increases returnees' production on average by 1.0% less relative to stayers. However, this coefficient is insignificantly different from zero in the corresponding IV specification.

Estimated returns to human capital also bear the sign predicted by the theory, returns being larger for land holder relative to producers, implying an average increase in production of respectively 24-34%, and 12-14%, as the average schooling period increases by one year. Interaction terms on educational attainment are all insignificant.

The coefficient on the dummy for renting land is positive and significant for all groups. However, when interacted with migration status in the IV estimation,

[34] Since a squared term of labour supply is also included, it should be taken into account when computing the estimated partial marginal productivity. The corresponding estimated coefficients are significant, negative, and equal to 1.67×10^{-5}. Hence, zero marginal productvity occurs at 180 weekly hours of on-farm labour supply per adult member, which is larger than the number of hours in a week.

the coefficient is negative[35] and significant, and offsets totally the positive effect of renting land, or an overall effect for returnees of -3.9%, all other things being equal. This suggests that migrants under-cultivate the land they rent compared to stayers, which is probably due to their being more 'expropriation averse', having already experienced fleeing persecutions and leaving everything behind. This risk aversion is likely to be exacerbated by tenant status, which is highly unregulated in Rwanda.

Although the regression coefficients suggest significant differences in returns to exogenous income from selling labour, these effects are very small.

The coefficient on the dummy for access to agricultural extension service is insignificant, whereas the corresponding interaction term with migration is significant, positive in the IV estimation, suggesting an increase in output by on average 18.8–22.9% for migrants. This implies that migrants benefit more from gaining access to agricultural skills and inputs through a public infrastructure than stayers do, all other things being equal.

However, the simple difference estimators only provide partial results. Indeed, since over 45% of post-1994 returnees in the sample live in policy areas, identifying the impact of the policy on post-1994 returnees' agricultural productivity can only be allowed by a difference-in-difference estimation.

6.3.3 Assessing the impact of the policy on migrants

Estimating the difference in difference specification allows to assess the impact of the policy, controlling for migration status. Regression outputs for the OLS and IV[36] estimations are presented in table 7. Controls used in this regression model are the same as those included in the simple difference estimation model.

Looking at the estimated returns to production inputs, no differentials are isolated for land, and labour. However, differentials in returns to seeds are observed in the OLS estimation, as the coefficient on the DID interaction term is significant, and negative, suggesting that returns to seeds are on average 74.3% lower for returnees in policy areas that for the rest of the population, all other things being equal. Two explanations can be suggested for this effect. First, the fact that migrants are less able to use seeds efficiently in policy areas only suggests that, assuming that all returnees lost human capital during their exile, living in imidugudu reduces skill spill-over, rather inducing a 'ghetto effect'. Second, it may be that returnees who need to buy seeds in the first place are those who did not produce enough in the previous period to save seeds for cropping, i.e. the relatively 'low ability' farmers, suggesting that some selective sorting is at stake. However, this assumption fails to explain why these differences are observed for returnees in policy areas only, since low ability farmers should arguably be spread uniformly all over the country, unless sorting into

[35] The dummy for renting land is only capturing the impact on renting land. However, all returns to land are captured by the 'tot. area_ad' variable. Hence finding negative signs is not inconsistent with the theory.

[36] Instrumenting seed consumption (and all the interacted terms) with the commune level of seed consumption.

the programme is made on the basis of unobserved ability.

No significant differentials in returns to educational attainment are observed.

The dummy for renting land still exhibits a significant, negative coefficient when interacted with the migration dummy in the IV estimation, and the total negative effect from renting land is larger than in the difference estimation, with an average decrease in output by 6.4%. The DID coefficient on renting is insignificant. Overall, this negative impact of being a tenant for migrants specifically offers some rationale to the villagisation policy, insofar as returnees who benefit from the land redistribution programme are less likely to rent land[37], and hence have higher level of agricultural production relative to those in non-policy areas.

The estimated differences and DID coefficients on income from labour are all significant in the IV estimation, although the implied effects are still very small. The estimated signs however suggest that an increase in the income from labour has, on average, a positive impact on agricultural yield for stayers in non-policy areas, whereas it has negative impact on returnees' production. The impact for those living in policy area is smaller, whereas the coefficient for returnees living in policy areas is positive. Overall, these signs suggest that, although some complementarity is observed between income from on-farm for stayers not subject to the policy, this is attenuated for those living in policy areas, whereas these two sources of income become substitutes for returnees in non-policy areas. However, the DID coefficient suggest that returnees in policy areas use icome from off-farm employment neither as a substitute, nor as a complement to on-farm income.

The DID coefficient on access to agricultural extension service bears a significant, large, and positive coefficient, implying that returnees in policy areas increase their output by on average 45.5% to 51% when they have access to such infrastructure. This effect is much larger than that captured by simple difference estimation, and the benefit is limited to migrants in policy areas.

Estimating the DID coefficients of the reduced form brought some evidence of heterogeneity in returns to factors and characteristics across migration status and policy status. Moreover, it isolated some channels by which the policy has improved migrants productivity, as well as some drawbacks. However, looking at figure 8 suggests that taking the averages as 'reference' point in the estimation procedure may not capture the 'action', as most of the disparities in output seem to occur in the lower range of the distribution.

[37] In the data, 16.3% of returnees living in imidugudu declared renting some land, against 21.6% in non-policy areas.

Table 7: Estimation results : difference-in-difference (dependent: ln(annual household agricultural production per adult member))

Variable	**OLS Coefficient** (Std. Err.)	**IV Coefficient** (Std. Err.)
On-farm LS	0.006	0.006
	(0.001)**	(0.001)**
On-farm LS_aft94	0.001	0.000
	(0.002)	(0.002)
On-farm LS_imid	0.001	0.001
	(0.001)	(0.001)
On-farm LS_aft94_imid	-0.002	-0.002
	(0.002)	(0.002)
Seeds bought	0.035	0.091
	(0.004)**	(0.020)**
Seeds bought_aft94	0.000	0.014
	(0.004)	(0.017)
Seeds bought_imid	0.006	0.019
	(0.004)	(0.027)
Seeds bought_imid_aft94	-0.026	-0.050
	(0.007)**	(0.035)
Tot. area_ad	0.924	0.749
	(0.093)**	(0.109)**
Tot. area_ad_aft94	0.106	-0.044
	(0.163)	(0.190)
Tot. area_ad_imid	-0.094	-0.048
	(0.121)	(0.144)
Tot. area_ad_aft94_imid	0.179	0.271
	(0.264)	(0.285)
Avg. educ. Attn_producer	0.012	0.015
	(0.005)*	(0.006)*
Avg. educ. Attn_producer_aft94	0.008	-0.005
	(0.012)	(0.014)
Avg. educ. Attn_producer_imid	-0.003	-0.007
	(0.009)	(0.010)
Avg. educ. Attn_producer_aft94_imid	-0.007	0.006
	(0.017)	(0.019)

Continued on next page...

... table 7 continued

Variable	OLS Coefficient (Std. Err.)	IV Coefficient (Std. Err.)
Avg. educ. Attn_holder	0.031	0.024
	(0.008)**	(0.009)*
Avg. educ. Attn_holder_aft94	0.002	-0.008
	(0.014)	(0.017)
Avg. educ. Attn_holder_imid	0.002	-0.007
	(0.012)	(0.016)
Avg. educ. Attn_holder_aft94_imid	0.008	0.017
	(0.020)	(0.026)
Rents land	0.163	0.164
	(0.051)**	(0.051)**
Rents land_aft94	-0.158	-0.278
	(0.117)	(0.132)*
Rents land_imid	-0.061	-0.134
	(0.116)	(0.135)
Rents land_aft94_imid	0.025	0.198
	(0.187)	(0.212)
Tot. rev from selling labour_ad	0.001	0.000
	(0.000)**	(0.000)*
Tot. rev from selling labour_ad_aft94	-0.000	-0.001
	(0.000)*	(0.000)**
Tot. rev from selling labour_ad_imid	-0.001	-0.000
	(0.000)**	(0.000)†
Tot. rev from selling labour_ad_aft94_imid	0.000	0.001
	(0.000)	(0.000)*
Prop. employee_hh	-0.604	-0.593
	(0.181)**	(0.183)**
Prop. employee_hh_aft94	0.488	0.482
	(0.330)	(0.363)
Prop. employee_hh_imid	-0.153	-0.100
	(0.323)	(0.322)
Prop. employee_hh_aft94_imid	-0.314	-0.367
	(0.458)	(0.482)
Agricultural extension service	0.016	0.010
	(0.074)	(0.074)

Continued on next page...

... table 7 continued

Variable	OLS Coefficient (Std. Err.)	IV Coefficient (Std. Err.)
Agricultural extension service_aft94	0.001 (0.126)	0.061 (0.129)
Agricultural extension service_imid	-0.084 (0.125)	-0.089 (0.125)
Agricultural extension service_aft94_imid	0.412 (0.192)*	0.375 (0.201)†
Owns cattle	-0.310 (0.050)**	-0.277 (0.053)**
Owns cattle_aft94	-0.081 (0.095)	0.022 (0.105)
Owns cattle_imid	0.023 (0.072)	0.058 (0.086)
Owns cattle_aft94_imid	0.060 (0.135)	-0.028 (0.152)
Output (sold) from livestock	0.012 (0.011)	0.009 (0.012)
Output (sold) from livestock_aft94	-0.018 (0.011)	-0.015 (0.012)
Output (sold) from livestock_imid	-0.007 (0.013)	-0.018 (0.017)
Output (sold) from livestock_aft94_imid	0.014 (0.013)	0.024 (0.018)

Significance levels : † : 10% ∗ : 5% ∗∗ : 1%

6.3.4 Quantile treatment effect

Quantile regression estimation uses different quantiles as reference value, hence computing quantile effects rather than average effects. Computing quantile effects would thus isolate any heterogeneity in the determinants of yield at different points in the distribution. The use of quantile regression to measure quantile treatment effect (QTE) is still under discussion in theoretical econometrics, and it is unclear whether the QTE estimates computed using simple parametric quantile regression technique have desirable properties. Firpo (2004) suggests the use of a semi-parametric quantile regression technique, with involves computing propensity score estimates, and using them in the quantile estimation, to yield estimates with standard large sample properties. However, this study

uses the baseline parametric quantile estimation to compute QTE, as Firpo's method is not yet 'empirics-friendly', and as the debate regarding the properties of QTE estimators is still on.

Table 8: Estimation results : Quantile regression of DID (dependent: ln(annual household agricultural production per adult member))

Variable	**Quant. 0.25** (Std. Err.)	**Quant. 0.50** (Std. Err.)	**Quant. 0.75** (Std. Err.)
On-farm LS	0.004	0.006	0.006
	(0.001)**	(0.001)**	(0.001)**
On-farm LS_aft94	-0.000	0.001	0.000
	(0.002)	(0.002)	(0.001)
On-farm LS_imid	0.002	0.002	-0.000
	(0.001)*	(0.001)	(0.001)
On-farm LS_aft94_imid	0.000	-0.002	-0.001
	(0.002)	(0.003)	(0.002)
Seeds bought	0.043	0.038	0.033
	(0.004)**	(0.004)**	(0.003)**
Seeds bought_aft94	-0.001	-0.001	-0.002
	(0.004)	(0.004)	(0.004)
Seeds bought_imid	-0.001	0.006	0.008
	(0.004)	(0.004)	(0.003)*
Seeds bought_imid_aft94	-0.025	-0.023	-0.018
	(0.005)**	(0.007)**	(0.006)**
Tot. area_ad	1.126	0.922	0.825
	(0.089)**	(0.106)**	(0.088)**
Tot. area_ad_aft94	0.106	0.173	0.321
	(0.136)	(0.159)	(0.131)*
Tot. area_ad_imid	-0.194	-0.012	-0.085
	(0.114)†	(0.142)	(0.118)
Tot. area_ad_aft94_imid	0.238	0.240	0.075
	(0.212)	(0.248)	(0.195)
Avg. educ. Attn_producer	0.019	0.009	-0.000
	(0.006)**	(0.007)	(0.006)
Avg. educ. Attn_producer_aft94	-0.019	0.017	0.023
	(0.013)	(0.015)	(0.012)†

Continued on next page...

... table 8 continued

Variable	Quant. 0.25 (Std. Err.)	Quant. 0.50 (Std. Err.)	Quant. 0.75 (Std. Err.)
Avg. educ. Attn_producer_imid	-0.019	-0.000	0.011
	(0.010)†	(0.013)	(0.011)
Avg. educ. Attn_producer_aft94_imid	0.014	-0.017	-0.019
	(0.019)	(0.023)	(0.020)
Avg. educ. Attn_holder	0.041	0.028	0.035
	(0.009)**	(0.011)**	(0.010)**
Avg. educ. Attn_holder_aft94	0.001	0.001	-0.026
	(0.016)	(0.018)	(0.015)†
Avg. educ. Attn_holder_imid	0.014	-0.004	-0.007
	(0.014)	(0.017)	(0.014)
Avg. educ. Attn_holder_aft94_imid	0.005	0.015	0.011
	(0.024)	(0.028)	(0.024)
Rents land	0.287	0.182	-0.001
	(0.061)**	(0.073)*	(0.062)
Rents land_aft94	-0.104	-0.073	-0.203
	(0.135)	(0.161)	(0.132)
Rents land_imid	-0.156	-0.071	0.158
	(0.121)	(0.145)	(0.123)
Rents land_aft94_imid	-0.091	-0.073	0.038
	(0.223)	(0.266)	(0.221)
Tot. rev from selling labour_ad	0.001	0.000	0.001
	(0.000)**	(0.000)†	(0.000)**
Tot. rev from selling labour_ad_aft94	-0.001	-0.001	-0.000
	(0.000)**	(0.000)†	(0.000)
Tot. rev from selling labour_ad_imid	-0.000	-0.000	-0.001
	(0.000)**	(0.000)	(0.000)**
Tot. rev from selling labour_ad_aft94_imid	0.001	0.000	0.000
	(0.000)*	(0.000)	(0.000)
Prop. employee_hh	-1.003	-0.524	-0.407
	(0.163)**	(0.199)**	(0.178)*
Prop. employee_hh_aft94	1.147	0.436	0.475
	(0.326)**	(0.393)	(0.337)
Prop. employee_hh_imid	0.106	0.025	-0.091
	(0.286)	(0.361)	(0.327)

Continued on next page...

... table 8 continued

Variable	Quant. 0.25 (Std. Err.)	Quant. 0.50 (Std. Err.)	Quant. 0.75 (Std. Err.)
Prop. employee_hh_aft94_imid	-0.767	-0.451	-0.770
	(0.512)	(0.618)	(0.534)
Agricultural extension service	0.099	0.100	-0.002
	(0.050)*	(0.059)†	(0.050)
Agricultural extension service_aft94	0.027	-0.106	-0.040
	(0.117)	(0.140)	(0.120)
Agricultural extension service_imid	-0.170	-0.082	0.001
	(0.094)†	(0.112)	(0.095)
Agricultural extension service_aft94_imid	0.332	0.344	0.296
	(0.185)†	(0.221)	(0.187)
Owns cattle	-0.380	-0.283	-0.315
	(0.049)**	(0.058)**	(0.049)**
Owns cattle_aft94	0.007	-0.095	0.013
	(0.092)	(0.107)	(0.087)
Owns cattle_imid	0.056	0.001	0.019
	(0.074)	(0.089)	(0.075)
Owns cattle_aft94_imid	-0.017	0.071	0.079
	(0.142)	(0.167)	(0.139)
Output (sold) from livestock	0.007	0.020	0.010
	(0.009)	(0.011)†	(0.009)
Output (sold) from livestock_aft94	-0.010	-0.024	-0.015
	(0.009)	(0.011)*	(0.009)†
Output (sold) from livestock_imid	-0.003	-0.019	-0.001
	(0.013)	(0.015)	(0.011)
Output (sold) from livestock_aft94_imid	0.009	0.024	0.006
	(0.013)	(0.015)	(0.011)

Significance levels : † : 10% * : 5% ** : 1%

The results from 0.25, 0.50 and 0.75 QTE estimations are presented in table 8, and the specification used is the same as the one used in the DID model above.

These regressions capture significant heterogeneity in returns to inputs across quantiles, and across groups. Returns to labour are different across the first and the other two quantiles, suggesting higher productivity in the higher range of the distribution. The coefficient on family on-farm labour supply interacted

with the policy dummy is significant and positive in the regression at the first quantile, implying that an increase of one hour per week in the allocation of total family labour supply would increase output by 0.2% more for those living in policy areas and producing at the median. However, the DID coefficients are all insignificant. Hence, although returns to labour are higher in the lower parts of the distribution for those living in policy areas, there is no evidence of productivity gap across migration stata.

Returns to seeds are also found to be heterogeneous across quantiles, and groups. Contrary as was found for labour, returns to seeds are higher in the first quantile of the distributions than in the second, and higher in the second than in the third. This could reflect the fact that, the poorer the household, the more it is parcimonious with the amount of seeds it uses, and, hence, the higher the returns. The DID coefficient is negative and significant for all quantiles of the distribution, the effect being larger, in absolute terms, in the lower ranges of the distribution. The interaction term with the policy status dummy bears a significant, positive coefficient in the last quantile. This implies that the impact of the policy in terms of returns to seeds on the control group, i.e. stayers, was insignificant for all quantiles of the distribution, apart from the last (0.75) quantile, for which the impact was positive. This positive impact suggests an increase in returns to seeds by 24.2% relative to stayers in non-policy areas for this quantile. Summarizing these effects, a unit[38] increase in seed consumption increases output by 4.3% for stayers anywhere and returnees in non-policy areas, and by 1.8% for returnees in policy areas in the first quantile, compared to respectively 3.8%, and 1.5% at the median. These findings imply that, whereas no productivity gaps are observed across migration stata in non-policy areas in terms of returns to seeds, returnees' productivity is lower than that of stayers in policy areas. Hence, this suggests that the policy, rather than encouraging positive skill spill-overs across returnees and stayers, created some sort of ghettos. The fact that these effects are captured by seeds can be explained by the fact that planting is a highly skill-intensive relative to more physical agriculture-related activities.

Returns to land are heterogenous across quantiles, returns being higher in the lower parts of the distribution. The coefficient on the interaction term between land and policy in the first quantile estimation is significant and negative, implying a decrease in returns to land by 17.2% for households living in policy areas. This could suggest two things. First, since quality of land is not controlled for in this specification, this coefficient may be capturing the fact that land is of inferior quality in imidugudu communes where households produce in the last quarter of the distribution. However, should this quality effect be true, this penalty should apply equally to all households within the same commune, since land quality is unlikely to vary within the same village. Hence, that would imply that, within these 'low potential' communes, all households produce in the first quarter of the distribution, as this effect failed to be observed in the

[38] A unit increase in seed consumption is the equivalent in monetary terms of 1000 Rwandan francs, or approximately a $3 increase.

second and last quantile regressions. An alternative explanation would be that, other things being equal, the worse-off households living in imidugudu cultivate their land less intensively than those living in non-policy areas. This may be due to the fact that, having undergone one land reform, both returnees and stayers anticipate more changes in the future, and hence choose not to over-invest in their land as they fear they may be expropriated. The fact that this effect is only significant for the first quantile suggests that risk aversion has a stronger impact on those with more limited resources. The interaction term between land and migration status bears a signifcant and positive coefficient in the last quantile regression, implying that returnees' returns to land in this range of the distribution are 38.9% higher relative to stayers'. Not only does this contradict the assumption that returnees' productivity is lower than that of stayers', but it suggests that it is, in the upper quantile of the distribution, higher. This finding could be rationalised by arguing that, during their stay in camps, returnees were allocated a very limited amount of land, if any. Hence, one may argue that the most able of them learnt how to exploit land more intensively than they would have in better conditions. This may also explain why the effect is only observed in the last quantile, as high ability farmers are expected to produce in this part of the distribution.

Returns to holders' and producers' education need to be interpreted simultaneously. In the first quantile, returns to producers' educational attainment are significant and positive, implying an increase in production of 1.9% as the average educational attainment across producers increases by one year, whereas they are insignificant in the other two quantiles. However, returns to holders years of schooling are significant and positive in all quantiles.This suggests that production in the last two quantiles is more hierarchic than in the lower quantile, whereby only holders make decisions regarding management and organisation of the exploitation, the producers performing only physical intensive tasks. The difference and DID coefficients on educational attainment variables are all insignificant in the second quantile, whereas some are significant in the first and last quantiles. In the first quantile regression, the coefficient on the interaction term between producers' educational attainment and policy status is negative and significant, offsetting totally the positive coefficient on producers' schooling, and implying a zero effect of producers' education on production in policy areas. This suggests that, in policy areas, farmers producing in the first quantile of the distribution organise their exploitation in an equivalently hierarchic manner as in the higher quantiles. This suggests that imidugudu encourage transfers of management techniques between worse off and better off households, although it is unclear whether this consists of an improvement or not. In the third quantile, the coefficients on the interaction between schooling and migration are significant both for producers and holders, the one on producers being positive and that of holders being negative. These signs suggests that, in the upper range of the distribution, returnees adopt a less markedly hierarchic system of production than stayers do.

The negative effect of renting land on migrants as observed in the IV estimation at the average (cf. tab.7) is not observed at any of the quantiles, although

the effect of renting land for all groups is heterogenous across quantiles, being significant and positive at the first two quantiles, and insignificant in the last one.

Significant heterogeneity in returns to off-farm labour supply are observed across quantiles, and across migration stata in the first quantile. The coefficients on the proportion of household members supplying labour to the off-farm sector are negative and significant for all three quantiles, inversely increasing (in absolute term) with agricultural production. This suggests that poorer households substitute off-farm and on-farm incomes at a higher rate. The interaction term between off-farm labour supply and migration status is large and positive for the first quantile of the distribution, totally offsetting the negative effect mentioned hereabove. This suggests that, whereas stayers tend to substitute on-farm income with income from selling labour on the off-farm sector, returnees producing in the first quantile use these incomes as complements, probably allocating off-farm revenue to input purchase. These coefficients imply that an increase of one unit (or 100%) in the proportion of members selling labour on the off-farm market[39] leads to a 100.3% decrease in output for stayers in the first quantile, compared to a 14.4% increase in output for returnees, and respectively to a 52.4% decrease for all groups at the median. The effect of off-farm labour supply on the third quantile is homogeneous across groups, with a decrease of 40.7% in output when the proportion of members working off-farm increases by 100%.

The impact of having access to an agricultural extension service varies across quantiles and groups. Whereas access to such infrastructure increases output by 10.5% at the median for stayers and retunrees in all areas, it does not have any significant impact at the last quantile. However, the effect at the first quantile is to increase output by 10.4% for all groups in non-policy areas, whereas it is significant and negative for all groups in policy areas, or a total reduction in output of 5.2% for stayers in policy areas. The DID coefficient implies a total increase of output for returnees in policy areas of 34.1%. Overall, these effects are very large, and the negative impact on stayers in policy areas producing in the lower range of the distribution cannot be intuitively explained. Finding no evidence that having access to such service increase output in the highest quantile is not very surprising, insofar as relatively wealthier farmers are probably not in need of this type of help.

Some differentials in returns to income from selling products from livestock are also observed at the median across migration status. Whereas a unit[40] increase in output from livestock increase stayers' agricultural output by 2%, it decrease returnees' output by 0.4%, at the median. Although this effect is small, it suggests that returnees producing at the median are more specialised than stayers within the same range of the distribution, and tend to substitute crop production with livestock production, whereas stayers seem to use livestock

[39] It is important to note that an increase in off-farm labour market participation by 100% would not necessarily imply an equivalent decrease in off-farm participation as off-farm employment is seldom full-time.

[40] The unit is 1000 Rwandan francs, or an equivalent of $3.

production to invest more in their crop production.

Hence estimating the QTE isolated some differentials in the effect of the policy across groups, and across different ranges of the distribution.

7 Discussion

This study has assessed the impact of a policy intervention in post-war Rwanda on post-1994 returnees economic outcome. Moreover, a human capital effect was tested against a pure input effect. Returnees' agricultural productivity was found to differ slightly from stayers', although such differentials seem to be exarcebated in policy areas. Indeed, the empirical evidence suggests that the villagisation programme on average increased returnees' output essentially by increasing access to land for this group. Although the results suggest that production techniques are more homogeneous across production quantiles in policy areas, no evidence was found in favour of positive skill spill-overs between stayers and returnees in policy areas. Some of the results even suggest a 'ghetto' effect, whereby returnees' productivity in imidugudu was found to be lower than that their counterparts in non-policy areas. The empirical findings also suggest that both returnees and stayers producing within the lower range of the distribution under-exploit their land in communes where the policy was implemented, which is probably related to their anticipating more policy interventions in the future. Access to an agricultural extension service proved, on average and in the first quantile, to dramatically boost returnees' output in policy areas, suggesting that more aggregated patterns of settlement improved access to public good infrastructures.

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Appendix

A Index of variables

Table 9: Index of variables and abbreviations

Variables	Definitions
HH	stands for household
HHH	stands for head of household
X_aft94	Indicates that variable X is interacted with the dummy for returnee status
X_imid	Indicates that X is interacted with the dummy for policy status

Continued on next page...

... table 9 continued

Variables	Definitions
X_aft94_imid	Indicates that X is interacted with both dummies for returnee and policy status
On-farm LS	total annual on-farm family labour supply, expressed in weekly value
Seeds bought	Amount of seeds bought over the year in 1000 Rwandan francs (USdollars 3)
Tot. area_ad	Amount of land cultivated by the household, normalised by the number of adults in the household
Avg. educ. Attn_producer	Average Educational attainment (in years) of those involved in the production
Avg. educ. Attn_holder	Average Educational attainment (in years) of those in charge of a parcel of land (holders)
Rents land	Dummy for whether HH rented some land over the year
Tot. rev from selling labour_ad	Total income from selling labour, normalised by the number of adults in the HH, expressed in 1000 Rwandan francs (USdollars 3)
Prop. employee_hh	Proportion of household members (children and adults) having worked off-farm in exchange of money or a payment in kind
Agricultural extension service	Dummy for access to an agricultural extension service in the commune. This service is an infrastructure through which farmers can buy/rent/benefit from tools, seeds, advice on agricultural techniques
Owns cattle	Dummy for whether the HH owns some cattle
Output (sold) from livestock	Amount earned by selling products issued from livestock exploitation

Prefectures	**Number of communes in sample**	**Average total population per commune (Std Dev.)**	**Average number of observations per commune**
Butare	40.0	1194.9	11.4
		(552.9)	(0.6)
Byumba	40.0	970.2	11.4
		(428.0)	(1.1)
Cyangugu	39.0	896.4	10.9
		(456.0)	(1.2)
Gikongoro	40.0	604.2	11.6
		(213.1)	(0.6)
Gisenyi	40.0	866.4	11.4
		(255.7)	(0.7)
Gitarama	40.0	846.7	11.6
		(405.4)	(0.6)
Kibungo	40.0	1419.2	10.9
		(1262.8)	(2.0)
Kibuye	40.0	714.7	11.7
		(282.7)	(0.6)
Kigali Ngali	39.0	750.9	10.6
		(351.2)	(2.4)
Ruhengeri	40.0	1085.2	11.7
		(642.0)	(0.6)
Umutara	36.0	876.8	11.0
		(474.0)	(1.6)

Table 10: Sample description

B Data: further descriptive analysis

	Communes without Policy		***Communes with Policy***	
	Freq.	*Percent*	*Freq.*	*Percent*
Butare	30	10.03	10	7.41
Byumba	32	10.70	8	5.93
Cyangugu	32	10.70	7	5.19
Gikongoro	37	12.37	3	2.22
Gisenyi	35	11.71	5	3.70
Gitarama	26	8.70	14	10.37
Kibungo	4	1.34	36	26.67
Kibuye	35	11.71	5	3.70
Kigali Ngali	23	7.69	16	11.85
Ruhengeri	22	7.36	18	13.33
Umutara	23	7.69	13	9.63
Total	299	100.00	135	100.00

Table 11: Description of the policy implementation across Rwandan prefectures.

	Arrived after 1994 (%)		
Imidugudu (%)	*No*	*Yes*	*Total*
No	2,725 (74.45)	677 (54.29)	3,402
Yes	935 (25.55)	570 (45.71)	1,505
Total	3,660	1,247	4,907

Table 12: Migration and Policy Status in the Sample

Age Class	# of obs.	% of sample	# boys	# girls	Male ratio
0-4 (1)	5005	15.6%	2459	2552	96
5-9 (2)	4514	14%	2209	2311	95.6
10-14 (3)	4943	15.4%	2401	2550	94
15-19 (4)	4626	14.4%	2135	2502	**85**
20-24 (5)	2867	9%	1301	1571	**82.8**
25-29 (6)	1930	6%	824	1110	**74**
30-34 (7)	1592	5%	710	888	**80**
35-39 (8)	1456	4.5%	641	818	**78**
40-44 (9)	1420	4.4%	593	830	**71**
45-49 (10)	1057	3.3%	509	549	92.7
50-54 (11)	821	2.5%	352	472	**74.6**
55-59 (12)	547	1.7%	234	314	**74.5**
60-64 (13)	455	1.4%	186	269	**69**
65-69 (14)	345	1.1%	141	204	**69**
70-74 (15)	269	0.8%	118	152	**77.6**
75-79 (16)	142	0.4%	75	68	1.1
80-84 (17)	164	0.5%	78	85	91.7
Total	32153	100%	14966	17245(53.6%)	86.8

Table 13: Age Distribution within sample

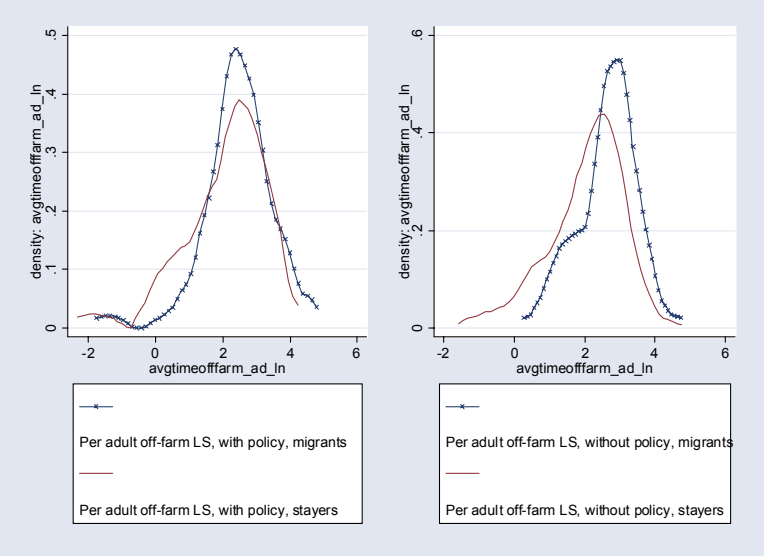

Figure 11: Kernel density estimations of off-farm labour supply, by policy regime and migration status.

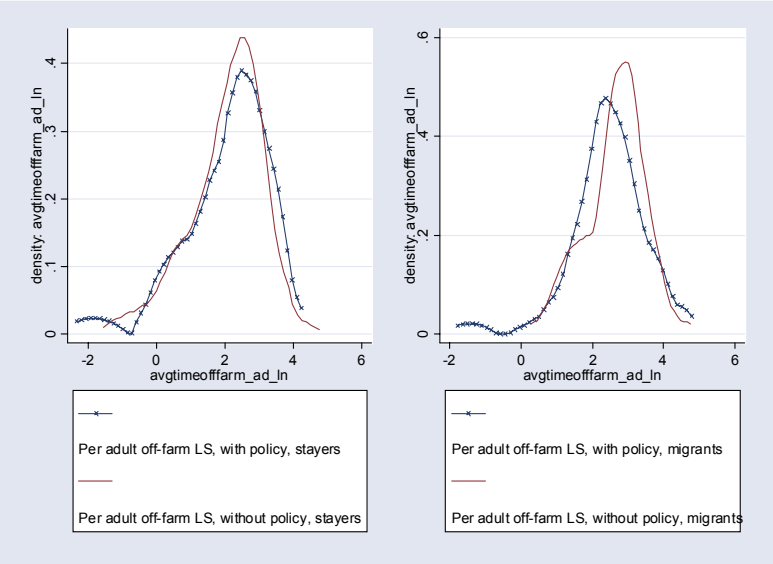

Figure 12: Kernel density estimations of off-farm labour supply, by migration status and policy regime.