Abstract

Whether an increase in the scarcity of renewable resources like arable land can be considered as a valid cause of armed conflict or not remains a fervently debated question in environmental security research. Systematic quantitative investigation of the causal connection between resource scarcity and conflict, so far, has exclusively focused on supply and demand induced scarcity, that is, on scarcity caused by ecological and demographic changes like land degradation, rainfall variations or population growth, which bring about a reduced per capita availability of resources. Yet, a close look at the case study literature reveals that such processes are unlikely to provoke armed conflict unless they have a profoundly detrimental impact on the social cohesion of affected populations. Among the different social consequences adverse demographic and ecological changes might have, a highly skewed distribution of resources seems particularly likely to breed violent conflict, especially if it matches demarcation lines between different social groups with a historically rooted perception of shared identity. As they result from exclusionary politics of resource appropriation, such horizontal inequalities are likely to breed grievances among disadvantaged communities, while the conflation of group affiliation with political power and the prospects to secure one’s livelihood facilitates intra-group cohesion and the collective use of violence against members of other communities. Inter-ethnic clashes around the 2007 Kenyan elections represent a paramount example of the brisance of such a conjuncture. Employing structural equation modelling techniques as well as historical analysis, this contribution demonstrates the highly destabilising effect of land scarcity and horizontal inequalities in the access to land on Kenyan society. Using a sample of 3,225 Kenyans employed in the agricultural sector, it confirms systematic discrepancies in experiencing the adverse effects of land scarcity between members of different ethnic communities prior to 2007. A short historical review of land distribution issues in post-independence Kenya complements this analysis. It clarifies that horizontal inequalities in the access to fertile land were the result of land grabbing and patronimial politics of resource allocation, substantiating a strong feeling of relative deprivation among disadvantaged communities. This explains the susceptibility of Kenyan society to ethno-politically instigated mass violence in late 2007.
Introduction

With the end of the cold war and the search for a new paradigm in international security research, scholars have increasingly turned their attention towards the possible violent consequences of climate change and overpopulation. Human-induced ecological processes such as land degradation, deforestation or water depletion in conjunction with population growth, certain researchers explain, significantly reduce per capita availability of essential renewable resources, whilst putting severe strains on institutional systems of conflict prevention. The resulting competition for resources in a weak regulatory environment is suspected to breed violent turmoil in developing countries, which lack the technological and institutional capacities to cope with increased resource scarcity.

However, environmental security scholars are cautious in claiming a direct and inevitable effect of adverse environmental and demographic changes on the likelihood of armed conflict. It is rather through their economic and political repercussions on society such as a weakened state, economic marginalisation and growing discontent among those populations that lack the access to vital resources that these processes unfold their violent potential (Homer-Dixon, 1994; Kahl, 2006). This idea is supported by extensive case study work, which emphasises political instability resulting from exclusionary practices of recourse allocation - rather than the depletion of resources per se - when explaining the causes of scarcity-related violence (see, for instance, Benjaminsen, 2008; Deherez, 2009; Hagmann & Mulugeta, 2008). Ecological and demographic processes altering the supply of and demand for renewable resources are thus unlikely to provoke armed conflict, unless they have a profoundly detrimental impact on the social cohesion of affected populations.

Among the different social consequences adverse demographic and ecological changes might have, a highly skewed distribution of resources resulting from competitive politics of resource appropriation seems particularly likely to breed violent conflict, especially if it matches demarcation lines between different social groups with a historically rooted perception of shared identity. Such disparities between ethnic, religious, cultural or other groups are referred to as “horizontal inequalities” in the literature (Stewart, 2002). As Fjelde and Østby (2011) explain, these are indicative of patrimonial politics, which monopolise essential resources in the hands of distinct social groups. In countries with a large agricultural sector and a weak institutional environment - which allows for the manipulation of legislation and clientism - the deliberate channelling of renewable resources and especially arable land to distinct populations may become a powerful political instrument. Political actors can ensure the loyalty of affiliated community members by providing a privileged access to resources, although the effective share of prosperity trickling down the patron-client network remains usually low in such settings (Van de Walle, 2003; Fjelde & Østby, 2011). In return, agriculturalists from different communities have an interest in supporting their political patrons, granting them the power to shift land tenure legislation or divert government subsidies in their favour. Yet, the conflation of group affiliation, political power and
the prospects of securing one’s livelihood as well as the competitive nature of patrimonial politics favour the collective perception of other communities as enemies. Among the members of politically inferior coalitions, this facilitates coordination and motivates violent action against individuals perceived as affiliated to political rivals (Cederman et al., 2011:481ff).

Inter-ethnic clashes around the contested 2007 Kenyan elections represent a paramount example of the brisance of such a conjuncture. Although irregularities in the tallying process and accusations of vote rigging certainly played an important part in triggering the wave of violence, which hit the country in late December 2007, many analysts of the Kenyan crisis perceive long standing rivalries for land between Kenya’s different communities and inequalities in the access to land as the underlying causes of the violence. These offered certain local politicians the opportunity to instigate inter-ethnic-clashes in fervently contested key constituencies, with the aim to eliminate their political rivals (HRW, 2008; ICG, 2008; Anderson & Lochery, 2008; Kanyinga, 2009). The Kenyan case is highly revealing with regards to the interaction of land scarcity, unequal distribution of land and patrimonial politics in producing an opportune environment for armed inter-group conflict. Hence it seems feasible to conduct an exemplary and systematic examination of the causal connexion between horizontal inequalities in the access to land and armed conflict. The analysis proceeds in several steps and employs a mixed methods design. Following a short résumé of the events around the 2007 Kenyan elections, the implications of land scarcity for Kenya’s agriculturalists is outlined. Using a representative sample of 3,225 Kenyans employed in the agricultural sector and structured equation modelling techniques, this section highlights the vital importance of land as a life sustaining resource and thus justifies the immediate political relevance of its distribution. Using the same data, significant differences between ethnic communities in experiencing the adverse consequences of land scarcity that existed prior to the 2007 elections are then asserted. The following section explains why these inequalities were perceived as highly unfair. It places the issue of land distribution in the context of Kenya’s post-colonial history, marked by patrimonial politics of resource redistribution that accounted for the strong perceptions of relative deprivation among less endowed communities. Taken together, these analytical steps underline the highly destabilising effect of land scarcity and land distribution issues on Kenyan society. Based on the findings of this analysis, a concluding section proposes a general reflection about the interplay of scarcity, unequal distribution of resources and violent inter-group conflict and several recommendations for further research.
The security crisis around the 2007 Kenyan elections

Sadly, inter-ethnic violence in times of elections has almost become commonplace in Kenyan politics. Since the 1990s every general election opposing two top candidates from different communities has been pretext to inter-ethnic clashes. These are signs for ethnic polarisation turning into a political instrument that is commonly employed by politicians who are more than willing to approve of bloodshed if it assures them a political majority (ICG, 2008). The intensity of the violence that erupted after the announcement of the contested electoral result on December 30th 2007 however, had been unprecedented and plunged the country into war-like conditions. On a superficial level, it appeared as a direct reaction to what was perceived as impudent electoral fraud. Evidence however suggests that a high propensity towards violence was already endemic to the electoral campaign, where certain local elites deliberately revived long-standing disagreements over arable land between different ethnic communities in order to eliminate their political rivals.

The rigging of the vote and post electoral violence

The electoral campaign had been a tight race between the incumbent president Mwai Kibaki and his Party for National Unity (PNU) and Raila Odinga’s Orange Democratic Movement (ODM). Yet, Odinga had been leading the polls since the beginning of the presidential campaign in October 2007 and preliminary figures on December 28th, one day before the scheduled announcement of the results, were clearly in his favour. The same evening, however, national observers complained of irregularities in the tallying process, which were later confirmed by senior members of the electoral commission. Results announced by the central tallying centre in Nairobi did not match results at constituency level and even displayed completely unrealistic participation rates in some instances (Taibl, 2009:145ff).

Samuel Kivuitu, chairman of the electoral commission, publicly expressed concerns about a possible manipulation of the vote. Nevertheless the final results were only postponed by a day and Kibaki was finally declared the winner of the general elections on December 30th.

Although it became apparent later that both candidates had recursed to fraud in order to inflate their votes (ICG, 2008:8; Klopp & Kamungi, 2008), the announcement of the contested results provoked the indignation of Odinga’s supporters and large-scale demonstrations in Kenya’s major cities. These were brutally repressed by police forces and led to more violent forms of protest; rapidly taking the form of targeted attacks against members of the Kikuyu community, affiliated to Kibaki. In Nairobi, Kisumu, Eldoret and Mombasa Kikuyu-owned shops were attacked and sacked by members of the Kalenjin, Maasai and Luo communities, which had supported Odinga. Soon after, gangs of Kikuyu youth were geared up for retaliatory actions. The violence engulfed other towns - mainly in the Rift
Valley province - and spread to the big slum areas of Nairobi, like Mathare and Korogocho. It peaked on New Years Eve with the deliberate burning of over 30 members of the Kikuyu group, who had sought refuge in a church near Eldoret. In January, violence concentrated in Kenya’s Rift Valley province. Kikuyu youth violently expelled members of the Luo, Luhya and Kalenjin communities from business-, industrial- and farming areas in and around Nakuru and Naivasha (ICG, 2008). Until Kibaki and Odinga could reach an agreement by the end of February 2008, the conflict had resulted in more than 1,000 fatalities. Estimates of the number of internally displaced persons vary between 350,000 and 600,000 (HRW, 2008; HPG, 2008:2).

At first sight, these violent events might appear as a spontaneous reaction to what was widely perceived as impudent vote rigging exerted by Kibaki and his Kikuyu supporters. Yet, there is evidence that local politicians and businessmen from different communities had planned them beforehand (HRW, 2008; ICG, 2008). Especially in the fervently contested Rift Valley, local strongmen had exacerbated pre-existing inter-ethnic tensions in a deliberate effort to intimidate their political rivals and secure a majority vote for their preferred candidate.

**An aggressive campaign in an insecure environment**

Prior to the electoral campaign it was rather foreseeable that Kikuyu and Luo would vote for the candidate from their respective community. Kibaki as well as Odinga also each chose a Luhya running mate—Moody Awori for the former, Musalia Mudavadi for the latter – to convince the populous Luhya electorate to join their cause. The Muslim population did not a priori favour one candidate. The Muslim’s poor, however, were apparently sensible to Odinga’s promises for democratic change and more rights for marginalised groups (Klopp & Kamungi, 2008; ICG, 2008). It was unclear whether the numerous Kalenjin communities would vote as a bloc for one candidate. Forming the majority in many constituencies in the Rift Valley, which accounted for almost a quarter of Kenya’s registered voters, they could have a decisive impact on the election. However, following the 2002 elections, divisions had emerged within these communities, especially between followers of the former president Daniel arap Moi, supporting Kibaki’s candidature and the followers of William Ruto, seen by many as the new representative of Kalenjin nationalism within Odinga’s formation (Lynch, 2008).

In order to secure the biggest possible share of Kalenjin votes, Odinga made decentralisation and the devolution of power - coined by the Swahili term “majimbo” - to a central theme of his presidential campaign in order to draw on Kalenjin aspirations for regional autonomy of the Rift Valley and their general anxiety about a strong, Kikuyu-dominated central government. The past association of an extremist interpretation of majimboism with inter-ethnic violence in the 1990s meant this strategy to be of strong risk. From a militant viewpoint, majimbo implied political consequences beyond the adoption
of a federal structure of government, such as the formation of ethnically homogenous administrative units. It further implied the exclusive entitlement to the natural resources of these regions to autochthonous ethnic groups. This radical interpretation of majimbo had been very popular within certain segments of the Kalenjin community throughout Kenya’s post-colonial history, for their ancestral lands in the Rift Valley had been occupied by colonial settlers and often been redistributed to members of other communities since, notably Kikuyu immigrants from Central province. Adopting a militant majimbo position was thus synonymous with advocating the eviction of immigrant communities from the Rift Valley and the restitution of land to autochthonous communities (Kanyinga, 2009:338; Klopp, 2002:274).

As Anderson and Lochery (2008) point out, “Odinga did not at any point advocate expulsions, but he was persistently vague in explaining exactly what his policy might entail. And his Rift Valley supporters, headed by William Ruto, Henry Kosgey and Sally Kosgei, did little better. Their past associations with militant majimboists led to the easy assumption that ODM would indeed support a radical interpretation of the majimbo agenda.” Whatever the intentions of ODM cadres might have been when invoking majimbo, it was evident that the resulting confusion would rally maximum support among land-seeking Kalenjin and Maasai coveting the land of their Kikuyu neighbours (ICG, 2008:5).

With certain local politicians and Kalenjin elders feeling encouraged by ODM, the presidential campaign in the Rift Valley already contained the seeds of the violence which was to be unfolded after the elections. Popular radio stations like KASS FM became the platform for Kalenjin audiences and politicians to use derogatory language and hate speech against Kikuyu, calling for their eviction (CIPEV, 2008:298f; KNCHR, 2007:8f). Several humanitarian organisations have also gathered evidence about the implication of Kalenjin elites in plans for a violent campaign against Kikuyu immigrants (HRW, 2008). In some instances, vehicles assigned to local politicians were found containing weapons to be used against political opponents (KNCHR, 2007). In other instances, influential Kalenjin businessmen and politicians hired and armed gangs of Kalenjin youth, preparing them to attack Kikuyu settlements, if Kibaki was to win the elections (ICG, 2008).

The use of violence was further encouraged by the lax attitude of local police and security forces and the wide impunity enjoyed by politicians who publicly called for attacking other communities (KNCHR, 2007). As Mueller (2011) explains, the Kenyan government had gradually lost its legitimate monopoly over violence. It thus wasn’t able to credibly discourage violence. Following state-sponsored inter-ethnic clashes in the 1990s, different communities had increasingly turned to self-help strategies, giving rise to all sorts of ethnic militias, gangs and mafia organisations such as Mungiki, Sungu Sungu, the Sabaot Land Defense Forces, the “Taliban”, the “Bagdad Boys” and parties of “traditional Kalenjin warriors”. These had established tight connections to members of the political establishment across the ethnic spectrum and become a political instrument of intimidation, often with the consent of local officials and police forces (Mueller, 2011:103f; Klopp & Kamungi, 2008; Anderson & Lochery, 2008).
When mass violence broke out in the aftermath of the elections, police forces frequently turned a blind eye on exactions between different communities. In some instances they even assisted their co-ethnics in the attacks (ICG, 2008:9; Taibl, 2009).

Kenya’s weak institutional environment, offering few non-violent options for the settlement of contentious political issues, is also argued to have facilitated the onset of inter-ethnic violence. The paramount power concentrated in the president’s hands as well as the deliberate effort to weaken autonomous institutions had turned the political game into a zero sum competition for the appropriation of the state apparatus and the accompanying economic rewards (Mueller, 2011:104ff). In conjunction with ethno-nationalist discourses, this had in turn exacerbated political conflicts between Kenya’s different communities for the control of power and the control of the countries greatest wealth: arable land. In this light, mass violence in the aftermath of the 2007 elections appears to have been the final consequence of inter-ethnic animosities, which had build up over decades around intermingled contentions over political power and fertile land.

The contentious land question

Indeed, most analysts of the Kenyan crisis agree that its origins are to be found in long-standing contention over arable land between Kenya’s different communities (Anderson & Lochery, 2008; Kanyinga, 2009; Klopp & Kamungi, 2008). In their post electoral survey, Dercon and Gutierrez-Romero (2011) assert that respondents living in areas, which had suffered land disputes before the elections had also more often been victims of violence following the elections. Using satellite information about burning houses and fields as a way to identify the main locations of violence in the Rift Valley, Aderson and Lochery (2008) further remark that post electoral violence took either place in larger towns or on rural settlement schemes, which were subject to contention between different agriculturalist communities. Their general findings are consistent with individual testimonies of victims and statements of perpetrators and confirm that violence in different places was indeed directed against immigrant minority communities in order to expropriate their land. In the Rift Valley, which experienced most of the violence, the steadily growing community of immigrant Kikuyu farmers coming from Central province was the primary target of land-seeking Maasai and Kalenjin (Harter, 2008; Gettleman, 2008; ICG, 2008). These were encouraged by local ODM politicians and elders in the Rift Valley, who had an interest in clearing their constituencies from Kibaki’s Kikuyu supporters. These mobilised their co-ethnics into violent action by offering them to settle on the land of displaced persons. A militant interpretation of majimboism offered the legitimate underpinning to advocate this violent strategy, for it intertwined the material needs of landless Kalenjin and Maasai agriculturalist with an abstract anxiety about being dominated by a central Kikuyu government.
These circumstances have to be understood in the context of Kenya’s post-independence history. Kenya’s land had been appropriated by the colonial administration to establish a white settler economy. Especially the fertile Rift Valley had been subject to land grabbing and the displacement of indigenous agro-pastoral communities like the Kalenjin and the Maasai. As the country transitioned to independence, they claimed their land back. Kenyatta’s post-independence government however opted for the accommodation of its Kikuyu kinsmen instead of resituating ancestral lands to autochthonous communities. Numerous Kikuyu migrated from Central province to the Rift Valley, aided by a government-sponsored redistribution of white settlers’ land. This contributed to the emergence of strong inter-group grievances and anti-Kikuyu resentment, most notably among landless Kalenjin and Maasai agriculturalists (Anderson & Lochery, 2008; Kanyinga, 2009; HPG, 2008:4). This development inevitably conflated aspirations for regional political autonomy with the claim for restitution of ancestral lands within the idea of majimbo. The demagogic use of this term for the presidential campaign was thus likely to revive strong inter-group animosities.

In view of the preceding résumé, the rigging of the vote in 2007 might well have been an important trigger for the subsequent clashes. It certainly also acted as a catalyst of violence that pushed the situation to unprecedented dimensions. The violence around the 2007 elections can however not be explained without acknowledging the profoundly destabilising effect of land distribution issues in Kenya. In this regard three propositions, which explain the causal relationship between structural land scarcities and the onset of inter-ethnic violence, stand out. First, land made up for the livelihoods of a great majority of Kenyans, its distribution thus being a highly sensible political issue, which could easily lead to contention. Second, patterns of resource distribution favoured Kikuyu farmers over agriculturalists from other communities, and third, these patterns were perceived as highly unfair and informed serious anti-Kikuyu sentiments, as a result of the past discrimination of other communities by a Kikuyu-dominated government. These propositions are each treated more thoroughly in the following sections.

**Land, livelihoods and horizontal inequalities in Kenya**

The first step to explain the implication of land distribution issues in the post-electoral violence is to understand the crucial importance of this resource for the many Kenyans deriving their livelihoods from agricultural activities and in addition to acknowledge its unequal distribution among Kenya’s different ethnic groups. This section proposes a simple framework to assess the impact of land scarcity on the livelihoods of Kenyan agriculturalists. It is subsequently used to examine differences between
Kenyan communities in experiencing the adverse consequences of land scarcity prior to the 2007 elections.

Data and methodology

Assessing the detrimental effect of resource scarcity is certainly not an easy task. To the best of the author’s knowledge there are no established measures of “demographic and environmental stress” or “DES” (Kahl, 2006) and most analysts concentrate on the ecological and demographic causes of DES, such as population growth or land degradation, rather than on DES itself (Raleigh & Urdal, 2007; Urdal, 2008; Theissen, 2008). Yet DES conceptually captures the net social effect of these processes. It does not only establish the presence of ecological and demographic strains on populations but also the absence of eventual coping mechanisms based on technological solutions or special institutional arrangements (Kahl, 2006: 40ff; Homer-Dixon, 1995). A measure of DES should thus emphasise the net impact of scarcity on the livelihoods of affected populations rather than its ecological or demographic origins. This section proposes a simple framework to assess the detrimental effect of land scarcity, which both considers ecological constraints on the availability of arable land as well as their repercussions on the lives of Kenyan agriculturalists.

Most obviously, shortages of essential resources like arable land represent an immediate threat to populations whose subsistence heavily depends on agriculture. For those people, loosing the access to quality land is often synonymous with loosing the ability to provide an existence for themselves and dependent family members. Scarcity, even at moderate levels, can also have a medium to long-term effect on the livelihoods of agriculturalists. Production shortfalls mean less income for agricultural employees and farmers who sell or trade their surpluses. Less income, in turn, implies lower savings and a reduced ability to invest in durable assets, which represents a certain level of security in the wake of unforeseen ecological disasters affecting agricultural production. Hence, even at moderate levels, the progressive depletion of land makes farmers increasingly vulnerable. Two effects should thus be observable for those affected by DES: a reduced ability to accumulate wealth and a reduced ability to provide themselves and their family members with essential agricultural commodities. Data from the Demographic and Health Survey (DHS)¹ allows for capturing these effects as well as their supposed ecological causes.

¹ Source: ICF Macro, MEASURE DHS, http://www.measuredhs.com
The DHS data contains information on socio-economic and health characteristics of individuals. These allow the assessment of the economic status of the respondents and of their exposure to food insecurity. At the same time the data is organised in spatial clusters at the level of enumeration areas (EA) with known longitude and latitude. This allows the merging of individual level data from the DHS with geo-referenced data on soil quality in a geographic information system. Hence a simplified model of the detrimental effects of land scarcity can be proposed for the Kenyan case and tested by means of structured equation modelling (SEM)-techniques (see figure 1).

Figure 1: Assessing the detrimental effects of land scarcity

The independent variable land scarcity is captured by a local measure of the average suitability of soils for agriculture in a respondent’s EA. The data for this variable is derived from the Global Agro-Ecological Assessment for Agriculture in the 21st Century (Fischer et al., 2002:33), which classifies various regions according to their prevailing chemical, drainage, texture and other constraints on soils. The variable is coded in such a way that higher values indicate more severe constraints on agriculture. As it represents

2 Latent variables as circles; respective indicators as squares; hypothesised causal effects indicated by +/- signs

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a local average of soil conditions, it assesses the relative proportion of low- to high quality soils within and in the immediate surroundings of the EA. It can thus be considered as an approximate measure of the scarcity of quality arable land.

Land scarcity is assumed to have a negative effect on respondent’s ability to accumulate wealth. Two indicators of housing quality capture this variable. The first indicator measures the quality of the material used to build the respondent’s house. The second indicator is an ordinal measure of the quality of the respondent’s toilet facilities. Housing assets have become a commonly employed proxy measure for wealth and used in assessments of economic inequalities (Filmer & Scott, 2008; see also McKenzie, 2005).

The second independent variable of the model is child mortality, which acts as an indicator of lacking food security. Children, unfortunately, are often the first to feel the repercussions of severe food shortages because of their greater vulnerability. A high rate of child mortality may thus be indicative of respondent’s inability to provide themselves and their families with essential agricultural commodities. According to the Food and Agriculture Organization of the United Nations and other aid agencies, malnutrition is indeed one of the most important direct and indirect causes of infant and child mortality (FAO, 2005; see also Rice et al., 2000). The model also takes a negative effect of asset wealth on child mortality into account, as a higher housing quality also implies better sanitation and a more hygienic environment for children. At the same time, higher wealth might also allow for better medical treatment of children. Higher asset wealth can thus be assumed to reduce child mortality.

The model further includes two control variables: Education and Infrastructure. Education hypothetically reduces the risk of child mortality and increases the prospects for a higher income and thus higher wealth. Better-educated parents can be assumed to have an increased awareness of child health, which reduces the risks of infant and child mortality. Better-educated persons are also more likely to be promoted to better-paid jobs. They can thus be assumed to enjoy a higher material standard of living. Education is captured by a measure of total years spent in education and the overall educational attainment of the respondent. Thus, the measure does not only include the personal time investment in education but also its returns in terms of a higher level of education.

Respondent’s quality of housing assets may finally also depend on certain infrastructural prerequisites. Conveniences like tap water or flush toilets for instance imply the presence of water conduct systems. Houses of a reliable quality are also unlikely to be built where they is neither electricity nor road access.

The quality of a respondent’s housing assets can thus be assumed to depend on the infrastructural development of his or her area of residence. Two indicator variables represent this control variable. The first measures the average quality of water supply in the respondent’s EA and thus assesses its overall quality of water supply systems. The second measures the percentage of respondents in the EA with access to electricity. A detailed description of all employed measurements can be found in Appendix A.
The analysis uses a sample of 3,225 Kenyans employed in the agricultural sector, taken from the nationally representative 2003 Kenyan DHS. One can assume subsistence farmers, agricultural employees and even better qualified professionals in the agricultural sector to be hit hardest by DES, for they directly depend on land for their survival and their income. The analysis proceeds in two phases. First, it examines the general impact of land scarcity on the living standards of Kenyan agriculturalists. This step demonstrates the vital importance of arable land for a large part of Kenya’s population and substantiates the proposition that shortages of land were an important motivation for poor Kenyans to resort to violent means. Second, using methods for grouped data, it compares the average levels of DES experienced by members of different ethnic groups. This step asserts that the stigmatisation of Kikuyu agriculturalists was substantiated by their privileged access to quality arable land.

The detrimental effect of land scarcity on the livelihoods of Kenyan agriculturalists

The general impact of land scarcity on agriculturalist’s livelihoods in Kenya is assessed using maximum likelihood estimation. The analysis is performed with the R-package lavaan (0.4-10). The results indicate an overall good fit (see Appendix B). Most global fit measures have orders of magnitude as recommended by Brown (2006:86ff, 113f). The Comparative (CFI)- and Tucker-Lewis (TLI)- fit indices are above 0.95, the root mean square error of approximation (RMSEA) is below 0.05 and the standardised root mean square residual (SRMR) is 0.023. Although the chi-square test yields a significant result – indicating a significant difference between the actual and the estimated covariance matrix – this is typical for large samples and should not necessarily lead to the rejection of the model (see Bentler & Bonett, 1980; Jöreskog & Sörbom, 1993; McDonald & Ho, 2002). All standardised factor loadings are further significant and in excess of 0.5, except for the loading of infrastructure on water supply quality, which comes close with 0.452. The measurement model being supported, the regression coefficients of the structural part of the model can be interpreted (see figure 2).
All coefficients are significant and have the expected sign. The quality of infrastructure and the level of education have a significant positive effect on housing asset wealth. Educated Kenyan agriculturalists and those living in an EA with a good infrastructure had significantly higher material living standards in 2003. Child mortality proves further to be impeded by higher levels of education and material wealth. Constraints on agriculture have a significant negative effect on housing asset quality and a positive effect on child mortality. Thus, in 2003, Kenyan agriculturalists living in an EA with a lower availability of quality arable land had lower living standards and their children had suffered more from food insecurity.

These results confirm the crucial importance of arable land in Kenya. In the period preceding the clashes in 2007 and 2008, Kenyan agriculturalists lacking access to quality arable land were generally less affluent and thus less likely to provide themselves and their family members with essential commodities. This explains the downright “hunger for land” felt by Kenya’s less privileged, which can be assumed to have acted as an important motivation for violence.

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3 Standardised factor loadings in italic letters; standardised regression coefficients in bold letters; significance levels: *** p<0.001, ** p<0.01, * p<0.05.
Horizontal inequalities in experiencing the negative effects of land scarcity

The second phase of the analysis evaluates differences between ethnic communities in the access to land. The sample is split into two groups separating Kikuyu agriculturalists from respondents affiliated to other ethnic groups. Since the aim of this analytical step is to compare the average latent levels of scarcity, wealth and food security in different ethnic groups, measurement- as well as scalar invariance has to be asserted prior to the analysis of the structural part of the model. To ensure invariance, the un-standardised factor loadings as well as the un-standardised estimated means of the indicator variables are constrained to be equal across groups. This does not result in a significantly degraded model fit. However, in the Kikuyu group, the standardised factor loadings of infrastructure on the quality of water supply and of education on single years of education are in excess of 1, which is an out-of range value – also referred to as Heywood case – placing strains on the analysis of the SEM solution (Brown, 2006). Consequently the model is simplified, with education and infrastructure now being each captured by only one indicator. Their measurement is thus less precise, which however should not seriously affect the analysis, for they are not central variables of interest.

Figure 3: SEM results for grouped data

The results indicate again an acceptable global fit (CFI = 0.973, TLI = 0.919, RMSEA = 0.055, SRMR = 0.02, see Appendix C). In both groups, all standardised factor loadings are further significant and in excess of 0.5. In the structural part of the model, two observations are noteworthy (see figure 3). First,

4 Standardised latent intercepts in italic letters. Standardised regression coefficients in bold letters. Significance levels: *** p<0.001, ** p<0.01, * p<0.05.
for Kikuyu agriculturalists, both the effects of agricultural constraints on asset wealth and child mortality are not significant, whereas they are for members of other ethnic communities. Thus in 2003, Kikuyu were apparently capable to avoid the detrimental effects of land scarcity. They may either have had access to the comparably better land within their EA, or simply had more land in order to compensate for its low quality. A further possibility might be a better access to credit, state subsidies or other means to cope with land scarcity. Second, the latent intercepts for the variables of interest are significantly different in both groups. Kikuyu agriculturalists, on average, were wealthier, better educated and less affected by child mortality but also living in EAs with better soil quality. Hence, in 2003, Kikuyu were not only living in areas with better land than members of other groups but were also less affected by bad soil conditions if they resided in areas with less suitable land.

The above results demonstrate that prior to the clashes of 2007 and 2008, Kenyan society was indeed marked by inequalities between Kikuyu and members of other communities that were apparent in Kenya’s most important economic sector: agriculture, accounting for nearly 62 percent of all jobs in 2004, without considering the many Kenyans deriving their livelihoods from informal agricultural activities (Republic of Kenya, 2006; CBS, 2004; WRI et al., 2007). Those inequalities were an important reason for anti-Kikuyu resentment among many landless Kenyans. And resentment, in turn, offered inclined political entrepreneurs the opportunity to orchestrate inter-ethnic violence. Adopting a historical perspective, the next section explains why inequalities in the access to land were indicative of a political economy based on competitive resource appropriation and ethnic clientism, which became the breeding ground for strong inter-group animosities.

A brief history of contention for land and inter-group grievances

A thorough understanding of the ease with which political elites could exploit contention over land to ignite inter-ethnic violence requires acknowledging the significance of the land issue in Kenya’s post-independent political economy. British colonial administrators had favoured sedentary agriculture and successively incorporated Kenya’s most attractive land into a white settler economy through the acquisition and alienation of land, the imposition of British property law and successive land reforms. The Crown Ordinance Act of 1915 established the creation of “native reserves” for Kenya’s different communities and ascribed the remaining land to the crown in order to redistribute it to colonial settlers. It consolidated a spatial segregation between Africans and non-Africans for one part and between Kenya’s different communities for the other. Entitlement to land became closely intertwined with the affiliation to a particular ethnic group, thus cementing ethnicisation (Kanyinga, 2009:327f). At the same
time, severe population pressure in Central province and settler demand for low cost labour acted conjointly to drag large parts of the Kikuyu community into the Rift Valley, where they sought employment on white settler farms. The fertile soils of this province, which became known as “white highlands” through the colonial period, had indeed attracted many European settlers to the detriment of indigenous Maasai and Kalenjin communities (Kenya Land Alliance, 2004; Anderson & Lochery, 2008). These predominantly agro-pastoralist populations saw their prospects further reduced by a large influx of immigrant Kikuyu squatters and wage labourers as well as a colonial policy biased towards settler agriculture.

As Kenya later transitioned into an independent state and its many landless peasants pressed for agrarian reform, the question of how to redistribute white settlers’ land became increasingly important. Two main political positions emerged. The Kenya African National Union (KANU) of the first Kenyan president Jomo Kenyatta advocated a strong centralised government and a political direction that would ensure economic stability and foster national unity. To this end, the white settlers’ interests had to be safeguarded as well as the right for every Kenyan to acquire land in every part of the country. This policy essentially reflected the interests of a nascent land-based African elite with a strong interest in establishing agricultural enterprises everywhere in the country. It also appealed to many Kikuyu immigrants in the white highlands as it opened up opportunities to acquire settlers’ land on which they had been working as employees to favourable conditions. The Kenya African Democratic Party (KADU), on the other side, preferred a federal government and the devolution of power (coined by the Swahili term “majimbo”). It pressed for granting regional autonomy to the different ethnic groups for their pre-colonial territories and for the restitution of settlers’ land to indigenous communities. This position accommodated large landowners in the Rift Valley who feared the negative impact of a strong national government on their enterprises but also mirrored the aspiration of dispossessed Kalenjin and Maasai communities. The most extreme interpretation of this policy was presented in viewing it as an appeal to forcefully evict white settlers and immigrant ethnic communities from the Rift Valley (Kanyinga, 2009:329).

KANU overwhelmingly won the immediate pre-independence elections in 1963 and the claim for resituating ancestral lands to indigenous communities was soon dismissed. KADU was dissolved a year later and its members integrated in KANU, making Kenya a de facto one party state. Kenyatta introduced a marked-based system of land redistribution and creation of settlement schemes, in which the government acquired land from willing settlers to offer it to African agriculturalists. These schemes favoured those with the necessary financial means and political influence to acquire land and were not primarily designed to compensate expropriated communities (Anderson & Lochery, 2008; HPG, 2008). Like other well-connected elites, Kenyatta himself and his family gained considerably from the redistribution of settlers’ land (Klopp & Kamungi, 2008). At the same time, the Kenyan president used the settlement schemes to accommodate the landless Kikuyu, many of whom had participated in the
Mau Mau peasant rebellion in 1952, as he feared a resurgence of anti-state grievances among this important segment of the population. The One Million Acre Settlement Scheme, Kenya’s most ambitious project of land redistribution, indeed privileged the acquisition of settlers’ land by those who had worked on it as labourers. It essentially served the interests of immigrant Kikuyu communities in the Rift Valley and represented a compensation for their relatives in Central province who were increasingly the victims of aggressive land grabbing by politically well-connected elites (Kanyinga, 2009; Anderson & Lochery, 2008).

However, this resulted in nourishing anti-Kikuyu resentment among the Kalenjin and Maasai communities of the Rift Valley. Since Kenyatta and other prominent Kikuyu figures dominated politics and land distribution was perceived as mainly serving Kikuyu interests, these communities became increasingly anxious about an emerging “Kikuyu domination” in the political and economic sphere. Grievances however were seldomly expressed as the government engaged in severe repression against critics of the president’s policies (see Klopp, 2000, 2002).

Throughout the 1970s and 1980s competition over the access to former settlers’ land intensified in the Rift Valley, opposing large land holding companies, which were mostly in the hands of either Kikuyu or Kalenjin elites. In an environment where access to land was contingent upon the ability to exert political influence these companies exploited land hunger among their respective communities to mobilise support and exert political pressure on the state administration. Local political and business elites became dependent on the support of their non-elite co-ethnics and these in turn had to rely on their co-ethnic patrons for securing their interests in what increasingly took the form of a competition between ethnically homogenous distributional coalitions (Kanyinga, 2009:332f). This conflation of access to state patronage and access to former settlers’ land for defined social groups clearly added an ethnic dimension to the question of post-independence land redistribution.

Ethnic segregation was further accompanied by class cleavages. Elites within every major community gained considerably from the corruption and clientism that were inherent to state sponsored land redistribution practices, while diverting the attention of their deprived co-ethnics by discursively depicting the issue of land distribution as an inter-ethnic problem. This, however, was not to last forever. In the early 1990s, during the presidency of Kanyatta’s successor Daniel arap Moi, aggressive land grabbing by politically well-connected individuals became more and more apparent, giving rise to anti-state resentment that even extended to the co-ethnics of the new president. Although affiliated to the Kalenjin as a Tugen, Moi increasingly became the target of criticism from other Kalenjin communities such as the Nandi (Klopp, 2000, 2002; Kanyinga, 1998).

As internal strains on Moi’s regime built up, so did international pressure. In the early 1990s, institutional donors like the international monetary fund pressed Moi for economic reform and the introduction of multi-party elections. They considered patrimonial politics within the one-party state as a major impediment to the economic development of the country. Attempting to hold on to his power
in the advent of multipartyism, Moi instrumentalised anti-Kikuyu tensions around the land issue in order to divert attention from the practices of his administration and rally maximum support among the Kalenjin and Maasai communities of the Rift Valley. He feared that immigrant Kikuyu agriculturalists, which made up an important share of this province’s electorate, would join the claim of the urban Luo and Kikuyu middle class for economic and political liberalisation, thus withdrawing key constituencies from his control. During the 1992 and 1997 general elections, local politicians of the Rift Valley affiliated to the Moi regime instigated violent campaigns against immigrant communities to intimidate political rivals and expel Kikuyu voters. Police and security forces assisted them by turning a blind eye and barring international observers and relief organisations the access to the locations of exactions (Kahl, 2006:135ff).

An integral part of this strategy was to revive a militant view of majimboism. It encompassed the notion that land in the Rift Valley had to be given back to autochthonous communities like the Kalenjin and Maasai, implying, if necessary, the forced dispossession and eviction of other communities, which had settled there during the colonial and post-colonial era. Hence, violence was primarily directed towards Kikuyu agriculturalists, the most numerous immigrant community on the settlement schemes of the Rift Valley, but also against Kikuyu and Luo civil servants and businessmen in the Rift Valley’s major towns (Anderson & Lochery, 2008:337; Kanyinga, 2009). Local politicians and Kalenjin elders allegedly involved in this violence also supported Raila Odinga’s candidacy in 2007 (Akiwumi, 1999). Once again, the militant majimboist cause was invoked to stigmatise Kikuyu settlers in the Rift Valley; this time, however, to secure a majority vote for ODM.

Reviewing how the question of land distribution has been handled through Kenya’s post-colonial history helps understand the association of horizontal inequalities in the access to quality arable land with patrimonial politics of resource appropriation, which have informed a strong feeling of relative deprivation and resentment against the privileged Kikuyu among Kenya’s less endowed communities. Following independence, land left behind by the departing white settlers rapidly became a resource for Kenya’s different elites to cement their power. National programs for the restitution of settler land through the building of settlement schemes were used for personal enrichment and rewarding close political allies by Kenyatta and later Moi (Republic of Kenya, 2004). They were also utilised to accommodate potential challengers to the nascent post-colonial regime such as the many landless Kikuyu who had participated in the peasant Mau Mau rebellion. As the only real threat to Kenyatta’s early government, they were granted land in the Rift Valley at the expense of indigenous Kalenjin and Maasai communities. Although patronage politics in Kenya favoured elites from across all ethnic groups and certainly also widened the gap between poor and wealthy members of the same group, they nevertheless contributed to the salience of ethnicity regarding land distribution issues. Whether they approved the governmental policy or not, political elites from every major ethnic group struggled to
secure a privileged access to the settlement schemes for their community. The conflation of ethnic affiliation, political power and the prospects to obtain arable land, in turn, informed the necessity of landless Kenyans to support the political patrons representing their community in an interethnic struggle for land (Taibl, 2009; Kayinga, 2009:335). This in turn led to the polarisation of more affluent groups, such as the Kikuyu, easing their violent targeting by aggrieved members of other groups.

Scarcity, inequalities and inter-group violence: suggestions for further research

In sum, horizontal inequalities in the access to land experienced by Kenya’s different ethnic communities before the 2007 elections were indicative of a political economy, in which land had become a currency for political entrepreneurs to secure support. Over decades, it had worked to the advantage of close allies and potential challengers to the political establishment, many of who were part of the Kikuyu community (HPG, 2008). Although these politics of resource redistribution certainly did not favour all Kikuyu alike, yet partly even marginalised an important section of this community, they contributed to the collective perception by other communities - notably the Kalenjin and Maasai from the Rift Valley - of Kikuyu as “greedy land grabbers” (ICG, 2008:11; Klopp & Kamungi, 2008). At the same time they impeded the construction of strong institutions and the design of political devices to settle disputes over land, increasing the relative attractiveness of inter-ethnic violence as a strategy to acquire land (Mueller, 2011).

The patrimonial politics of land distribution in post-independence Kenya had thus not only motivated strong inter-group grievances but also created an opportune environment for their violent expression. This explains the ease with which the aggrieved landless among the Kalenjin and Maasai communities could be mobilised through an ethno-nationalist discourse. The parallelism of autochthony and entitlement to land encapsulated in the militant interpretation of majimboism was indeed appealing to those who felt, they had been dispossessed of their ancestral lands by a Kikuyu-dominated government. At the same time, the simplistic stigmatisation of all Kikuyu as land grabbers enabled the targeting of the weakest members of this community and the seizing of their land, whilst conferring such conduct a semblance of legitimacy. This situation, in turn, was ruthlessly exploited by local elites to secure a majority vote for their community in ethnically heterogeneous constituencies.

Regarding the causal connexion between horizontal inequalities in the access to essential renewable resources like arable land and the occurrence of inter-group armed conflict, the Kenyan case is enlightening in different ways. First, the analysis reveals that horizontal inequalities in the access to land are indicative for exclusionary practices of resource allocation. These, in turn, are likely to strengthen grievances against individuals and social groups held responsible by others for their plight. Anti-group
animosities informed by biased policies of resource redistribution can then become a valid motivation for violence against members of the privileged community. Second, patterns in the political economy of a country, which result in horizontal inequalities, are also likely to impede the formation of a strong and legitimate regulatory environment. This makes violence a more opportune strategy to express grievances and address contention over scarce resources like arable land, for it curtails non-violent and cooperative arrangements between different parties.

As Kahl (2006:51ff) explains, the causal relationship between DES and violent conflict is moderated by the degree to which prevailing institutions can inhibit exclusionary practices of resource allocation and accommodate and integrate a wide array of social groups (institutional inclusivity); as well as by the degree, to which a society is predisposed to fractionalise itself along inter-group demarcation lines (groupness).

Inclusive institutions reduce the prospects for resource capture by powerful elites, prevent the political exclusion of economically marginalised individuals, and facilitate peaceful and cooperative strategies to cope with scarcity. Thus, they increase the opportunity costs for collective violence. Groupness, on the other hand, tends to promote intra-group cohesion and accrue inter-group competition for scarce resources in the wake of serious resource shortages. It facilitates the mobilisation of group members for collective violence against other groups; hence clearly increasing the opportunities for armed conflict.

Pronounced horizontal inequalities in the access to resources are both the result of an exclusive institutional environment and politics of resource allocation based on group affiliation. They therefore exemplify an opportune environment for the violent expression of inter-group grievances.

The preceding argument highlights that horizontal inequalities in the access to essential renewable resources can be regarded as a valid predictor of inter-group armed conflicts, for they indicate the presence of motivations as well as opportunities for the instigation of collective violence (see also Ostby & Fjelde, 2011; Cederman et al., 2011). Implications of this result for applied research are twofold. First, explanatory models of armed violence focussing on horizontal inequalities in the access to renewable resources might yield more satisfactory results than models simply considering environmental and demographic indicators of DES, which have performed poorly in the past years. Research in this direction is already under way. A team around Tor Arve Benjaminsen at the Peace Research Institute of Oslo is currently working on an ambitious quantitative project exploring the links between group-level differences in experiencing the adverse effects of environmental scarcities and violent conflict in different African and Asian countries.

Second, the importance of distributional issues within the scarcity-conflict nexus revealed by this analysis might stimulate a thorough reflection about how to simplify more complex explanatory models and reconcile empirical environmental security research with its theoretical underpinnings. There is still an important gap between the complexity of popular theoretical explanations for scarcity-related violence and their simplistic translation into testable models. Influential theoreticians such as Homer-
Dixon (1994, 1995) and Kahl (2006) emphasise the importance of a plethora of economic and political mediator and moderator variables: institutional inclusivity, groupness, state strength, technological ingenuity, etc. Their models are consequently overly complex, define unrealistic data requirements and are thus not testable in a strict statistical sense (Gleditsch, 1998). Empirical analyses, on the other hand, rarely include more than a few ecological and demographic predictors in their regression models. The fact that horizontal inequalities in the access to renewable resources are indicative of several political abuses and economic inefficiencies could serve as a shortcut here. A model simply testing for a mediation of horizontal inequalities in the access to vital resources between environmental or demographic variables and the likelihood of armed conflict would remain a simple method, which still implicitly incorporates the social and economic dimensions of the problem. A pre-impression of what would be possible with such an approach can be gained from an article written by Østby and colleagues (2011). Using geo-referenced census data and data from the DHS, they assert an interactive effect of population growth and differences in infant mortality rates between religious groups on the likelihood of armed violence in Indonesia’s provinces between 1990 and 2003. Similar analyses conducted in different countries would greatly enhance our knowledge of the direct social impacts of environmental and demographic stress and their wider implications for armed conflict.

**Bibliography**


## Appendix A: List of variables and indicators

<table>
<thead>
<tr>
<th>Factor</th>
<th>Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing assets</td>
<td>MATERIAL</td>
<td>Sum of quality scores for floor and roof material (ranging from 2 to 6)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Roof: 1=natural (grass, thatch...), 2=rudimentary (corrugated iron...), 3=finished (tiles...)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Floor: 1=natural (earth, mud...), 2=rudimentary (wood planks...), 3=finished (parquet, cement...)</td>
</tr>
<tr>
<td></td>
<td>TOILET</td>
<td>Toilet facilities: 1=no facilities, 2=pit toilet, 3=improved pit latrine, 4=flush toilet</td>
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<tr>
<td>Education</td>
<td>EDU_S</td>
<td>Single years of education</td>
</tr>
<tr>
<td></td>
<td>EDU_A</td>
<td>Educational attainment: 0=no education, 1=incomplete primary, 2=complete primary, 3=incomplete secondary, 4=complete secondary, 5=higher</td>
</tr>
<tr>
<td>Food insecurity</td>
<td>CHILDLOST</td>
<td>The number of children respondent has lost</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>WATER</td>
<td>Median quality of source of drinking water in EA: 1=rainwater, 2=surface water (lake, pond...), 3=open well, 4=covered well/borehole, 5=piped water</td>
</tr>
<tr>
<td></td>
<td>ELECTRICITY</td>
<td>Percentage of respondents in EA with electricity in their house</td>
</tr>
<tr>
<td>Scarcity of arable land</td>
<td>AGRCON</td>
<td>Soil constraints on agriculture: 1=no constraints, 2=very few constraints, 3=few constraints, 4=partly with constraints, 5=frequent severe constraints, 6=very frequent severe constraints, 7=unsuitable for agriculture</td>
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</table>
Appendix B: SEM results for complete sample

<table>
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<th>Used</th>
<th>Total</th>
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<tr>
<td>3096</td>
<td>3225</td>
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**Estimator**

ML

**Minimum Function Chi-square**

108.380

**Degrees of freedom**

13

**P-value**

0.000

**Chi-square test baseline model:**

- **Minimum Function Chi-square**
  7831.485
- **Degrees of freedom**
  28
- **P-value**
  0.000

**Full model versus baseline model:**

- **Comparative Fit Index (CFI)**
  0.988
- **Tucker-Lewis Index (TLI)**
  0.974

**Loglikelihood and Information Criteria:**

- **Loglikelihood user model (H0)**
  -30320.062
- **Loglikelihood unrestricted model (H1)**
  -30265.872

**Number of free parameters**

23

**Akaike (AIC)**

60686.124

**Bayesian (BIC)**

60824.995

**Sample-size adjusted Bayesian (BIC)**

60751.914

**Root Mean Square Error of Approximation:**

- **RMSEA**
  0.049
- **90 Percent Confidence Interval**
  [0.040, 0.057]
- **P-value RMSEA <= 0.05**
  0.582

**Standardized Root Mean Square Residual:**

- **SRMR**
  0.023

**Parameter estimates:**

<table>
<thead>
<tr>
<th>Information</th>
<th>Expected</th>
<th>Standard Errors</th>
<th>Standard</th>
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<tr>
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<td>Estimate</td>
<td>Std.err</td>
<td>Z-value</td>
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</tbody>
</table>

**Latent variables:**

- **HOUSING =~**
  - **H_toilet**
    1.000
  - **H_material**
    2.110

- **EDU =~**
  - **EDU_yearS**
    1.000
  - **EDU_attain**
    0.327

- **INFRA =~**
  - **clust_I_water**
    1.000
  - **clust_I_elctr**
    0.135

- **CHILD =~**
  - **childdead**
    1.000
  - **agrcon**
    1.000

**Regressions:**

- **HOUSING ~**
  - **EDU**
    0.032
  - **INFRA**
    0.374
  - **AGRCON**
    -0.027

- **CHILD ~**
  - **HOUSING**
    -0.330
  - **EDU**
    -0.049
  - **AGRCON**
    0.039
Appendix C: SEM results for grouped data

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<th>Number of observations per group</th>
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<td>2384</td>
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<tr>
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<td>834</td>
<td>841</td>
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Estimator: ML
Minimum Function Chi-square: 56.138
Degrees of freedom: 10
P-value: 0.000

Chi-square for each group:
<table>
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<th>Chi-square</th>
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<tr>
<td>0</td>
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<tr>
<td>1</td>
<td>20.530</td>
</tr>
</tbody>
</table>

Chi-square test baseline model:
Minimum Function Chi-square: 1730.354
Degrees of freedom: 30
P-value: 0.000

Full model versus baseline model:
- Comparative Fit Index (CFI): 0.973
- Tucker-Lewis Index (TLI): 0.919

Loglikelihood and Information Criteria:
- Loglikelihood user model (H0): -18769.168
- Loglikelihood unrestricted model (H1): -18741.099

Number of free parameters: 44
- Akaike (AIC): 37626.336
- Bayesian (BIC): 37892.073
- Sample-size adjusted Bayesian (BIC): 37752.267

Root Mean Square Error of Approximation:
- RMSEA: 0.055
- 90 Percent Confidence Interval: 0.041 0.069
- P-value RMSEA <= 0.05: 0.272

Standardized Root Mean Square Residual:
- SRMR: 0.020

Parameter estimates:

<table>
<thead>
<tr>
<th>Information</th>
<th>Expected</th>
<th>Standard Errors</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Estimated</td>
<td>Standard</td>
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</table>

Group 1 [0]:

| Latent variables | Estimate | Std.err | Z-value | P>||z|<| | Std.lv | Std.all |
|------------------|----------|---------|---------|------------------|--------|---------|
| HOUSING =~        |          |         |         |                  |        |         |
| H_toilet         | 1.000    | 0.332   | 0.612   |                  |        |         |
| H_material       | 2.098    | 0.086   | 24.447  | 0.000            | 0.697  | 0.669   |
| EDU =~           |          |         |         |                  |        |         |
| EDU_attain       | 1.000    | 1.166   | 1.000   |                  |        |         |
| INFRA =~         |          |         |         |                  |        |         |
| clust_I_elctr    | 1.000    | 0.113   | 1.000   |                  |        |         |
| CHILD =~         |          |         |         |                  |        |         |
| childdead        | 1.000    | 1.058   | 1.000   |                  |        |         |
| AGRCON =~        |          |         |         |                  |        |         |
| agrcon           | 1.000    | 1.772   | 1.000   |                  |        |         |

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Regressions:

\[
\begin{align*}
\text{HOUSING} & \sim \\
\text{EDU} & : 0.109, 0.007, 14.938, 0.000, 0.382, 0.382 \\
\text{AGRCON} & : -0.031, 0.005, -6.914, 0.000, -0.167, -0.167 \\
\text{INFRA} & : 1.352, 0.077, 17.627, 0.000, 0.460, 0.460 \\
\text{CHILD} & \\
\text{HOUSING} & : -0.384, 0.098, -3.910, 0.000, -0.120, -0.120 \\
\text{EDU} & : -0.113, 0.022, -5.055, 0.000, -0.125, -0.125 \\
\text{AGRCON} & : 0.036, 0.013, 2.333, 0.005, 0.060, 0.060 \\
\end{align*}
\]

Intercepts:

\[
\begin{align*}
\text{H_toilet} & : 1.860, 0.011, 171.670, 0.000, 1.860, 3.429 \\
\text{H_material} & : 2.978, 0.021, 140.643, 0.000, 2.978, 2.860 \\
\text{EDU_attain} & : 1.507, 0.024, 61.564, 0.000, 1.507, 1.293 \\
\text{clust_I_elctr} & : 0.027, 0.002, 11.271, 0.000, 0.027, 0.237 \\
\text{childdead} & : 0.533, 0.022, 24.007, 0.000, 0.533, 0.504 \\
\text{agrcon} & : 4.850, 0.037, 130.294, 0.000, 4.850, 2.737 \\
\text{HOUSING} & : 0.000, 0.000, 0.000, 0.000, 0.000, 0.000 \\
\text{EDU} & : 0.000, 0.000, 0.000, 0.000, 0.000, 0.000 \\
\text{INFRA} & : 0.000, 0.000, 0.000, 0.000, 0.000, 0.000 \\
\text{CHILD} & : 0.000, 0.000, 0.000, 0.000, 0.000, 0.000 \\
\text{AGRCON} & : 0.000, 0.000, 0.000, 0.000, 0.000, 0.000 \\
\end{align*}
\]

Group 2 [1]:

Latent variables:

\[
\begin{align*}
\text{HOUSING} & : H_{toilet} \sim 1.000, 0.243, 0.689 \\
\text{H_material} & : 2.098, 0.086, 24.447, 0.000, 0.509, 0.532 \\
\text{EDU} & : \sim \text{EDU_attain} \sim 1.000, 1.136, 1.000 \\
\text{INFRA} & : \sim \text{clust_I_elctr} \sim 1.000, 0.184, 1.000 \\
\text{CHILD} & : \sim \text{childdead} \sim 1.000, 0.543, 1.000 \\
\text{AGRCON} & : \sim \text{agrcon} \sim 1.000, 1.604, 1.000 \\
\end{align*}
\]

Regressions:

\[
\begin{align*}
\text{HOUSING} & \sim \\
\text{EDU} & : 0.059, 0.009, 6.806, 0.000, 0.276, 0.276 \\
\text{AGRCON} & : -0.004, 0.006, -0.610, 0.542, -0.025, -0.025 \\
\text{INFRA} & : 0.751, 0.055, 13.625, 0.000, 0.571, 0.571 \\
\text{CHILD} & \\
\text{HOUSING} & : 0.082, 0.103, 0.791, 0.429, 0.036, 0.036 \\
\text{EDU} & : -0.067, 0.018, -3.707, 0.000, -0.139, -0.139 \\
\text{AGRCON} & : 0.006, 0.012, 0.477, 0.634, 0.017, 0.017 \\
\end{align*}
\]

Intercepts:

\[
\begin{align*}
\text{H_toilet} & : 1.860, 0.011, 171.670, 0.000, 1.860, 5.282 \\
\text{H_material} & : 2.978, 0.021, 140.643, 0.000, 2.978, 3.114 \\
\text{EDU_attain} & : 1.507, 0.024, 61.564, 0.000, 1.507, 1.293 \\
\text{clust_I_elctr} & : 0.027, 0.002, 11.271, 0.000, 0.027, 0.237 \\
\text{childdead} & : 0.533, 0.022, 24.007, 0.000, 0.533, 0.504 \\
\text{agrcon} & : 4.850, 0.037, 130.294, 0.000, 4.850, 2.737 \\
\text{HOUSING} & : 0.000, 0.000, 0.000, 0.000, 0.000, 0.000 \\
\text{EDU} & : 0.000, 0.000, 0.000, 0.000, 0.000, 0.000 \\
\text{INFRA} & : 0.000, 0.000, 0.000, 0.000, 0.000, 0.000 \\
\text{CHILD} & : 0.000, 0.000, 0.000, 0.000, 0.000, 0.000 \\
\text{AGRCON} & : 0.000, 0.000, 0.000, 0.000, 0.000, 0.000 \\
\end{align*}
\]