Global Environmental Change 23 (2013) 1–10

Contents lists available at SciVerse ScienceDirect

Global Environmental Change

journal homepage: www.elsevier.com/locate/gloenvcha

An urbanization bomb? Population growth and social disorder in cities

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ARTICLE INFO

Article history:
Received 30 September 2010
Received in revised form 7 October 2012
Accepted 15 October 2012
Available online 28 November 2012

Keywords:
Urbanization
Population
Environment
Climate change
Security
Conflict

ABSTRACT

For the first time in history, the majority of the world population now lives in cities. Global urbanization will continue at high speed; the world's urban population is projected to increase by more than 3 billion people between 2010 and 2050. Some of this increase will be the result of high urban fertility rates and reclassification of rural land into urban areas, but a significant portion of future urbanization will be caused by rural-to-urban migration. This migration is expected to be particularly prevalent in countries and regions most affected by the changing climate. While urban populations generally enjoy a higher quality of life, many cities in the developing world have large slums with populations that are largely excluded from access to resources, jobs, and public services. In the environmental security literature, great rural resource scarcity, causing rural to urban migration, is seen as an important source of violent conflict. This study investigates how population growth affects patterns of public unrest in urban centers within the context of crucial intervening factors like democracy, poverty, economic shocks. It utilizes a newly collected event dataset of urban social disturbance covering 55 major cities in Asia and Sub-Saharan Africa since 1960. The empirical analysis provides little support for the notion that high and increasing urban population pressure leads to a higher risk or frequency of social disorder. Instead, we find that urban disorder is primarily associated with a lack of consistent political institutions, economic shocks, and ongoing civil conflict.

> And the cities keep growing. I got a general sense of the future while driving from the airport to downtown Conakry, the capital of Guinea. The forty-five-minute journey in heavy traffic was through one never-ending shantytown: a nightmarish Dickensian spectacle to which Dickens himself would never have given credence. The corrugated metal shacks and scabrous walls were coated with black slime. Stores were built out of rusted shipping containers, junked cars, and jumbles of wire mesh. The streets were one long puddle of floating garbage. Mosquitoes and flies were everywhere. Children, many of whom had protruding bellies, seemed as numerous as ants. When the tide went out, dead rats and the skeletons of cars were exposed on the mucky beach. In twenty-eight years Guinea's population will double if growth goes on at current rates. Hardwood logging continues at a madcap speed, and people flee the Guinean countryside for Conakry. It seemed to me that here, as elsewhere in Africa and the Third World, man is challenging nature far beyond its limits, and nature is now beginning to take its revenge. Robert Kaplan (1994, p. 2).

1. Introduction

For the first time in history, the majority of the world population now lives in cities. By 2050, current projections indicate that two in every three persons will live in urban areas and that all population growth during this period, around 3 billion people, will be absorbed by cities (UN, 2010). Most of this growth will take place in Sub-Saharan Africa and Asia. Considering the impending consequences of global warming, such as sea-level rise and more extreme weather patterns, even these far-reaching projections may turn out to be too conservative. Rapid growth of city populations puts significant demands on the societies' ability to provide public services like adequate housing, electricity, water supply, health care, education, and jobs. Widespread shanty towns around major cities in the developing world epitomize the challenges of accommodating a growing population. According to a recent survey, many governments of developing countries now explicitly discourage strong urban population growth; 77 percent

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[1] Authors listed alphabetically, equal authorship implied. This research has been carried out with financial support from the World Bank and the Research Council of Norway. We thank Kristian Hoelscher and Andreas F. Tollefsen for excellent research assistance.
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http://dx.doi.org/10.1016/j.gloenvcha.2012.10.016

of African and 66 percent of Asian countries have implemented policies to reduce migrant flows to large cities (UN, 2010, p. 13). However, while trying to slow urban growth may be politically desirable, it rarely works (UNFPA, 2007, p. 13).

Urbanization, or the increase in the urban share of the total population, is determined by three phenomena: natural growth, rural–urban migration, and reclassification of areas from rural to urban. Urban population growth holds a central place in the environmental security literature. There are at least two aspects to this. To some extent, rural-to-urban migration is seen as a consequence of high and increasing population pressure in the countryside, leading to rural scarcity of renewable resources like cropland, forests, and freshwater (Homer-Dixon, 1999). Various forms of environmental degradation, including desertification, prolonged droughts, and soil salinization, are other factors that might deteriorate agricultural livelihoods and push people to the cities. Climate change may accentuate such developments (e.g. Grimm et al., 2008; Lobell et al., 2011; UK Government Office for Science, 2011). On the other hand, high urban population growth may cause serious environmental problems in cities: water scarcity and contamination, land shortage, and insufficient sanitation. Although opportunities for employment are usually better in urban areas, the labor market may struggle to absorb fast-growing populations. The higher perceptible inequality in income and privileges among city dwellers is another latent source of urban frustration. Grassroots demands for democratic and economic reforms and a gradual fading of the rural experience are potential contributing risk factors. Strong urban population growth is not necessarily a significant threat to peace and stability; yet, earlier work suggests that strong urban population growth within the context of economic stagnation, little job creation, and poor governance can result in increased risks of violence and political turmoil (e.g. Goldstone, 1991; Gizewski and Homer-Dixon, 1995).

This study explores the empirical impact of high population growth on political violence in cities. In so doing, the article not only contributes to the prevalent environmental security literature, it also responds to calls for more systematic research on societal and security dimensions of climate change, which are severely under-researched and where the discourse so far is shaped by bold conjectures and incompatible scientific findings (Buhaug, 2010a; Salehyan, 2008). A key contribution of this article is a carefully designed quantitative analysis that places focus squarely on cities and their unique demographic features, as opposed to relying on overly aggregated country data. This is possible thanks to a new events dataset of urban social disorder in major Asian and African cities for the 1960–2006 period. The article's approach differs fundamentally from previous historical case studies as well as quantitative country-level studies, which in most cases are limited to studying major armed conflict with direct state involvement.

The article is organized as follows: In Section 2, we discuss recent trends in population growth and urbanization and develop an argument for how and under which conditions rapid city population growth might lead to increased levels of political unrest. We then present the data and estimation techniques (Section 3) before outlining and discussing the findings from the empirical analysis (Section 4). Section 5 concludes the article with a consideration of future research priorities.

2. Urbanization, urban population pressure, and political violence

2.1. Trends and projections in global urban population

The world presently hosts around 7 billion people and the number is rising. In 2010, the global population increased by an estimated 77.5 million. Although the global population growth rate has halved since it peaked in the early 1960s, in absolute terms the absolute population growth today is not much smaller that the peak of the late 1980s (about 87 million per year) according to the US Census Bureau. Strong population growth coupled with concern for the sustainability of renewable natural resources has set the stage for Malthusian doomsday predictions (e.g. Ehrlich, 1968; Kaplan, 1994) and also continued to dominate the environmental security discourse today. Yet, issues of composition and distribution of major demographic trends have received far less attention in the security discourse (notable exceptions are Goldstone, 1991, 2010; Cincotta et al., 2003). One demographic 'megatrend' that will have major social, economic and political impact is urbanization (Goldstone, 2010). According to UN statistics, the global share of the urban population increased more than fourfold during the 20th century, and while overall population growth is slowing down, urbanization remains a persistent force (UN, 2010).

Urban population growth has three complementary drivers: reproduction rate, migration, and reclassification of rural land. While natural increase due to a high birth-to-death ratio is an important factor contributing to urban population growth, rural–urban migration is the most important contributor to urban growth in many developing countries, where the concentration of investment and employment opportunities are important pull factors (UN, 2010). Kahl (2006) estimates that in developing countries, rural–urban migration currently accounts for 40–60 percent of annual city growth. As fertility is continuing to decline, migration will become a relatively more important cause of urban growth in the future.

Urban population growth is historically linked to development (UN-HABITAT, 2010) and some of the most rapidly urbanizing developing countries over the last fifty years, such as Botswana and the United Arab Emirates, have also experienced high economic growth rates. However, rapid urban population growth has also more recently taken place in much less affluent contexts, and particularly in Sub-Saharan Africa, high urbanization rates seem primarily to be driven by high population growth rates than by economic growth (e.g. Cincotta et al., 2003, p. 55). In both more and less developed contexts, market access and cost of communication and infrastructure imply that job opportunities become disproportionally located in cities. Urban centers also tend to offer better health care and other social services, while personal insecurity, poverty, and environmental degradation may force people to flee the countryside. With global warming and associated processes, such as sea-level rise, more extreme weather, and deterioration of agricultural productivity in vulnerable regions, the rates of migration and urbanization might increase further (Black et al., 2008; Piguet et al., 2011). Picking up on this possibility, a report by Christian Aid (2007, p. 1) warns of a "human tide" and considers migration "the most urgent threat facing poor people in developing countries." Other studies are much more cautious in their wording (e.g. Piguet et al., 2011; Raleigh and Jordan, 2010). The multi-causal nature of human migration implies that any attempt to quantify the mass of future 'environment-induced' urban population growth will be fraught with uncertainty (UK Government Office for Science, 2011). Regardless of the importance of environmental push factors relative to economic and other motives, however, the crucial reality remains; all global population growth within the next few decades will be absorbed by cities.

2.2. Population pressure, unrest, and political violence

Proper management of urban population growth and changing population structures is key to preserving human security. Rapid population growth can seriously constrain local governments' ability to provide basic services, including employment, housing, electricity, water, sanitation, enforcement of law and order, and

development of social capital, thus greatly affecting the quality of life of the citizens. According to Goldstone (2002), it is exactly when over-urbanization combines with underdevelopment – where the job market and the economy cannot keep up with urban population growth – that violence and instability may arise. Similarly, the mixing of ethnicities and shifting demographic composition of urban centers are cited as central destabilizing factors in urban environments. Climate-induced urban population growth and temporary rural–urban distress migration are likely to add to these challenges. People fleeing the disaster-struck or environmentally unsustainable countryside may have limited resources and social networks to rely on if the offered social safety-net is inadequate.

The notion of population pressure is central to the environmental security perspective (Homer-Dixon, 1999; Homer-Dixon and Blitt, 1998). Rapid population growth may lead to a reduced per-capita access to subsistence resources as resource reproduction is unable to keep up with the growing demand. This is typically taking place in rural contexts where the dependence on renewable resources is great. Overpopulation may also lead to a decline in the overall supply of certain resources, for example due to pollution, deforestation, overgrazing, unrestrained fishing, and clearing of land for housing. Rwanda, a densely populated and predominantly rural country, is a classic case in point. Resource scarcity may also spark or escalate inter-group competition. Under unfavorable economic and political conditions, such competition may take the form of violent conflict. Poor countries are argued to be particularly susceptible to violent resource conflicts as they have limited capacities to adapt to changing environments and often lack institutional arrangements for peaceful conflict resolution (Barnett and Adger, 2007) – even if a conditional relationship is yet to be robustly verified (for recent contributions, see Benjaminsen et al., 2012; Devitt and Tol, 2012; Gizelis and Wooden, 2010; Hendrix and Salehyan, 2012; Raleigh, 2010; Raleigh and Kniveton, 2012; Theisen, 2012; Theisen et al., 2011–2012).

While some individuals and communities manage to adapt to forms of resource scarcity, substitute resources or use them more efficiently, others will exit and settle in more promising environments, including in urban areas. In this way, rural–urban migration could act as a safety valve, relieving the countryside of the impending population pressure. On the other hand, large-scale migration to cities might merely translate the problem of overpopulation into an urban setting, potentially causing a security challenge (Cincotta et al., 2003; Gizewski and Homer-Dixon, 1995; Goldstone, 1991, 2002; Homer-Dixon, 1999; Homer-Dixon and Blitt, 1998; Kahl, 2006). Gizewski and Homer-Dixon (1995) point to three broad risk factors. First, rural–urban migrants are likely to experience economic marginalization and relative deprivation, increasing their awareness of their own situation and hence the potential for political radicalization. Second, migrants may experience difficulties in adjusting socially and psychologically to life in the city, and traditional sources to social authority and control are weakened. Third, the urban environment facilitates high levels of social communication, including greater opportunities for collective political action. The authors concede that in order to produce violence, city population growth rates have to interact with key facilitating factors (stressors) like economic crises, institutional breakdown, a high degree of communalism or ethnic cleavage, growing demands for democratization, presence of organized crime, and availability of weapons in the urban environment. Focusing on population settlement patterns, Toft (2003) notes that ethnic groups that are concentrated in urban centers have the greatest capabilities and potential for mobilization due to access to media, money, and dense economic and social networks. However, urban ethnic groups often lack a strong attachment to the city as their 'homeland', and are much more likely to engage in non-violent political activity.

2.2.1. Case study evidence

The notion that rapid urban population growth may relate to political violence seems to be borne out by several prominent case studies. In a careful analysis of political upheaval in early modern societies, Goldstone (1991) argues that cases of revolution and rebellion as diverse as the English and French Resolutions, rebellions in the Ottoman empire in the late sixteenth century, and the fall of the Ming dynasty in the mid-seventeenth century were all in part driven by strong population growth leading to large-scale rural–urban migration and declining real wages, producing opportunities for revolutionary movements. Also Huntington (1996, p. 113) notes the role of urbanization in causing social mobilization, and argues that the newly uprooted masses of rural-to-urban migrants throughout the Muslim World in the 1970s and 1980s were attracted to radical Islamic movements as these provided slum dwellers with social services and offered a "dignified identity". In an extensive case study research project linking population, environment, and conflict, Homer-Dixon and Blitt (1998) also address how natural resource scarcity and high rural population pressure is linked to urban violence and conflict. In the case of Pakistan, Gizewski and Homer-Dixon (1998, p. 188) find that high population pressure in rural areas push diverse and contending societal groups into close contact in urban contexts. Existing animosities and systematic inequalities between ethnic groups are becoming more easily observable and more salient in the competition for scarce urban resources, contributing to cause ethnically based urban violence. Similar links between urban growth rates and social unrest are noted for South Africa (Percival and Homer-Dixon, 1998) as well as in an earlier study on Southeast Asia (Evers, 1975). Further, in an analysis of urban ethnic violence in Kenya in the 1990s, Kahl (2006) concludes that the prime cause of the conflict was overstretched infrastructure and social services due to rapid rural–urban migration.

2.2.2. Quantitative studies of level of urbanization

The quantitative studies of relevance can broadly be separated into those addressing the level of urbanization, and those studying change. Cross-national time-series studies have at best found mixed evidence for the relationship between high levels of urbanization (measured by the share of the national population that lives in urban areas) and violent conflict. Collier and Hoeffler (2004) report that larger urban population shares, and in particular higher population concentrations, are associated with a reduced risk of civil war, even though the substantive effects are quite small. This corroborates the observation that societies with low population densities and predominantly rural populations tend to have relatively low government capacity (Herbst, 2000). Urban populations are easier to rule as they are proximate to government means of authority and control, and they also provide an important source of state income through taxation (Herbst, 2000). Ravallion et al. (2007) show that the large majority of the world's poor still lives in rural areas and conclude that urbanization in developing countries has contributed to poverty alleviation. In a study of 70 less developed countries for the 1978–1989 period, Auvinen (1997) found that the share of the population living in urban areas is positively associated with political protest, but not with more serious forms of violent conflict and regime change. The State Failure Task Force (Esty et al., 1998) made an important distinction between levels of development and found that high urbanization levels increase the risk of state failure for the very poorest countries in Sub-Saharan Africa. However, for more developed countries, high levels of urbanization were associated with lower

state failure risk, leading the report to conclude that it was a question of being "out of balance", whereby economic development fails to keep up with urban growth (Esty et al., 1998, p. 15).

2.2.3. Quantitative studies of urban population dynamics

Few statistical studies consider whether and how changes in the size and composition of the urban population affect security. One notable and influential exception is Cincotta et al. (2003), whose bivariate comparisons indicate that countries undergoing rapid urban growth of four percent or more per year are twice as likely to experience civil conflict as countries with an annual urban population growth below one percent. While that study highlights the need for systematic assessment of the relationship between urban population growth and violent conflict, there are some caveats to the empirical observations. The analysis does not account for third factors, such as level of development and type of government; the temporal data coverage is limited, it provides only one observation per country for urban growth (1990–1995 period), and it includes conflict observations from the 1990 through 2000 period only. In a global study of conflict outbreaks between 1950 and 2000, Urdal (2005) uses the same urban population growth and conflict data as Cincotta et al. (2003). The study covers all countries in the world, analyzing 192 conflict outbreaks, and controlling for factors like regime type, level of development, economic growth, and overall population growth. It concludes that urban population growth rates are not associated with conflict risk for the full period covered by the study, and that high urban population growth actually is linked to lower conflict risk when only looking at the post-Cold War period (1990–2000). In a time-series study of Indian states for the 1956 through 2002 period, Urdal (2008) found that urban population growth rates were not predicting either of three different measures of political violence across time and space in India. Although an urban phenomenon like Hindu–Muslim riots were unaffected by the growth in urban populations, high urban population growth was found to be associated with lower probability of traditional armed conflict (Urdal, 2008).

2.2.4. A new approach: studying city population growth rates

Despite the limited support reported in the quantitative studies referred to above, several issues imply that a rejection of a causal relationship between rapidly growing urban populations and violence might be premature. First, previous quantitative analyses are largely limited to investigating direct relationships, thereby enforcing rather crude causal assumptions. The general ignorance of conditional effects in quantitative research has been subject to major criticism from case-oriented researchers (e.g. Homer-Dixon, 1999). Consequently, in Section 2.3, we develop a theoretical argument that specifically incorporates the role of institutions, level of development, and economic shocks. Second, earlier research is restrained in that it generally conducts empirical analysis at a too high level of aggregation. Whereas arguments link increasing population pressure to local violence, statistical analyses habitually apply a country-level approach where national urban population shares or urban population growth statistics are regressed on country-level conflict data. This is problematic since urban population growth may in principle alleviate population pressure and conflict risk in rural areas, while potentially increasing the likelihood of violence and disturbances in urban areas. To remedy this problem, the present study uses city-level data on population growth and political violence to specifically address urban population-violence dynamics. A third significant limitation of past research concerns the dependent variable. Determined by data availability, earlier cross-national statistical studies have focused on conventional armed conflicts between organized parties beyond a certain severity threshold, typically 25 or 1000 annual deaths (e.g. Cincotta et al., 2003; Collier and Hoeffler, 2004; Urdal, 2005). Focusing only on the most severe forms of conflict may disguise many important nuances in the nature and distribution of contemporary urban violence. In the introduction to a recent special journal issue on "Climate change and conflict", Gleditsch (2012, p. 5) noted that none of the studies in this emerging field addressed urban violence. In contrast, this paper uses a newly collected dataset on urban social disorder that includes both violent riots and non-violent protests and demonstrations. Our assumptions and methodological approach are thus fundamentally different from earlier studies in that we are not focusing on the emergence of national conflicts but rather on urban dynamics in violent and non-violent political activities. As such, our results are complimenting, but not directly comparable to, previous research.

Methodological issues aside, a frequent criticism of both historical case studies and statistical assessments alike is that even if strong urban population growth may not have been linked to conflict in the past, massive urban growth in the future could lead to greater pressures and thus increase conflict risks more than we have seen in previous decades (e.g. Gizewski and Homer-Dixon, 1995). Similar claims are often articulated within the overlapping climate security debate, usually with reference to unspecified environmental or demographic 'tipping points' (e.g. Russill and Nyssa, 2009) that could upset known determinants of human behavior. We agree that rapid urban population growth – in the same manner as other plausible security threats – cannot be assessed outside of the economic and political realm. Strong population growth should not be expected to bring about violent social tensions in all urban contexts. We are not convinced, however, that established causal patterns necessarily will be dramatically different in the future and that past trends cannot inform us about likely future developments. According to the UN-appointed Intergovernmental Panel on Climate Change (IPCC, 2007), certain forms of stressors that could contribute to exacerbating the pressure from burgeoning urban populations will become more prevalent in some parts of the world. A number of cities with high population growth rates in our dataset are situated in areas identified by the IPCC as particularly vulnerable to such stressors, including Bamako and Lomé in West Africa, as well as other African cities like Nairobi, Khartoum, and Luanda, and Asian cities like Kathmandu, Dhaka, Saigon, and New Delhi. These stressors include heat waves and droughts, extreme weather events (storms, floods, wildfires), erratic precipitation patterns, and depletion of natural containers of freshwater, such as lakes, rivers, and glaciers. While such developments might have serious consequences for urban livelihood in vulnerable societies, they do not comprise a new phenomenon as such. More of the same does not dictate new causal relations by necessity.

2.3. Theoretical propositions

The broad literature on social movements and collective action offers a number of possible insights into how increasing urban population pressure might transform into political violence. Theoretical approaches range from almost deterministic assumptions about ethnic hatreds and associated security dilemmas (e.g. Horowitz, 1985; Kaufmann, 1996; Posen, 1993) via modernization-based arguments of radicalization of aggrieved, unemployed youths (e.g. Goldstone, 2002; Huntington, 1996) to classical theories of structural inequalities and relative deprivation (e.g. Gurr, 1970). Common to all of these contributions is their attention to the distribution of opportunities and privileges among the population. Where access to such goods is shaped by underlying social cleavages, such as class, religion or cultural and historical origin, mobilization is more likely to occur. Reflecting such a context-sensitive approach,

Goldstone (2002) argues that economic failure is especially detrimental, and that unmatched trends in economic and urban growth may induce violent conflict. Economic shocks in the form of recession or stagnation of the national economy could accentuate differences in and importance of economic privileges between individuals and groups, thus raising levels of dissatisfaction and grievances to the extent that it could spur violent reactions (Brennan-Galvin, 2002; Gizewski and Homer-Dixon, 1995; see Cederman et al., 2011; Østby, 2008 for empirical research). Some attribute the upheavals in London in August 2011 to precisely such a logic, referring to economic inequalities, cuts in welfare spending, a marginalized immigrant population, and endemic youth unemployment as causes for the rioting (The New York Times 7 August 2011). More generally, however, rapid urban growth is likely to be a greater challenge to states that have low functional capacity (Barnett, 2003). Critical in this regard, such states may be unable to provide basic services to a burgeoning population. While urban life is typically better than rural life in the sense that a higher share of urban dwellers have access to health care, education, food, and proper housing (Lomborg, 2001; National Research Council, 2003), there is often a mismatch between the expectations of rural–urban migrants and the extensive poverty found in many urban slums. Rampant urban growth combined with breakdown in urban services and employment opportunities arguably produce deprivation that could translate into grievances if a state is passive or even contribute to further deprivation (Kahl, 2006). Hence, we surmise that the quality of urban governance, which is tightly linked to state capacity, is decisive in maintaining inter-group relations and avoiding violence under contexts of high urban population growth.

Finally, we assume that democracies, all other things being equal, are more capable of handling rapid urban growth than non-democracies. Consolidated democracies are widely regarded as the superior political system in terms of quality of governance, especially under sound economic development (Charron and Lapuente, 2010). Moreover, democracies perform better on environmental indicators, such as land degradation, pollution, and deforestation (Li and Reuveny, 2006), thus potentially generating less 'push' of migrants from rural areas. As preferences and interests of the urban poor are often poorly represented by organized groups in national politics, states with rapid urban population growth and underdeveloped political institutions are likely to face demands for better government services, political reforms, and improved opportunities for participation (Kahl, 2006).

From this reasoning we formulate two testable hypotheses:

Hypothesis 1. High city population growth rates are associated with higher levels of urban social disturbance.

Hypothesis 2. The positive effect of city population growth on social disturbance is most pronounced in the contexts of economic shocks, low state capacity, and absence of democracy.

3. Data and methodological approach

3.1. Research design

The empirical analysis covers 55 major cities in 49 different countries with yearly observations for the 1960–2006 period. Most cities are found in developing countries; the data include 23 cities in Sub-Saharan Africa and 32 in Central- and East Asia. The sample is determined by the coverage of the Urban Social Disorder data (see Urdal and Hoelscher, 2012). The USD data are compiled from electronic news reports in the *Keesing's Record of World Events* (KRWE) and builds on a similar project developed by Banks (2010). The dataset covers various forms of both violent and non-violent politically motivated disorder, including demonstrations, rioting, terrorism, and armed conflict. General criminal violence is not recorded. To the extent possible, each event is coded with precise start and end dates, the actors involved, the target, number of participants, and number of casualties. From these data we generated two count measures of urban social disorder, both aggregated to the city-year level. We separate between *lethal events*, counting only those events reported to have resulted in at least one death, and *non-lethal events*, which include only those events where no casualties were reported. For comparison, we also use dichotomous measures of urban disorder, coded as 1 if at least one lethal/non-lethal event was reported during the year. While many non-lethal events may also be largely non-violent (e.g. repeated demonstrations in Tokyo against US military presence in Japan), some may have involved violence that did not lead to deaths (e.g., attempted assassination of Ugandan President Obote on 19 December 1969), or it could be that fatalities that occurred were not reported in the relevant news reports.

A total of 3375 events are registered in the dataset, of which 1378 (40.8 per cent) are reported to have led to fatalities. Correspondingly, 33.9 percent of all city-years experienced non-lethal events, while 25.2 percent of the observations hosted at least one lethal event. The overall trend is increasing over time, both with respect to the absolute number of events and the share of lethal unrest, albeit with considerable inter-annual variation (Fig. 1). Population growth is a conceivable contributor to the rising trend, but better news coverage and more systematic reporting in recent times are probably just as important explanatory factors. Besides, the rate of the contemporaneous population growth in these cities are many times higher than the growth rate in disorder events, implying a considerable drop in per-capita frequency of social unrest during the period.

Before moving to operational matters, a few caveats are in order. News reports in the KRWE certainly do not cover all relevant social disturbance events. First, powerful and autocratic regimes are better positioned to censor information about public unrest and other unpleasant incidents. However, they are also likely to be relatively successful in preventing disturbance from happening, making it inherently difficult to empirically distinguish between bias and regime effect. Second, international media attention varies significantly between countries and regions. Events happening in countries that are low on the international agenda (i.e., small countries with few economic, political, and cultural ties to the West) are arguably less likely to be reported than similar events in countries of great political and economic importance. A similar bias toward English-speaking countries and news reports in the KRWE is likely. Generally, larger episodes of violence and

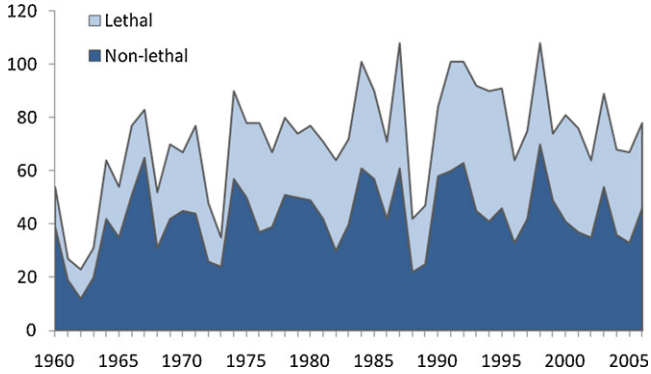

Fig. 1. Urban social disorder events by year, 1960–2005. *Note*: The figure illustrates the annual frequency of non-lethal and lethal disorder events in 55 major cities in Asia and Sub-Saharan Africa.

unrest are more likely to be reported than low-intensity and isolated incidences. Finally, improvements in communications technology over time and increasing international presence in more locations could lead to a time trend bias. These time trends may also vary geographically, as media interest in specific regions and countries changes over time. Yet, we have little reason to suspect these potential biases to seriously distort our estimates, and while specific records of disorder events might be inaccurate, we believe that the overall trends across space and time are representative.

3.2. Operationalization and estimation

The main explanatory variable to evaluate Hypothesis 1 is growth in the urban population. We consider several alternative measurements to corroborate our results. The primary measure used is *city population growth*, based on city-level population data from the UN Demographic Yearbook (UN, annual), supplemented by data from two online resources, the World Gazetteer (n.d.) and City Population (n.d.). As these sources provide updated population figures for selected years only, we created annualized *city population* estimates by interpolating linearly between the available observations, and extrapolating (for a maximum of five years) based on the rate of growth between the last two observations. City-specific interannual growth rates were then calculated as smoothed five-year moving averages, based on the annual estimates. This procedure ameliorates the problem of sharp spikes in the growth data, although using raw inter-annual growth rates in the empirical analysis produces virtually identical results.

In the robustness section, we substitute the UN-based population measures with another city-specific population growth rate measure based on CIESIN's Gridded Population of the World data (GPW v.3.0), extracted by means of geographic information systems (GIS) tools. We selected a coarse grid resolution of 1×1 degree before identifying the grid cells to which the 55 cities correspond. The GPW data are available for every 5 year since 1990, and we used linear interpolation to fill in missing values. From this, we calculated the inter-annual and five-year growth rates. As a final alternative measure, we use five-year growth rates for the entire urban population in the country based on UN statistics on urban and rural populations (UN, 2008). The different population growth indicators are not highly correlated ($r = 0.32$–0.58), suggesting that they tap partly different demographic processes.

The following control variables are included in all models: log-transformed *city population size* (UN, annual); dummy variables for *democratic* and *autocratic* regime types, coded from the Scalar Index of Polities (SIP) data (Gates et al., 2006); log-transformed real *GDP per capita* data (Gleditsch, 2002); a dummy for *economic shock*, defined as a negative change in real GDP per capita since the previous year; and *ongoing conflict* from the UCDP/PRIO Armed Conflict Data (Gleditsch et al., 2002; Themnér and Wallensteen, 2012). In addition, we include a common *time trend* to account for a possible temporal bias in reporting.

We use negative binomial regression to analyze the event count measures. This approach was chosen due to the skewed distribution of events with a few high-violence observations and a majority of relatively peaceful ones. The dichotomous disorder measures are analyzed using fixed-effects logit regression. All models are run with a lagged dependent variable (*LDV*) to account for temporal dependence between observations. Lastly, city fixed effects are specified to account for unobserved heterogeneity between the cities and to ensure that the parameter estimates reflect strictly temporal covariation between social disorder and the right-hand-side variables.

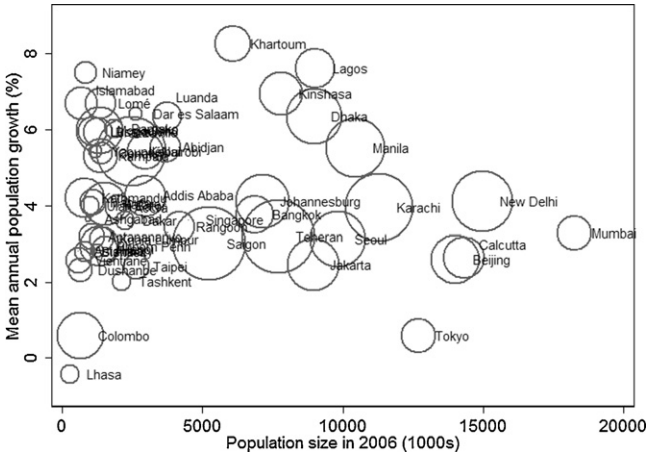

Fig. 2. Urban social disorder events by city population size and growth, 1960–2005. *Note*: The figure illustrates the association between city-specific population size and growth and the number of recorded urban social disorder events since 1960, represented by the size of the symbols.

4. Results and discussion

4.1. Main findings

The multivariate empirical evaluation of the proposed hypotheses is conducted by means of three sets of regression models, presented in separate tables below. These include alternative city population growth measures, contextual controls, potential interaction effects, and other sensitivity measures. Moreover, all models are estimated separately for non-lethal and lethal events. Overall, we find no evidence of a systematic connection between city population growth and the risk or frequency of urban social disorder.

A preliminary assessment of the population-disorder relationship is visualized in Fig. 2. Scatter plots are of limited value for causal inference, but they are very effective in displaying patterns of co-variance. The larger symbols to the right of the figure reveal that larger cities have more demonstrations and riots in a normal year but there is little evidence to suggest that higher population growth rates (vertical axis) are associated with more political violence. If the USD estimates were normalized by population, we would find that the per capita rate of disorder events is inversely related to city size.

A significant limitation of this plot, beyond its inability to control for third factors, is the complete ignorance of time. Hence we cannot deduce in one direction or another regarding the dynamics between city population growth and public unrest based on this simple assessment alone. Next, we offer a more comprehensive assessment, accounting for potentially important contextual factors, such as institutional characteristics, economic development, and ongoing intrastate conflict. Table 1 shows the results from two pairs of models. The first two models are estimated using negative binomial regression on the annual count of lethal (1a) and non-lethal (1b) events. The second set of models (2a–b) use simpler dichotomous dependent variables, again separated by severity level. The number of observations differs slightly between the lethal and non-lethal samples. This is because the fixed-effects estimator by design excludes units without variation on the dependent variable. Three cities in our sample did not experience deadly disorder during the full sample period (Astana, Singapore, and Ulan Bator) while one city (Singapore) also avoided non-lethal unrest.

The models in Table 1 show no general effect of city population growth on the frequency of political violence. Indeed, the negative

Table 1
Base models, population growth and urban social disorder.

	1a	1b	2a	2b
	Lethal	Non-lethal	Lethal	Non-lethal
City population growth	0.017	−0.012	0.019	−0.018
	(0.012)	(0.011)	(0.018)	(0.017)
City population	0.001	0.105	0.109	−0.218
	(0.084)	(0.067)	(0.213)	(0.188)
Democracy	−0.324*	−0.017	−0.524*	−0.117
	(0.138)	(0.114)	(0.217)	(0.197)
Autocracy	−0.342**	−0.241**	−0.368*	−0.186
	(0.100)	(0.089)	(0.153)	(0.140)
GDP capita (ln)	−0.248**	0.056	−0.464*	−0.087
	(0.096)	(0.074)	(0.188)	(0.160)
Economic shock	0.220*	0.275**	0.484**	0.327**
	(0.088)	(0.077)	(0.127)	(0.119)
Ongoing conflict	0.633**	0.257**	0.890**	0.362*
	(0.104)	(0.091)	(0.153)	(0.146)
Time trend	0.012*	0.001	0.017	0.021*
	(0.005)	(0.004)	(0.011)	(0.010)
LDV	0.120**	0.098**	0.568**	0.769**
	(0.015)	(0.009)	(0.120)	(0.105)
Constant	0.835	−1.647*		
	(0.873)	(0.668)		
χ^2	220.98	199.28	145.42	102.83
Observations	2185	2227	2185	2227
Number of cities	53	54	53	54

Note: Negative binomial (Models 1a and b) and logit (2a–b) regression with city fixed effects. Standard errors in parentheses.
* Significant at 5%.
** Significant at 1%.

sign of the growth estimate for lethal events suggests that an opposite effect is more probable. In principle, this lack of association could be the result of an endogenous relationship between urban population growth and violence whereby rural residents refrain from moving to the city when it is considered unsafe. We do not believe this is an important dynamic, however. Urban social disorder is a rare phenomenon – the mean USD score is 1.3 events per city year; the median is 0 – and only in exceptional cases do they have a significant impact on a large portion of the citizens. One such case could be the disturbances in Teheran culminating in the Iranian Revolution of 1979. Yet, even during the extremely violent years of the late 1970s (the USD data contains records of 38 separate events during 1978 alone), available population estimates indicate no contemporaneous drop in the population growth of Teheran.

So what explains urban violence, then? The variable in Table 1 with the most powerful and consistent effect is economic shock. Defined as negative growth in GDP per capita since the preceding year, economic shocks significantly and substantively increase the risk and rate of social disorder, regardless of severity level and estimation technique. Interestingly, this effect disappears almost completely if we apply a one-year time lag to the shock variable. This could indicate an endogeneity problem, or even reverse causality. Yet, violent urban protest is unlikely to have a measurable impact on the national growth rate, unless the violence was to escalate into protracted armed conflict. In fact, we find it much more problematic to assume a one-year intermittency between the materialization of economic problems and people turning to the streets.

Other factors that perform consistently across the models in Table 1 are population size, ongoing intrastate conflict, and autocratic political system. The positive effect for population comes as no surprise, and the same goes for civil war. The strong negative effect for authoritarian states – more significant in statistical terms than that of democracy – might seem less intuitive. This could indicate a reporting bias, whereby details of public unrest in regimes with a tight grip on national information flow are less likely to reach international media. However, we believe this result reflects the true nature of authoritarian rule, where public demonstrations are illegal and defiance is harshly punished. The effect of democracy is heavily dependent on the level of violence. For deadly riots, the dampening effect of democracy is stronger than the reverse effect of economic shock, but for non-lethal events its influence is indistinguishable from zero. Democracies by design allow for political demonstrations, and even though the protests sometimes turn violent, they rarely evolve into bloodshed. Somewhat surprisingly, GDP per capita exhibits only a trivial effect when shocks are accounted for, contrasting its powerful negative effect on civil war (Hegre and Sambanis, 2006).

The results from Table 1 dictate a rejection of Hypothesis 1, but dismissing the role of urban population growth altogether would be premature as its effect on urban violence might be conditional on certain contextual characteristics, as expressed in Hypothesis 2. In the next set of models, we evaluate three possible indirect effects, where population growth is interacted with democracy, GDP per capita (inversed, to ease interpretation), and economic shock. For simplicity, we limit the selection of models to negative binomial regressions with the continuous dependent variable from now on although we maintain the distinction between lethal and non-lethal events as the behavior of some covariates vary with severity levels. The results are presented in Table 2.

Overall, the extended models reinforce the impression left by Table 1, that the rate of city population growth is largely irrelevant for politically motivated urban violence. In only one of the models do the parameter estimates indicate a possible effect of population growth, working through the level of economic development. The interaction between population growth and poverty in Model 4b suggests that the frequency of non-lethal disorder events go up with higher city population growth rates in poor countries, as predicted by Hypothesis 2. However, when the interaction term is interpreted jointly with the individual effects of population growth and income, we find that the overall effect is quite small. For a city with median scores on all other covariates, the predicted score from Model 5b is virtually constant at 0.3 events per city year for the entire range of observed population growth rates. For lethal events (4a) and for the interactions with democracy (3a–b) and economic shock (5a–b), the impact of city population growth is negligible. The remaining covariates in all essence produce results identical to those reported above. Democracy (as well as autocracy) maintains the negative parameter estimate from previous models, indicating that a free, liberal political system can safeguard against lethal urban riots. Moreover, all forms of urban disorder are more likely during national economic crises, and lethal events are also more frequent when a civil war is ongoing. Lastly, we find a weak time effect with more urban disorder in recent years, but this pattern is evident only for lethal events.

4.2. Sensitivity

The interaction terms add little to the baseline model besides introducing multicollinearity issues, and log likelihood tests indicate that the simpler Models 1a–b are superior (and similar models without the city population growth indicator would be more efficient still). We have further performed additional sensitivity tests. First, one possible concern is that our proxy for city population growth – operationalized as five-year moving average of annual city population growth – is too effective in leveling peaks in the demographic data, thereby failing to distinguish temporary disruptions from long-term migration patterns. However, when replacing the city population growth

Table 2
Interaction effects.

	3a	3b	4a	4b	5a	5b
	Lethal	Non-lethal	Lethal	Non-lethal	Lethal	Non-lethal
City population growth	0.011	−0.009	0.129	−0.234	0.032*	−0.005
	(0.013)	(0.012)	(0.141)	(0.123)	(0.013)	(0.013)
City population growth × democracy	0.036	−0.013				
	(0.027)	(0.027)				
City population growth × inverse GDP capita			−0.835	1.656		
			(1.046)	(0.905)		
City population growth × economic shock					−0.053*	−0.022
					(0.022)	(0.021)
City population	0.006	0.105	−0.006	0.123	−0.006	0.100
	(0.085)	(0.067)	(0.085)	(0.068)	(0.084)	(0.067)
Democracy	−0.480**	0.034	−0.315*	−0.032	−0.306*	−0.014
	(0.184)	(0.153)	(0.139)	(0.114)	(0.139)	(0.114)
Autocracy	−0.334**	−0.245**	−0.341**	−0.231**	−0.335**	−0.239**
	(0.100)	(0.090)	(0.100)	(0.090)	(0.100)	(0.089)
GDP capita (ln)	−0.236*	0.050	−0.286**	0.119	−0.246*	0.060
	(0.096)	(0.075)	(0.107)	(0.082)	(0.096)	(0.074)
Economic shock	0.220*	0.274**	0.232**	0.259**	0.462**	0.368**
	(0.088)	(0.077)	(0.089)	(0.078)	(0.132)	(0.118)
Ongoing conflict	0.637**	0.256**	0.637**	0.250**	0.624**	0.256**
	(0.104)	(0.091)	(0.104)	(0.091)	(0.104)	(0.091)
Time trend	0.012*	0.001	0.013*	0.000	0.013*	0.001
	(0.005)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)
LDV	0.120**	0.098**	0.119**	0.097**	0.118**	0.097**
	(0.015)	(0.009)	(0.015)	(0.009)	(0.015)	(0.009)
Constant	0.743	−1.611*	1.166	−2.239**	0.795	−1.671*
	(0.875)	(0.673)	(0.963)	(0.746)	(0.874)	(0.669)
χ^2	222.33	199.44	221.83	199.97	228.10	201.69
Observations	2185	2227	2185	2227	2185	2227
Number of cities	53	54	53	54	53	54

Note: Negative binomial regression with city fixed effects. Standard errors in parentheses.
* Significant at 5%.
** Significant at 1%.

measure with other using either shorter smoothing periods or simply inter-annual differences, the main results are unchanged (models are not shown here).

Second, there is a scholarly debate about the use of fixed effect models in conflict research. Fixed-effect models not only capture city-specific effects not explained by our model, but also exclude observations with lack of temporal variation on the response variable. However, altering the models by either specifying fixed effects at the country level or applying random effects makes no difference; city population growth remains unrelated to the risk and extent of urban political unrest. Different operationalizations of the dependent variable only demonstrate the robustness of this non-result. Models with a binary dependent variable, as reported in Table 1, or categorized versions of the count measure behave virtually identical.

Third, one might object to the inclusion (and control) of civil war-affected observations as some of the civil war events potentially could also be coded as urban social disorder, hence constituting a situation with the same phenomenon on both sides of the equation sign. We believe this is not likely to be a widespread pattern here, however. The UCDP/PRIO civil war data and the USD data rely on very different inclusion criteria. This means that few disorder events would qualify for inclusion in the civil war data. In addition, most civil wars occur in peripheral parts of the country and the capital and other major cities are rarely affected by violent events (Buhaug, 2010b). Even so, the strong overrepresentation of disorder events among country years with ongoing civil war demands some attention. Hence, in tests not shown we replicated the main models separately on the civil war and non-civil war sample. This revealed some deviating patterns; for example, we find that the risk-inducing effect of economic shocks applies mostly to observations with no civil war in the country. More important in this context, however, population growth replicates its insignificant effect on both subsamples (z-score < 0.1). Other tests that are also not shown here include outlier analysis and alternative estimation techniques (OLS, logit). Neither of these modifications produced results substantively different from those reported here. Moreover, we have evaluated the contribution of city population growth to the model's predictive ability by estimating the model on a shorter time period (1960–1996) and then compare out-of-sample predictions for the subsequent decade with true observations (Ward et al., 2010). Again, we find population growth to have a trivial contribution to the model's overall performance. See the online appendix posted alongside the replication data for documentation of this analysis.

As a final and somewhat more comprehensive sensitivity test, we decided to substitute our demographic measures with other sources of population data. One problem with the applied city-level population data is that they conflate natural growth with rural–urban migration, so it is impossible to distinguish empirically between the two processes. We are aware of no alternative population statistics that would remedy this limitation so this is a challenge left for future work. However, there is a second potential source of inaccuracy in the UN city population data that is easier to evade: expanding city limits and reclassification of rural into urban lands. Gridded population data, linking population estimates to fixed geographic entities (in our case, 1 × 1 degree grid cells), offer a useful alternative source for estimating city population growth rates. Models 6a–b in Table 3 show the results with GIS-generated population data described in further details in the data section above. Note that these data are only available since 1990 so we lose a significant number of observations. The weakening of many of the important control variables, in particular democracy and economic shock, is worrying and suggests that this subsample

Table 3
Alternative population data.

	6a Lethal	6b Non-lethal	7a Lethal	7b Non-lethal
City grid cell population growth (GIS)	0.210 (0.135)	0.160 (0.136)		
City grid cell population (GIS)	0.093 (0.257)	−0.071 (0.155)		
Urban population growth (national)			−0.044* (0.022)	−0.101** (0.021)
City population			−0.028 (0.085)	0.030 (0.070)
Democracy	−0.579 (0.396)	−0.149 (0.277)	−0.380** (0.138)	−0.099 (0.115)
Autocracy	−0.483 (0.261)	0.107 (0.216)	−0.344** (0.099)	−0.274** (0.088)
GDP capita (ln)	0.051 (0.498)	0.183 (0.253)	−0.276** (0.097)	−0.012 (0.077)
Economic shock	0.085 (0.169)	0.263 (0.149)	0.237** (0.086)	0.258** (0.076)
Ongoing conflict	0.639** (0.212)	0.088 (0.206)	0.643** (0.103)	0.334** (0.089)
Time trend	−0.003 (0.024)	0.012 (0.020)	0.010* (0.005)	−0.003 (0.004)
LDV	−0.034 (0.040)	0.037 (0.030)	0.120** (0.015)	0.093** (0.009)
Constant	−0.703 (4.231)	−1.074 (2.424)	1.641 (0.937)	0.023 (0.731)
χ^2	15.97	10.90	187.24	213.74
Observations	377	396	1916	1969
Number of cities	40	42	51	53

Note: Negative binomial regression with city fixed effects. Standard errors in parentheses.
* Significant at 5%.
** Significant at 1%.

might not be representative of the universe of cases. While these models clearly thus have limitations, it is worth noting that city population growth measured by using GIS population data reproduce the statistically insignificant relationship between population growth and political violence.

The second substitute for our explanatory variable of prime interest is country-level rates of urban population growth. These data are less precise as they do not pertain exclusively to the cities of observation. On the other hand, they are available in a format that is clearly comparable across countries and over time. Moreover, as the cities in the Urban Social Disorder data are national capitals and other important urban centers, they are likely to have a significant bearing on the estimates in the UN's urbanization data. Strikingly, Models 7a–b indicate that urban population growth at the country level is negatively and significantly associated with urban demonstrations and riots. This result holds when controlling for crucial contextual factors, such as regime type, economic performance, and ongoing conflict. Hence, while rapid urban population growth may represent considerable challenges to human security and well-being in the growing mega-cities of the world, there is little in the historical data to suggest that strong urban population growth will necessarily lead to more unrest and violence.

5. Conclusions

This article set out to study whether rapid city population growth is associated with a higher risk or frequency of urban violence. To this end, we analyzed a new dataset on urban social disorder, applying a variety of model specifications and variable operationalizations. All models failed to support the proposed association. Although one cannot rule out the possibility that this non-result is due to poor data, selection bias or misspecified models, we believe this reflects the true relationship. Population growth in cities and urban disorder are at best causally unrelated; some models even indicated a reverse connection. How do we explain this? While it is all too easy to imagine the Kaplanesque shanty-towns and slums of rapid-expanding urban centers in the third world, one must not forget that cities offer unsurpassed economic opportunities and public goods. Jobs are more plentiful and living standards are often much higher in urban centers, and this population concentration has been vital for the development of industry and trade. In fact, no country in the modern age has achieved sustained economic growth without contemporaneous urbanization (UNFPA, 2007). And even if strong urban population growth were to increase the level of urban social disorder, a related question remains: what happens in rural communities with considerable out-migration? It might be the case that rural–urban migration (as well as other forms of mobility) under certain conditions may function as a societal safety valve, relieving the pressure on vulnerable lands in the countryside. It is certainly a thought worthy of further exploration.

A number of challenges remain within this research portfolio. Ideally, we should be able to distinguish between natural and migration-induced city population growth. While the underpinnings of population pressure might apply in any instance, notions of relative deprivation, ethnic incompatibilities, and reaction to modernization should be more relevant in the latter case. Are security implications of urban population growth qualitatively different in cities with large labor-induced immigration compared to cities that have absorbed large masses of people fleeing an unsustainable countryside, or cities with high natural reproduction rates? Specifying under which conditions population growth is more likely to lead to increased human insecurity and social unrest in urban centers is a natural and important next step.

In addition, it would be pertinent to expand the scope of human insecurity beyond the present definition of social disorder and look at wider patterns of political and social insecurity. Homicide rates, organized crime, and terrorist events are plausible candidates. Another promising approach would be to study the presumed connection between urban population growth and political instability. Moreover, plans already exist to expand the spatial coverage of the Urban Social Disorder data to include Latin America and the Middle East. Although we have no a priori reason to expect significant regional differences in the urban population growth-security nexus, covering Asia and Africa only will always lead to concerns about the generalizability of the results.

Improving healthcare systems and sustained high birth rates imply that the populations of the third world will continue to grow, and economic development and increasing economic interdependence mean that this population growth will be absorbed by urban centers. Processes associated with climate change, especially sea-level rise but also marginalization of fertile lands in vulnerable areas, threaten to escalate this demographic trend further. Accordingly, policy makers, NGOs, and UN agencies are increasingly worried about the potency of future forced migration. Some even consider climate-induced displacement – most of which is expected to the form of rural–urban migration – to be "the most urgent threat" facing the developing world (Christian Aid, 2007, p. 1). It is time, then, to intensify focus on potential security consequences of migration and the growth of cities also within academic circles. This paper represents but one small effort in this endeavor, and its main empirics-derived conclusion gives reason for cautious optimism. If anything, high urban population growth is associated with slightly *lower* risk of social disorder in cities. Future research will reveal whether this finding holds also for other forms of violence, and to what extent large out-migration affects the security of rural communities.

Appendix A. Supplementary data

Replication data are available in the online version, at doi:10.1016/j.gloenvcha.2012.10.016.

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