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Youth Bulges, Insurrections, and Politico-Economic Institutions

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Youth Bulges, Insurrections, and Politico-Economic Institutions

Theory and Empirical Evidence

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We develop a model of insurrection markets and integrate the youth bulge as measured by the relative youth cohort size. Apart from certain spontaneous outbreaks of violence or riots we find youth bulges alone to be no proper predictor for political violence. However, deliberate insurrection activities that aim at changing political and economic power positions are nevertheless affected by youth bulges, but only when interacted with characteristics of the respective underlying set of politico-economic institutions. We test these implications of our theory in an empirical model based on cross-country panel data and find the effect of the relative youth cohort size on insurrection outbreaks to be moderated by changes in the underlying institutional setting, particularly changes in the labor-market conditions as approximated by unemployment rates.

JEL classification: H56; J10; J22; P16

Keywords: Youth bulges, demography, insurrections, political economy of revolutions.

1 Introduction

When watching news reporting insurrection activities, riots, or demonstrations, one is hardly ever surprised to see most activists to be particularly young, and whenever violence is associated with the respective scenery, it also comes as no surprise that most activists are male. It hence appears straightforward when (Goldstone 2002) claims historical periods of political violence to have always been closely related with periods of demographically young societies. Nevertheless, a large youth share in the population has only recently become under somewhat closer inspection in the social sciences. Since Graham Fuller used the term “youth bulge” in 1995 in a CIA conference report (Fuller 1995; see also Fuller 2003; Niang, no year, 8) in order to pinpoint a potential demographic source of conflict, the phenomenon has been picked up by newspaper commentators (Heinsohn 2007, 2009; Caldwell 2007; Whelton 2007), and, somewhat hesitantly, by scholarly researchers as well (see overviews by Goldstone 2002; Urdal 2006; Niang, no year).

But no earlier than in 2006, a first systematic empirical investigation of the demographic impact of the youth bulge on political violence has been published (Urdal 2006; see also Urdal 2004). And up to then, sophisticated speculation rather than scholarly theorizing has dominated the search for theoretical answers to the question as to what the causal relations between youth bulges and political conflict may be. While economic explanations have been part of many, if not most, of these sophisticated speculations, there has as yet no consistent theory been provided that captures the main ideas, systematically relates them and works out testable empirical implications. In particular, there is a lack in a theory explaining why young people in a youth-bulge situation should be particularly prone to political violence in general and to insurrection activities in particular.

When it comes to political violence, it makes sense to distinguish spontaneous outbreaks of violence or riots on the one hand from deliberate insurrection activities that aim at changing political or economic power positions on the other hand. In this paper, we are interested in the latter and we will generally refer to them as insurrection activities. In order to become convincing, then, a theory of insurrections and the youth bulge needs to provide for a link between a youth-bulge phenomenon with collective-action problems of insurrection activities.

Since insurrection activities as defined here aim at shifting economic and/or political power, they direct collective action to a certain, and at least allegedly common, goal.

A theory of youth bulges and insurrections, then, needs to show how the existence of a youth bulge affects the difficulties in the formation and effectiveness of insurrection groups with respect to the (alleged) common goal in a consistent manner. This is how this paper aims at adding to the literature. It develops a theoretical framework in the tradition of Grossman (1991, 1999; see also Wall 2006) that integrates the most important characteristics of youth bulges into a theory of insurrection activities.

Our common goal is derived by the assumption of a kleptocratic society to start with. This kleptocratic society presumably forms the basis for potential grievances by those who do not belong to the kleptocratic elite in general and by the respective youth cohort in particular. We then introduce a demographic factor, representing the youth bulge as well as two hypothesized characteristics of relatively young persons, namely a certain attitude to risk and a relation of their productivity on “insurrection markets” on the one hand and that on traditional labor markets on the other.

We then empirically test our theory by help of a cross-country panel data set and find our theoretical predictions confirmed: A youth bulge impacts on insurrection onsets in interaction with the underlying institutional setting of the official labor market as measured by changes male youth unemployment rates.

In the following section, we briefly clarify some fundamental definitions and concepts and we relate them to the literature. Based on this groundwork we develop our theoretical model in section 3. In section 4, we test our theoretical conclusions in a logistic regression model based on a broad cross-country panel data set. In section 5 we discuss the implications of our results, suggest further empirical and theoretical research and conclude.

2 Some basic concepts and definitions

Urdal (2004, 2006) as well as Staveteig (2006) claim that simply relating the size of some youth cohort to the total population may be misleading since, in their view, a youth bulge has broader implications than a specifically flat form of the population pyramid. To be precise, a youth bulge represents no less than a historical transition phenomenon of a society on its path into a modern society. At a certain point in time, both dropping mortality rates and rising per-capita income tend to drive down birth rates, which leads to a long tail of adult and older people on the one hand and

to dropping sizes of succeeding children cohorts, so that the respective youth cohort tends to form a bulge in the overall age structure of the respective society on its way of modernization. Over time, then, this bulge works itself all the way through the age structure until it eventually disappears.

Viewed in that way, it makes sense to follow Urdal (2006) by measuring a youth bulge by the relative youth cohort size (*RYCS*) rather than simply by the share of the youth cohort in total population. Hereby, the *RYCS* is defined as the youth cohort in percent of the respective older cohorts of the economically active population. Hence, the *RYCS* is what we refer to in the rest of this paper when dealing with the size of a youth bulge.

A youth bulge may have its merits for a society, as it can, for example, be associated with Samuelson's (1958) biological interest rate. Hence, relatively low per-capita contributions of the youth cohort to common-pool consumption loan systems like social security are associated with relatively high per-capita allowances to older cohorts which lead to particularly wealthy cohorts of pensioners in some industrialized countries.

However, for the respective youth-bulge cohorts themselves, these advantages do hardly materialize. To the contrary, forming a demographic bulge implies a relative abundance of the respective cohort's members, which starts at birth and works its way through the life cycle. At some time, then, the "bulge" cohort forms a youth bulge, and here it potentially faces bottlenecks (Urdal 2006, 615) in search for opportunities in education and on job markets. Depending on the characteristics of the respective economic and political institutions, this tentatively leads to either real-wage drops or underemployment as well as to general lacks in career opportunities (Easterlin 1987). What is more, in light of rising competition by members of the succeeding youth cohort, the older cohorts might be inclined to limit the access to economic positions and possibly also to political participation and the like. Depending on the institutional background, this implies potentials for grievances on the side of such a youth cohort's member, and it might, once again depending on the underlying institutional setting, turn out to be a supporting factor for political violence (Niang, no year, 12; Staveteig 2006, 7).

To put it in economic terms: While the bottleneck hypothesis of youth bulges implies an abundant youth cohort to face dropping relative prices for whatever its members supply to the society they live in, the resulting economic and political effects are manifold but obviously dependent on numerous determinants within the politico-institutional setting of a society. A flexible, market oriented setting in some ideal form that does not privi-

lege incumbent persons in both political and economic positions of all sorts whatsoever would, as far as such a society ever existed, have implications particularly different from a society that systematically privileges persons that have already been successful in occupying such positions in the past. As a result, if young potential successors in political and economic positions face open markets but falling supply prices they may still find taking opportunities relatively advantageous as compared to organizing themselves in insurrection organizations that aim at breaking up power positions in both economic and political terms.

This is different when a relatively abundant youth cohort faces closed shops in that both economic and political positions are occupied by members of older cohorts and defended by them by administrative means. In such a case intruding into the sphere of these privileges by simply working hard, by being better as well as by providing better ideas and services to society may not be of much help for the youth cohort's members. Still, while the ensuing grievance may be a necessary condition for the youth cohort for proceeding to insurrection activities, it is not a sufficient condition, and the reason is the collective-action problem of revolutions (Tullock 1971; Lichbach 1998; Apolte 2012). Hence, while spontaneous outbursts of political demonstrations and even of riots and violence might be explained by the development of a youth bulge in a closed-shop society alone (Kuran 1989), deliberate activities that aim at changing political power positions call for more than just that, namely for an integration of the determinants discussed so far in a more comprehensive approach, and such an approach has to take collective action into account.

In order to fix ideas, we assume a society that is characterized by a particularly privileged politico-economic elite that controls both the political and the economic sphere. While markets are used to a certain extent in order to coordinate economic activities, all productive assets are finally owned and conducted by members of this particular elite. It is then hypothesized that such an underlying setting may induce potential political entrepreneurs to enter the market for economic and political power by way of forming insurrection groups. These entrepreneurs, then, provide solutions for the collective-action problem of insurrection activities, but they are of course driven by personal interests and that is by the motive to redistribute power and wealth away from the incumbent elite to themselves. In doing so they hire young potential insurrection activists, and here is where the effects of the youth bulge step in.

3 An economic model of insurrections and the youth bulge

3.1 Basic Model

Consider a society consisting of a ruling elite, which we refer to as the government elite G or simply the government, a competing elite, which we refer to as the revolutionary elite R , and a group of citizens. Both elite groups consist of some leading individuals plus a relatively narrow clientele. G is modeled as a kleptocratic elite that not only runs the government but that also owns the shares of the entirety of the economy's productive assets. Hence, while these assets are formally in private hands, the private owners stem from group G , and all formal profits flow into their purse. Finally, the government elite imposes labor-income taxes on the citizens which their members also use for own consumption.

The revolutionary elite R seizes resources from that part of the economy that it has informally brought under its control; it uses these resources for own consumption as well as for hiring insurgents which they compensate for their activities on the basis of a broadly understood compensation rate w_I , paid either in cash or in kind. Finally, we have a number N of citizens that are neither part of G nor of R .

While governmental control over all economic activities formally rests with the government elite, this group has effective control only over those parts of the economy that are not under the informal control of the revolutionary elite. To be precise, we model the respective control capacities of the government and the revolutionary elite as shares A^G and A^R of the total productive assets in the economy. We normalize the total value of productive assets to unity, so that $A^G + A^R = 1$. While the share A^G is formally as well as effectively under the control of the government, the share A^R is only formally under the control of the government but effectively controlled by the revolutionaries.

There are two income-generating activities available for the citizens, one is work on the regular labor market and the other is insurrection. We normalize the time each individual citizen devotes to each of the income-generating activities to unity. Hence, we assume the citizens to allocate a fraction l to labor and another fraction i to insurrection, such that the disposable time is $l + i \leq 1$ on the level of a representative individual, and $L + I \leq N$ with $L = lN$ and $I = iN$ on the level of the society as a whole. As the full-time portfolio of the citizens is, in principle, devoted to either work or insurrection,

any situation $l + i < 1$ would be due to some sort of involuntary unemployment.

Labor time is supplied to a private firm that utilizes all assets A . The private firm is run by a management that is appointed by members of the government elite and that is itself part of the government elite. Insurrection activities are supplied to the members of the revolutionary elite R .

At this point, we build the youth bulge into our model, considering the following aspects:

- Employees between 15 and 24 years of age have, on average, not yet reached the level of productivity that employees of an age above 24 years have. While a part of the 15 to 24 year old may have already run through some sort of a formal education, all of them will at best be in the beginning of a process of gathering professional experience, and that will drive up their productivity over a longer time to come. We hence assume employees between 15 and 24 to be, on average, less productive on the labor market than employees above 24.
- Young people are typically more volatile in their judgments and attitudes in general and in their judgments and attitudes toward governments and potential revolutionaries in particular.
- Young people are typically less risk averse than older people.

In order to consider these aspects within the structure of our model, we define a youth-bulge ratio $r \in [0, 1]$ as the share of those who belong to the potential of economically active young persons that are between 15 and 24 years of age to those who are still active, but older than 24.

The private firm utilizes all productive assets A as well as labor L as inputs and maximizes profits under conditions of perfect competition. We assume a production function $F(L^e, A)$ with L^e being effective labor supply. The production function is assumed to satisfy the *Indada* conditions in the two arguments L^e and A . In order to consider the productivity effect of the youth bulge, we define effective labor supply as $L^e = \delta r^{-1} L$ with $\delta \in (0, 1)$. The economy's output Y is then:

$$Y = F(\delta r^{-1} L, A) \tag{1}$$

Next, we model A^R as being linearly dependent on the total time I that the citizens

allocate to insurrection activities:

$$A^R = \beta I \quad \text{with } \beta > 0. \quad (2)$$

We assume the government to tax labor income by a nominal tax rate t^G on the wage sum. However, as the government's effective control over the economy is limited by the revolutionaries' share in power, the government can effectively tax only that part of labor income that is generated under both its formal and its effective control. Since we assume a homogenous production technology, the share A^G in the assets effectively controlled by the government is, at the same time, the share in both employment and the part of the wage sum that is effectively under the government's control. The government's effective labor-income tax rate is hence $A^G t^G$. As we focus our attention on the citizens' allocation of time between labor and insurrection and in order to keep the analysis simple, we assume the government's decision on the tax rate t^G as exogenous. On top of the unequal distribution of property rights, the tax rate t^G is an indicator of how the government oppresses the citizens. The income Y^G of the government's elite is hence:

$$Y^G = \pi + t^G A^G w_L L \quad (3)$$

where π are profits of the firm since they are assumed to stream into the purse of the share owners who are in their entirety members of the government's elite, w_L is the wage rate on the labor market, and L is total labor employed.

The revolutionary elite, in turn, "asks" the management of the share A^R of capital that is under its effective control for contributions t^R on the basis of the capital value, which is also A^R . The revolutionaries' incomes can thus be written as:

$$Y^R = t^R A^R - w_I, \quad \text{with } t^R A^R \leq \tau^R A^R Y, \quad \text{or } t^R \leq \tau^R Y, \quad (4)$$

where w_I is the compensation rate for insurrection activities, and $\tau^R \in (0, 1)$ is an upper bound of what can maximally be taxed away from the capital owners under the power of the revolutionary elite, determined by formal or, obviously more important, informal institutions. The private firm's profit π is:

$$\pi = F(\delta r^{-1} L, A) - w_L L \quad (5)$$

Utility U of an individual and representative citizen depends on effective net labor income

as well as on the compensations for insurrection activities. We assume an additively separable utility function where regular net effective labor income ¹ adds one-to-one to total utility U . For reasons of simplicity, we ignore utility or disutility from regular work, but not from insurrection activities.

We are particularly interested in both the compensations the citizens receive from the revolutionary elite and in the differences in the way insurrection activities affect their personal utility level. For that matter, we introduce a variable μ that captures the properties of the citizens' relation to both the government and the revolutionary elite by measuring two interacting aspects. One is the degree of grievance against or loyalty to the government; and the other aspect is the degree of credibility of the revolutionary elite with respect to the promised compensations for insurrection activities. The latter is important since there is naturally no formal institutional setting that enforces promised payments by the revolutionary elite (Gates 2002). Hence, a value of $\mu = 0$ indicates either perfect loyalty to the incumbent government or zero credibility of the revolutionary elite's compensation payment promise.

Finally, we assume younger people to have more pronounced attitudes toward both grievance against the government and trust in a revolutionary group than have older people. Moreover, we assume them to be less risk averse. We capture these aspects by weighting the variable μ with the youth-bulge ratio r in order to measure the total effect of grievance and trust on the extent to which compensations for insurrection activities enter the citizens' utility function. Summing up, the citizens maximize the following utility function:

$$U = (1 - A^R t^R) w_L l + ((1 + w_I)^{r\mu} - 1) i. \quad (6)$$

Note that, for $\mu = 0$, we get $(1 + w_I)^{r\mu} - 1 = 0$, so that insurrection activities do not yield any utility to the citizens in such a case. For insurrection activities to generate utility to the citizens, we will need to have both some degree of grievance against the government and some credibility of the revolutionary elite. Given both, the value of a positive μ will be magnified by rises in the youth-bulge ratio r . Note further that (6) implies some risk aversion with respect to the compensation rate w_I , where $r\mu$ gives the degree of risk aversion in the way that higher values of the youth-bulge ratio are associated with lower degrees of risk aversion.

The final element of our model is a simple labor-market imperfection. In particular, we

1. That is gross labor income $w_L l$ minus effective labor income tax, defined by the effective tax rate t^{GA} .

assume a restriction on the side of the labor suppliers in the form of a probability ε of being unemployed. Since each citizen's time devoted to either work or insurrection is normalized to unity and since the only legal way of spending time for income generation is labor on the regular labor market, the official level of full employment on the labor market is simply N . Our relevant labor-market restriction will hence be $L \leq \varepsilon N$. On the individual citizen's level, then, labor supply will be restricted by a demand restriction $l \leq \varepsilon$. Within the framework described above, the firm, the revolutionary elite, and the citizens will maximize their respective objective functions.

The management of the firm takes $F(\delta r^{-1}L, A)$ and w_L as given and maximizes net profits. Given (5), the first-order condition is:

$$w_L^* = \delta r^{-1} F'(L). \quad (7)$$

As we assume competition on both the labor market and the market for insurrection activities, the revolutionary elite maximizes $t^R A^R - w_I I$, subject to $t^R \leq \tau^R Y$. Given (2) and (4), the Kuhn-Tucker conditions² for a maximum of Y^R with respect to L imply:

$$w_I^* = t^R \beta \text{ for } I > 0; \quad w_I^* \geq t^R \beta \text{ for } I = 0; \quad \text{and } t^R = \tau^R Y \text{ for } \lambda > 0 \quad (8)$$

The condition $w_I^* \geq t^R \beta$ for $I = 0$ is of no relevance for both the citizens and the revolutionaries, so that we do not need to consider that case any further. The condition $t^R = \tau^R Y$ for $\lambda > 0$ simply says that the revolutionaries will take whatever the upper bound τ^R allows them whenever the restriction $t^R \leq \tau^R Y$ is binding.

Finally, the citizens maximize (6) subject to their time restriction $l + i \leq 1$ and subject to the labor-market restriction $l \leq \varepsilon$. The Lagrangian, then, is as follows:³

$$\mathfrak{S} = (1 - t^R A^R) w_L l + ((1 + w_I)^{r\mu} - 1) i + \lambda_1 (1 - l - i) + \lambda_2 (\varepsilon - l). \quad (9)$$

If both restrictions in (9) were non-binding, so that $\lambda_1 = \lambda_2 = 0$, then this would imply (by equation (27) in the appendix) that either $w_L = 0$ or $l = 0$ since both are nonnegative. Note, however, that $l = 0$ is ruled out by the *Inada* conditions for the production function, while $w_L = 0$ is ruled out by both the *Inada* conditions and by $\delta r^{-1} > 0$ in combination with the firm's first-order maximization condition (7); this is

2. See the appendix for details.

3. The full set of the *Kuhn-Tucker* conditions is given in the appendix.

at least true as long as the effective tax-rate is not fully confiscatory, i.e. as long as $t^G A^G < 1$. A non-binding time restriction of the citizens, i.e. $l + i < 1$ and hence $\lambda_1 = 0$, is nevertheless possible, but that presupposes the labor-market imperfection to induce a binding constraint, so that $\lambda_2 > 0$. Both restrictions to be non-binding, however, is not possible as long as $t^G A^G < 1$.

Given $\lambda_2 > 0$, however, a non-binding time constraint of the citizens remains possible, but this would, according to equation (28) in the appendix, be associated with either $i = 0$, or with $(1 + w_I)^{r\mu} - 1 = 0$, or both. The implication is this: Should $\lambda_2 > 0$, so that the citizens are rationed in their labor-market supply, and should the marginal utility from insurrection activities $(1 + w_I)^{r\mu} - 1$ be zero, then the citizens are unable to fully employ their disposable time for income generation: On the market for insurrection, they have no incentive for being active because of $(1 + w_I)^{r\mu} - 1 = 0$; and on the labor market, they would want to be active to the full extent of their time devoted for income-generating activities, but they cannot do so because of the positive chance $\varepsilon > 0$ of being unemployed.

Finally, combinations of $\lambda_1 > 0$ with $\lambda_2 = 0$ or with $\lambda_2 > 0$ are also possible. In the former case, we have a cleared labor market, whereas in the latter case all unemployed time left from the labor market will be supplied to the revolutionary elite.

3.2 Equilibria

In what follows, we focus on two cases: In case A, the time restriction is non-binding (i.e. $\lambda_1 = 0$) while the labor-market restriction is binding (i.e. $\lambda_2 > 0$); and in case B, the time restriction is binding (i.e. $\lambda_1 > 0$) while the labor-market restriction may or may not be binding, so that $\lambda_2 > 0$.

Case A: $\lambda_1 = 0$; $\lambda_2 > 0$

From equation (27) and from $\lambda_1 = 0$, we have $l((1 - t^G A^G)w_L - \lambda_2) = 0$. Since the *Inada* conditions of the production function $F(\delta r^{-1}L, A)$ rule out $L = lN = 0$, we have $(1 - t^G A^G)w_L = \lambda_2 > 0$. The non-negativity of $(1 + w_I)^{r\mu} - 1$ in combination with equation (23) in the appendix implies $(1 + w_I)^{r\mu} - 1 = 0$ because of $\lambda_1 = 0$. Substituting the compensation rates w_L and w_I by the marginal productivities from (7) and (8), and considering the labor-market restriction in (30) as well as the assumption of case A that

$\lambda_2 > 0$, the equilibrium in case A is:

$$(1 - t^G A^G) \delta r^{-1} F'(L) - \lambda_2 = (1 + t^R \beta)^{r\mu} = 0; \quad \text{or} \quad (1 - t^G A^G) \delta r^{-1} F'(L) - \lambda_2 > 0 \quad (10)$$

Note that, because of $\lambda_2 > 0$, employment L in equilibrium is lower than N and the wage rate in equilibrium $w_L = \delta r^{-1} F'$ is higher than its market-clearing value. We define the latter as $w_L^e = w_L(L = N)$.

Figure 1 depicts case A. $\delta r^{-1} F'(L)$ represents marginal productivity on the regular labor market and at the same time marginal utility of regular work derived by the citizens. The prevailing net wage rate $w_L > w_L^e$ determines an employment level $L \leq N$, while the market-clearing wage rate w_L^e would lead to full employment if it were not for the labor-market restriction. Because of the latter, however, employment falls short of N , leaving an amount $(1 - \varepsilon)N$ of labor unemployed. However, as long as $(1 + t^R \beta)^{r\mu} = 0$, so that there is no utility that the citizens could generate by insurrection activities, the $(1 - \varepsilon)N$ unemployed labor will not be reallocated to the market for insurrections.

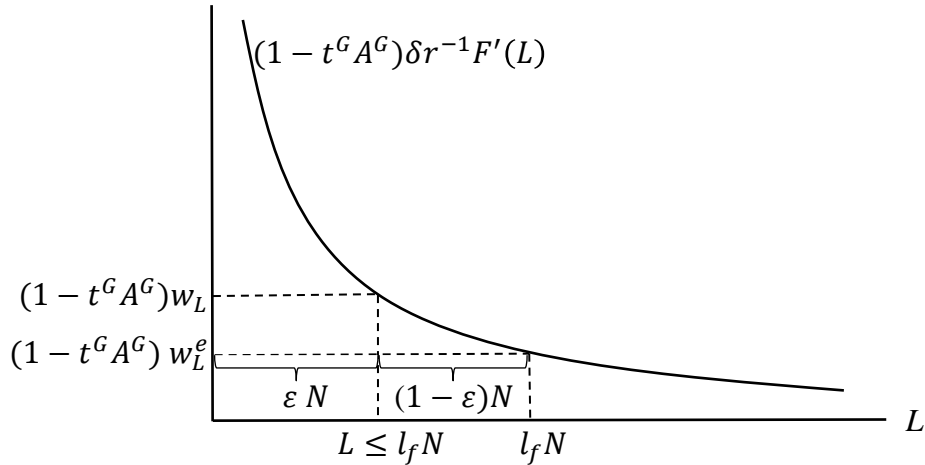


Figure 1: Case A

Case A is a very simple case in which the citizens supply labor only on the regular labor market, either because marginal productivity on the market for insurrections is zero, or the promise of the revolutionary elite to compensate citizens for insurrection activities is not credible, or because the citizens are fully loyal to the government. For the latter cases, $\mu = 0$ applies. However, the labor-market imperfection in combination with the lack of opportunities on the market for insurrection activities deters the citizens from allocating their entire time designated for income generation into either regular work or

insurrection activities. The latter is different in case B.

Case B: $\lambda_1 > 0; \lambda_2 \geq 0$

From (29) in the appendix and from the assumption $\lambda_1 > 0$ in this case, we get $1 = l + i$. Furthermore, from condition (27), $\lambda_1 > 0$, and $l > 0$, we get $(1 - t^G A^G)w_L - \lambda_2 = \lambda_1$. Combining this with condition (23) leads to $(1 - t^G A^G)w_L - \lambda_2 \geq (1 + t^R \beta)^{r\mu} - 1$. After having inserted the marginal productivities from (7) and (8), we can finally consider two subcases B1 and B2. We define subcase B1 as:

$$(1 - t^G A^G)\delta r^{-1} F'(L) - \lambda_2 > (1 + t^R \beta)^{r\mu} - 1 \quad (11)$$

which, according to (28), is associated with $i = 0$,⁴ as in case A. This case, however, requires $\lambda_2 = 0$, since any $\lambda_2 - 1 > 0$ would make the labor-market restriction binding, so that $l < 1$, which would, in combination with $i = 0$, violate $1 = l + i$. The reason is straightforward: If the citizens were restricted in their labor supply to $l < 1$, and if the supply of insurrection activities could yield any additional utility, then the citizens would take that opportunity, given their utility function (6) and given that $(1 + t^R \beta)^{r\mu} - 1 > 0$. But this, in turn, would be incompatible with $1 > l + i$. Hence, $i = 0$ requires the effective net wage to be higher than the utility of insurrection activities even in a case of full employment on the regular labor market. As a result, there is no supply of insurrection activities in case B1 since the utility derived from insurrection activities is simply too low, as compared to the utility derived by regular work. By contrast, we define case B2 as:

$$(1 - t^G A^G)\delta r^{-1} F'(L) - \lambda_2 = (1 + t^R \beta)^{r\mu} - 1 \quad (12)$$

which, according to (28), is associated with $i \geq 0$. Subcase B2 is the basis for cases A and B1 since it gives the condition for an optimal time allocation for all situations where the marginal utility from insurrection activities is sufficiently attractive for the citizens in order to set $i > 0$ and hence for allocating at least some time into these activities. The difference between cases A and B1 is that in case A, any positive marginal utility of insurrection activities is sufficient for allocating time away from regular labor and into insurrection activities because of the labor-market restriction; in case B1, by contrast, there is no labor market restriction and marginal utility of insurrection activities is

4. This is so since $i=0$ whenever $(1 + t^R \beta)^{r\mu} - 1 = 0$, since insurrection would not yield any utility in that case. If, however, $(1 + t^R \beta)^{r\mu} - 1 > 0$, then condition (28) in the appendix directly requires $i = 0$.

strictly below the net effective wage rate even with full employment on the regular labor market, so that it never pays for the citizens to allocate time into insurrection activities. Hence, whenever the labor-market restriction is binding and/or whenever marginal utility of insurrection activities climbs to a level above the net effective wage rate at full employment, insurrection activities become paying to the citizens; and that is what case B2 is about.

There are hence two major driving forces for insurrection activities that both directly stem from the official labor market: One is the effective net wage rate as compared to marginal utility derived from insurrection activities, and the other is a binding labor-market restriction with $\lambda_2 > 0$, and hence unemployment.

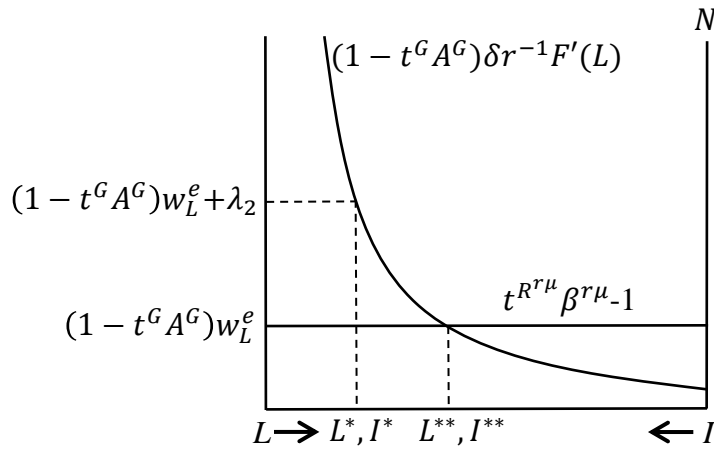


Figure 2: Case B

Case B2 is depicted in figure 2. It shows the marginal utility lines of the citizens for labor-market activity (i.e. $(1 - t^G A^G) \delta r^{-1} F'(L)$) on the one hand and for insurrection activities (i.e. $(1 + t^R \beta)^{r \mu} - 1$) on the other. Insurrection activities i and labor-market activities l always add up to one for each citizen in case B2, so that we have $L + I = N$ on the macro level. If the labor-market restriction were non-binding, that is if $\lambda_2 = 0$, an equilibrium were reached at L^{**}, I^{**} , where the marginal utility levels derived from the respective activities are equal. With a binding labor-market restriction, though, that is with $\lambda_2 > 0$, the activity levels on the respective markets in equilibrium are L^*, I^* with lower regular work and higher insurrection activities as compared to L^{**}, I^{**} , although marginal utility of insurrection activities falls short of the net effective wage rate on the regular labor market. Note that an increase in the youth-bulge rate r shifts the

marginal-utility line of the labor market downwards and the marginal-utility line of the market for insurrections upwards. Hence, an increase in the youth bulge will reallocate time away from work on the regular labor market and into insurrection activities.

Case B2 can be used for directly fixing the central empirical implications of our model. Assume, for simplicity, a *Cobb-Douglas* production function on the labor market with α as the production elasticity. Then the equilibrium condition (12) turns into $(1 - t^G A^G) \delta r^{-1} \frac{\alpha}{L^{1-\alpha}} - \lambda_2 = (1 + t^R \beta)^{r\mu} - 1$ and, because of $N = L + I$, into:

$$I = N - \left(\frac{(1 - t^G A^G) \delta \alpha}{r((1 + t^R \beta)^{r\mu} - 1) + r \lambda_2} \right)^{\frac{1}{1-\alpha}} \quad (13)$$

Generally speaking, the term in brackets on the right-hand side indicates the opportunity costs of working time on the regular labor market in terms of foregone utility from insurrection activities. As these opportunity costs rise, insurrection activities will rise, too.

4 Empirical Evidence

The model presented in the previous section has a number of empirical implications both in general and with respect to the youth bulge. The general implications are:

1. Productivity on the regular labor market, relative to productivity of insurrection activities, is a key factor for the allocation of time between regular labor and insurrection. Consequently, a decrease in either δ or α or both and an increase in $t^R \beta$ tend to raise insurgence activities. Hence it is not low productivity or, for that matter, low wages and poverty as such that drive people into insurrection activities, but it is the ratio of utility between the two income-generating activities labor or insurrection that counts. This is very much in line with now established findings of the economic theory of terrorism according to which terrorist activists are by no means recruited from groups of persons with low income and poor education (Krueger 2008). What rather counts for potential insurrection activities is the relative attractiveness of activities in the official or in the insurrection sector (Collier and Hoeffler 2004; Sageman 2004; Krieger and Meierrieks 2011).

2. Unemployment is another key factor for the allocation of time between insurrection and work on a regular labor market. An increase in the labor-market restriction, as

indicated by λ_2 , raises insurgence activities simply by restricting career options in the official labor market.

3. The degree of oppression exercised by the government, as indicated by the government's effective tax rate $t^G A^G$, lowers the opportunity costs of insurrection activities and hence raises their level. Note that for this effect to materialize, no irrationality with respect to the production of the (perceived) public good associated with insurrections is necessary. Rather, oppression changes the opportunity costs of one activity in terms of the other, and that changes the citizens' allocation of time.

With respect to the youth bulge, we have further implications. Formally, it can easily be shown from (13) that $l'(r) > 0$, so that a rise in the youth-bulge ratio tends to drive people away from the regular labor market into insurrection activities. There are three main effects behind that:

1. The youth-bulge ratio changes the degree of risk aversion with respect to the utility derived from insurrection activities via $r\mu$ in (13).
2. The youth-bulge ratio changes the relation between the utility derived from work on the one hand and from insurrection activities on the other. This is given by the first r below the fraction bar in (13).
3. Finally, the youth-bulge ratio directly interacts with the labor-market restriction, as can be seen by the term $r\lambda_2$ in (13). Hence, a rise in the youth bulge, in combination with poor perspectives on the labor market, once again lowers the opportunity costs of insurrection activities.

The labor-market restriction appears to be of particular importance. It suggests that it is not the youth bulge as such that magnifies the threat of insurrection activities. It is rather the interaction of a high share of the youth cohort—and in societies with a traditionalist division of sexes, the share of young male people—in percent of the rest of the economically active population, with poor perspectives on the labor market. If the official labor market does not offer opportunities for young (male) citizens, and if there are non-official groups in search of people that support them in their extra-constitutional activities, then it is not particularly astonishing when young people allocate their time budget accordingly. Our empirical implications are thus not that the youth bulge as such counts for insurrection activities. What rather counts is the youth bulge in interaction with the underlying politico-economic structure, in particular the labor-market conditions.

4.1 Data and Empirical Strategy

In the empirical analysis that follows we focus on the interaction between youth bulges and the labor-market constraint for the propensity of insurrection activities. To this end, we develop an empirical framework that aims at explaining the likelihood of a country to experience an insurrection onset taking into account the demographic structure as well as the official labor-market prospects of that country. In the baseline model, we include all countries with more than 500,000 inhabitants for the period 1992 to 2012 regardless of the political system or the level of development (though we control for both aspects).

Following existing studies on civil war (Fearon and Laitin 2003; Collier and Hoeffler 2004; Urdal 2006), data on internal conflicts are drawn from the Uppsala/PRIO armed conflict data set (Themnér and Wallensteen 2011). Accordingly, our dependent variable refers to the outbreak of a “contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths per year” (Gleditsch et al. 2002)⁵. The binary variable is coded one in that year where the threshold of 25 battle-related deaths is reached for the first time during the conflict episode, given that there is no other conflict ongoing in the previous or current year⁶. All country-years that do not experience any type of conflict activity are coded zero, while country-years of ongoing conflict or with overlapping conflicts are coded missing. The chosen procedure controls for potential endogeneity problems that might stem from feedback effects of ongoing insurrection activities on the economic and demographic variables included in the model.

With regard to the youth-bulge ratio we define the relative youth cohort size (*RYCS*) by calculating the ratio of the male youth cohort (men aged between 15 and 24) to the total working population (men and women aged between 15 and 64). This approach

5. The Uppsala/PRIO data set differentiates between four types of conflict: internal armed conflict, internationalized armed conflict (intervention or support from abroad), extrasystemic or colonial conflicts and interstate conflicts (see Themnér and Wallensteen 2011). Since our approach focuses on the determinants of *internal* violent conflicts, we only include internal as well as internationalized armed conflicts. While our theoretical predictions could be applied to insurgencies against colonial powers as well, we exclude these conflicts due to data problems and consider only sovereign country-years.

6. Even though the Uppsala/PRIO project sets a relatively low violence threshold of 25 battle-related deaths per year we argue that this threshold is sufficiently high in order to capture only insurrection onsets that are the result of a deliberate organization of activities aimed at changing political power positions rather than spontaneous outbursts of political demonstrations and riots (see Gleditsch et al. (2002) and Sambanis (2004) for a discussion of different definitions and thresholds of internal conflicts).

appears justified on theoretical grounds because young men entering the labor market compete with the total working population for available job positions. From an empirical perspective we acknowledge that ratios including total population might be distorted due to changes in fertility rates as argued by Urdal (2004, 2006). Population data is taken from the UN World Population Prospects (UN WPP 2014).

In order to investigate the interaction between the youth-bulge ratio and the labor-market constraint, we rely on employment data as provided by the World Bank (World Development Indicators (WDI) 2014). In particular, we focus on the male youth unemployment rate defined as the number of unemployed males aged between 15 and 24 relative to the total male working population of that age group. To our knowledge, this measure is the best available proxy for the (institutional) labor-market constraint of the youth. We compute annual *changes* in unemployment rates as our indicator for a binding labor-market constraint. We rely on changes in, rather than levels of, unemployment since we aim to explain violent insurrection outbreaks rather than ongoing conflicts. However, in order to observe the transition from a conflict-free situation to an insurrection onset at the aggregate country level, there must be some triggering event that changes the initial labor-market equilibrium in such a way that a latent conflict potential is transformed into an effective insurrection movement (Acemoglu and Robinson 2001; Apolte 2012). According to our model, an increase in unemployment will induce individuals to reallocate their disposable time away from official work and towards insurrection activities. At the aggregate level, the increase in unemployment (translating into a larger labor market constraint λ_2) will shift the labor-market equilibrium as indicated in figure 2. Thus, changes in the unemployment rate translate into changes of the allocation of labor supply between labor markets and insurrection activities on the level of the society as a whole, thereby triggering the occurrence of violent conflict onsets.

In contrast, with regard to youth bulges we include the levels of the relative youth cohort size. As depicted in figure 2, youth bulges influence the position of the marginal-utility lines of both, the labor market and insurrection activities. Since the demographic structure changes slowly over time, we should assume that youth bulges influence the general disposition of a society to supply a larger share of disposable time to insurrection activities. Hence, the relative values of the youth cohort size appear to be the appropriate measure of demographic pressures.

Based on these considerations, we specify our logistic regression model as follows:

$$p(\text{insurstart}_{it} = 1|\mathbf{X}) = \Lambda(\beta_0 + \beta_1 RYCS_{it-1} + \beta_2 \Delta UE_{it-1} + \beta_3 RYCS_{it-1} * \Delta UE_{it-1} + \mathbf{X}_{it-1} \beta_x + \epsilon_{it}) \quad (14)$$

where Λ is the standard logistic cumulative distribution function $\Lambda(\mathbf{X}\boldsymbol{\beta}) = \frac{\exp(\mathbf{X}\boldsymbol{\beta})}{[1+\exp(\mathbf{X}\boldsymbol{\beta})]}$.

Our explanatory variables of interest are the relative youth-cohort size (*RYCS*), which we refer to as the *youth-bulge ratio*, changes in the (male youth) unemployment rate as reflected by ΔUE and the interaction of these two variables⁷. Following the extensive literature on civil wars, we include as controls four variables that have been identified as robust determinants of internal armed conflicts: Total population, income per capita, political instability and war-prone neighbors (see Hegre and Sambanis (2006) and Blattmann and Miguel (2010) for a review).

The most robustly established link is presumably the correlation of civil conflict with economic development (Blattman and Miguel 2010). For this reason, we include the natural log of GDP per capita from the WDI as a proxy for the level of development in our model. To measure political instability we follow Fearon and Laitin (2003). *Anocracy* takes the value one for all country-years for which the composite polity2-score of the Polity IV Project lies between -5 and +5 (Mashall, Gurr, and Jagers 2014). The theoretical rationale is that while both, consolidated democracies and strong autocracies, have the capacity to ensure a high level of political stability that renders internal unrest less likely, political systems in the intermediate range of the polity-scale, so-called “anocracies”, should be expected to face higher levels of internal instability since neither democratic institutions nor autocratic suppression are fully effective. In addition, we control for possible contagion effects and geographic diffusion of insurrections by accounting for the presence of violent internal conflicts in neighboring countries in a given year.

Obviously, the reaction of individuals to changes in unemployment is likely to be different at different levels of the overall level of unemployment. Therefore, we include levels of the male youth unemployment rate in addition to its variation. We also take into account the path dependency of civil conflicts: *proximity to conflict* measures the number of years without violent activity that have passed since the last conflict, which is discounted by

7. We will denote changes in total unemployment rates by ΔUE_{tot} and changes in male youth unemployment rates by ΔUE_{ym}

the factor four⁸.

Finally, the vector X may include further control variables in some regressions that are likely to be associated with both, insurrection onsets as well as our demographic and economic covariates. Except for time-invariant regressors, all explanatory variables are lagged by one year in order to account for potential reversed causality. In most specifications, we also include country- and year-fixed-effects to control for unobserved heterogeneity.

Our baseline model includes 151 countries that have experienced 82 insurrection onsets according to the above specified criteria (see table 1, model 1). This corresponds to 3% of all observations. The sample covers the period 1992 to 2012 and is constraint by the availability of unemployment data. Summary statistics and correlations are given in the appendix (see tables A.1 and A.2).

4.2 Results

First, we examine the cross-country evidence of the determinants of insurrection onsets in our pooled logit model (see column 1, table 1). The results for our sample are consistent with the findings in the literature (Hegre and Sambanis 2006; Urdal 2006; Blattman and Miguel 2010). A larger total population increases the likelihood of insurrection activities. A large population size might be associated with ethnic and religious heterogeneity that could spur grievances among the members of (discriminated) minorities (Collier and Hoeffler 2004). In addition, a large population (density) might be associated with institutional crowding, especially when urbanization takes place. A higher per capita income reduces the propensity of violent conflict as expected. Though the concrete interpretation of the role of economic development for insurrections varies, there is a consensus in the literature emphasizing that higher income levels reduce the viability of rebellion by raising the opportunity costs for activists and/or improving state capacity to successfully prevent insurgencies (Fearon and Laitin 2003; Collier and Hoeffler 2004). While the correlation of civil conflict with both low economic development and negative income shocks is well established in the literature (Miguel, Satyanath, and Sergenti 2004; Blattman and Miguel 2010), we argue here that for young people it is not (only)

8. The formula is $\exp[(-\text{years in peace})/4]$ following Urdal (2006) and Hegre et al. (2001). We assume that the risk of an insurrection outbreak is high immediately after a conflict episode, but diminishes as time passes and is halved approximately every 3 years. Regressions with alternative discount rates for *proximity to conflict* do not change the results.

the overall situation of the economy that drives them towards insurrection groups but the relative position of their youth cohort in the economy and their access to income opportunities that is ultimately restricted by formal and informal institutions. With regard to the impact of political instability on insurrections the results suggest that anocracies are confronted with a higher risk of insurrection activities, presumably due to a lack of institutional capacities to either efficiently suppress political unrest or provide non-violent channels of political participation like free elections. We also find that proximity to conflict is an important determinant of the propensity of an insurrection onset. The positive and significant coefficient suggests that conflict-specific capital depreciates over time thereby reducing the opportunity for insurrection activities (Fearon and Laitin 2003). In contrast, we do not find an effect of neighboring countries at war in our sample.

Finally, when it comes to our central explanatory variable of interest, the youth-bulge ratio, we find that larger youth cohorts indeed change the relation between utility derived from work and from insurrection activities. As a result, (young male) people reallocate time away from the official labor market toward insurrection activities. On the aggregate country-level, this effect materializes into a higher risk of internal armed conflict onsets as reflected by the positive and significant coefficient, confirming previous studies of Urdal (2004, 2006).

In column (2) and (3) we stepwise include changes in male youth unemployment as well the interaction of the youth-bulge ratio and the unemployment measure. The results confirm our theoretical expectation as the interaction term enters the regression with a positive significant coefficient. Thus, the conflict potential of a youth bulge is aggravated by negative labor-market shocks (i.e. rising unemployment). On the other hand, the coefficient on changes in youth male unemployment is significant only when the interaction term is included in column (3). The negative parameter estimate of the main effect is not intuitive at the first side. However, the coefficient estimates the impact of a change in male youth unemployment when the youth-bulge ratio is zero, which is not meaningful from an empirical perspective. Interestingly, we find that changes in youth male unemployment increase the likelihood of a conflict even when we control for the absolute level of the unemployment rate. Hence, conditional on the overall level of unemployment, negative labor-market shocks always increase the risk of insurrections.

In column (4) and (5) of table 1, we control for unobserved cross-country heterogeneity by applying conditional (fixed-effects) logit estimation techniques and analyze the

Table 1: Baseline Results

Dep. variable: Insurrection onset	Pooled logit model		Fixed-effects logit model		OLS model		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Youth bulge ratio	0.104* (0.059)	0.106* (0.057)	0.120** (0.056)	0.285 (0.215)	0.328 (0.227)	0.005 (0.004)	0.004 (0.004)
Change in male youth unemployment		-0.018 (0.076)	-0.658*** (0.124)	0.004 (0.095)	-0.823** (0.337)	-0.000 (0.001)	-0.009* (0.005)
Youth bulge ratio x change in male youth unemployment			0.040*** (0.008)		0.054*** (0.018)		0.001* (0.000)
Male youth unemployment rate		0.016 (0.012)	0.011 (0.012)	-0.010 (0.071)	-0.040 (0.069)	0.000 (0.001)	0.000 (0.001)
Total population (ln)	0.360*** (0.073)	0.381*** (0.074)	0.392*** (0.073)	-2.015 (1.385)	-2.185 (1.433)	-0.075* (0.041)	-0.076* (0.041)
Per capita income (ln)	-0.244* (0.134)	-0.281* (0.146)	-0.279* (0.149)	1.185 (0.745)	1.338* (0.782)	0.021 (0.017)	0.021 (0.017)
Anocracy	0.603** (0.264)	0.606** (0.261)	0.619** (0.261)	0.742* (0.429)	0.669 (0.440)	0.044** (0.021)	0.044** (0.021)
Neighbor at war	0.062 (0.306)	0.076 (0.297)	0.075 (0.308)	-0.116 (0.444)	-0.289 (0.441)	0.004 (0.010)	0.003 (0.010)
Proximity to conflict	1.510*** (0.301)	1.510*** (0.300)	1.526*** (0.306)	-2.038*** (0.525)	-2.014*** (0.538)	-0.138*** (0.025)	-0.138*** (0.025)
Country FE	No	No	No	Yes	Yes	Yes	Yes
No. of conflicts	82	82	82	82	82	82	82
No. of countries	151	151	151	45	45	151	151
Observations	2,658	2,658	2,658	645	645	2,658	2,658
(Pseudo) R^2	0.150	0.152	0.165	0.079	0.108	0.026	0.027

Notes: Robust standard errors clustered at the country-level are reported in parentheses. All time-varying explanatory variables are lagged by one year. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

within-country variation in our sample. The coefficients of our variables of interest are comparable to the pooled logit model, even though the main effect of the relative youth cohort size is no longer significant. Again, the positive and significant interaction term suggests that neither youth bulges nor high youth unemployment *per se* are sufficient to explain internal conflicts. Rather, demographic pressures translate into an increased likelihood of conflict only in the presence of negative labor-market shocks. These results are also supported when we repeat the analysis with changes in the *total* unemployment rate as reported in table A.3 in the appendix. The result for the interaction of the youth-bulge ratio with changes in male youth unemployment is notably robust across specifications (see also table 2 and 3). In contrast, some of the coefficients of the controls lose significance or change sign upon the inclusion of country-fixed effects. In particular, income per capita is no robust determinant of conflict risk in our sample when controlling for the labor-market situation of a country. Yet, since most variation in these variables (as well as in the youth-bulge measure) stems from the cross-section rather than the time-dimension, it is not surprising that significance of these variables vanishes in the within-estimation. This might also explain the rather ambiguous results for population size, income levels and proximity to conflict.

Since quantitative interpretation of interaction effects in logit models is problematic, we re-estimate specification (4) and (5) in a linear probability model (see column (6) and (7) in table 1). The positive and significant coefficient of the interaction effect again supports the idea that the effect of changes in the labor-market constraint depends on the demographic structure of the society. More precisely, evaluated at the average youth-bulge ratio of 15.07%, a marginal larger increase in the male youth unemployment rate raises the propensity of an insurrection onset by 0.006. At the sample mean of conflict risk (0.031), this means that a one standard deviation larger increase in the male youth unemployment rate of about 3% aggravates the likelihood of an insurrection onset by 1.8 percentage points, or 58%. This is a substantial impact on conflict risk at a youth-bulge ratio that corresponds to the value for China in 1992 or Morocco in 2009. Evaluated at the 75th percentile of *RYCS* (18.57%) - which corresponds for instance to the value of Ethiopia in 1993, Ghana in 1999 and Nigeria in 2008 - a one standard deviation larger increase in the male youth unemployment rate aggravates the risk of an insurrection onset even by 2.85 percentage points, or 92% of the average probability of conflict, whereas for lower levels of the youth-bulge ratio (e.g. at the 25th percentile or 11.83%, which corresponds to Hungary in 1994, Bulgaria in 2004, or Cyprus in 2011), the respective

impact is much smaller (0.84 percentage points , or 27%)⁹ .

Overall, the results confirm our theoretical predictions: It is not the demographic structure as such that supports insurrection outbreaks but whether large youth cohorts are confronted with a decline in income prospects in the official labor market that aggravate existing institutional bottlenecks and render alternative activities like insurrections more attractive. In other words, an increase in unemployment will hit young males disproportionately, driving them toward insurrection activities and triggering the outbreak of internal political violence.

4.3 Sensitivity of Results

Though the reasoning of institutional bottlenecks imposed by large youth cohorts is present in the literature, only few studies have attempted to integrate labor-market indicators directly in an empirical framework aimed at testing the demography-insurrection nexus (e.g. Campante and Chor 2012). One reason apparently concerns data constraints because estimates for employment indicators are available only since 1992 at a broad cross-country level. A second concern relates to the quality of unemployment data in developing countries. Official statistics there tend to underestimate unemployment in countries with large agricultural and informal sectors where the labor force is largely self-employed and underemployment is prevalent (Fields 2012). These problems are, however, of limited relevance for our approach since we use annual changes rather than levels of unemployment rates. A third concern regards potential endogeneity stemming from identification and measurement problems. Issues of causal direction and omitted variables are a general concern in cross-country studies of civil conflicts since socio-economic variables and the wide-ranging consequences of violent conflicts are likely to influence each other in a continuous and complex manner. Even though there are some advances in the search for exogeneity like the application of instrumental variable approaches (Miguel, Satyanath, and Sergenti 2004; Brueckner and Ciccone 2011), these have their own drawbacks regarding the concrete channels of transmission and are ap-

9. The partial effect for ΔUE_{ym} is calculated with the parameter estimate of the main effect (-0.009) and the interaction effect (0.001) (see table 1). The standard deviation of ΔUE_{ym} is 2.973 and the sample mean of $RYCS$ is 15.07 (see table A.1). Thus, an increase in ΔUE_{ym} by one standard deviation raises the probability of a conflict onset by 0.018 or 1.8 percentage points ($=(-0.009 + 0.001*15.07)*2.973$). Evaluated at the sample mean of $insurstart$ ($=0.031$), this corresponds to an increase in the probability of insurrection onset by 58.21%. The partial effects of ΔUE_{ym} at the 25th and 75th percentile of $RYCS$ are calculated analogously.

plicable only to a limited extent in our case (La Porta, Lopez-De Silanes, and Shleifer 2008; Burke, Hsiang, and Miguel 2014). We will try to respond to some of these concerns below by applying various robustness checks to our model. Yet, we emphasize that future research is necessary to identify the exact channels of causality between institutional bottlenecks, demographic pressures and political violence if we want to interpret any results on the determinants of civil conflict as more than mere correlations.

In table 2 we show that the relation between youth bulges, unemployment and insurrections is robust to different subsets of countries. In column (1), we test our model for a subsample of autocratic countries, suspecting that non-democratic regimes might impose different institutional constraints to individuals than democratic systems. However, the results support the idea that the interaction of the relative youth cohort size and changes in the labor-market prospects of this cohort determines the violent potential of a youth bulge, irrespective of the political system. The same conclusion applies when we include only developing countries or add region dummies in our analysis as depicted in column (2) and (3) of table 2. Again, the coefficient of the interaction term is positive and significant across specifications and comparable to our baseline estimations.

In column (4) and (5), we examine whether our results change when applying alternative definitions of our dependent variable, *insurrection onset*. Sambanis (2004) discusses several limitations regarding the coding rules of armed conflicts applied in the PRIO data set such as the battle-related death-threshold, finding the precise start and end date of a conflict, and problems related to the distinction between intrastate, interstate and extrastate conflicts. We therefore test both, a more and a less restrictive definition of internal armed conflict onset. In column (4), we include only conflicts that cause more than 1,000 battle-related deaths and disregard all minor armed conflicts. In column (5) we relax the condition that a new insurrection onset must be preceded by at least one year of conflict inactivity and include all conflict onsets that are reported in the PRIO data. The coefficients in column (4) are not significant, but display the expected signs and magnitudes. Applying a more strict definition of insurrection onsets leaves only 36 conflict onsets in our sample which may explain the lack of significance. In contrast, the coefficients are highly significant and similar to our baseline results when we include all onsets reported by PRIO in column (5). Overall, the results appear robust irrespective of the definition chosen.

Regarding potential problems of reversed causality, we account for the fact that internal armed conflicts will influence both, economic as well as demographic factors due to eco-

Table 2: Sensitivity Analysis I

Dependent Variable	Autocracy subsample	Developing subsample	Region dummies	Alternative definition of civil conflict		“False” specification
	Baseline: Conflict onset if there is no ongoing conflict	(1)	(2)	(3)	(4)	(5)
Youth bulge ratio	-0.305 (0.365)	0.354 (0.241)	0.157** (0.077)	0.189 (0.449)	0.154 (0.160)	0.322 (0.254)
Change in male youth unemployment	-1.033** (0.431)	-0.810** (0.362)	-0.636*** (0.121)	-0.258 (0.396)	-0.727*** (0.241)	-0.744** (0.349)
Youth bulge ratio x change in male youth unemployment	0.059** (0.024)	0.059*** (0.020)	0.039*** (0.008)	0.018 (0.023)	0.050*** (0.014)	0.050*** (0.019)
Youth bulge ratio x change in male youth unemployment in t+1						-0.019 (0.313)
Country FE	Yes	Yes	No	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes	Yes	Yes
No. of conflicts	54	81	82	36	120	78
No. of countries	34	45	151	23	51	45
Observations	353	645	2,658	259	987	610
Pseudo R ²	0.276	0.143	0.191	0.278	0.120	0.150

Notes: All columns are logit estimations with logit coefficients reported. Robust standard errors clustered at the country-level in parentheses. All regressions include as additional controls: *Male youth unemployment rate*, *proximity to conflict*, *total population*, *income p. c.*, *anocracy and neighbor at war* (coefficients not reported). All regressors lagged by one period. In column (1) only countries with a polity2-score of 5 or lower are included. In column (2) only developing countries are included as defined by the UN. In column (3) region dummies are added for Eastern Europe and the former Soviet Union, Asia, North Africa and the Middle East, Sub-Saharan Africa, and Latin America. “Western” (Western Europe, North America and Australia) is the base category (coefficients not reported). In column (4) only conflict onsets are considered with at least 1,000 battle-related deaths per year (given that there is no ongoing conflict). In column (5) all conflict onsets are included that are reported in the PRIO dataset, irrespective whether there was another ongoing conflict in the considered year. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

conomic devastation, deaths and refugees, by omitting all country-years of ongoing conflict episodes in our main definition of insurrection onset and lag the explanatory variables by one year. In addition, in column (7) we include future values of our interaction term. If causality indeed runs from unemployment and demography to insurrections and not the other way around, future values of these variables should have no explanatory power for conflict onsets in the current period. This idea is given support by the insignificant coefficient in column (7), whereas the lagged interaction term remains highly significant and positive.

In table 3, we inspect the possibility of omitted variables and measurement error more closely. To this end, we include alternative measures for economic development (proxied by infant mortality) and political instability (measured as the absolute polity2-score and its squared term) in column (1) of table 3. Infant mortality as well as the squared term of the polity2-score are significant supporting the idea that more developed and more democratic countries face a lower risk of violent conflict outbreaks. In column (2) we add further potential determinants of civil conflict, namely military expenditure, secondary education and GDP per capita growth. However, the parameter estimates of these variables are not significant. Yet, given the importance of economic growth in the literature on civil conflicts we still suspect that the conditional effect of a youth bulge is driven by more general economic downturns that impact on the opportunity costs of insurrections through other channels such as relative productivity or excessive taxation. Therefore, we interact the relative youth cohort size with the per capita income growth rate in column (3) and (4) of table 3 to check whether our unemployment measure is just a proxy for more general economic trends. However, when substituting GDP per capita growth for unemployment changes, neither economic growth nor the interaction term are statistically significant, whereas the youth-bulge ratio now is. This implies that *conditional* on the more general situation of the economy, negative youth-specific labor-market shocks in combination with demographic pressures have a distinct effect on the propensity of conflict onsets.

Yet, it remains to be emphasized that even though our results appear robust across specifications and estimation methods, the obstacle of endogeneity cannot ultimately be ruled out. In particular, using lagged explanatory variables does not eliminate the question of causality, since the anticipation of future conflict may affect current investment behavior and thus can have an impact on economic variables such as economic growth and unemployment. To overcome these drawbacks in research on civil conflict,

Table 3: Sensitivity Analysis II

Dep. variable: Insurrection onset	Economic growth * RYCS			Legal origin * RYCS		
	(1)	(2)	(3)	(4)	(5)	(6)
Youth bulge ratio	0.116 (0.257)	0.519 (0.327)	0.385* (0.219)	0.385* (0.219)	0.186** (0.079)	-0.157 (0.115)
Change in male youth unemployment	-0.621*** (0.226)	-2.177*** (0.741)				
Youth bulge ratio x change in male youth unemployment	0.041*** (0.015)	0.126*** (0.046)				
Economic growth rate			0.709 (1.534)	-0.414 (20.746)		
Youth bulge ratio x economic growth				0.060 (1.112)		
Civil law					0.717** (0.337)	-6.532*** (1.693)
Youth bulge ratio x civil law						0.407*** (0.098)
Infant mortality rate	0.021** (0.010)					
Regime type	0.000 (0.056)					
Regime type squared	-0.030*** (0.010)					
Military expenditure		0.033 (0.109)				
Secondary education		-0.060 (0.069)				
Country FE	Yes	Yes	Yes	Yes	Yes	No
No. of conflicts	85	46	84	84	88	88
No. of countries	48	32	47	47	148	148
Observations	703	323	704	704	2,715	2,715
Pseudo R^2	0.123	0.326	0.110	0.110	0.171	0.188

Notes: All columns are logit estimations with logit coefficients reported. Robust standard errors clustered at the country-level in parentheses. Year fixed effects and additional controls as in table 2 always included. In column (5) and (6) region dummies are included. *Secondary education* is the ratio of total secondary school enrollment to the population of the respective age group. *Military expenditure* is measured as % of GDP. Both taken from WDI (2014). Civil law is an indicator variable that takes the value one if the legal traditions of a country originate from French or German civil law. British common law is the base category. Countries with Scandinavian legal origin are excluded in column (5) and (6). Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

several papers seek to isolate exogenous variation in socioeconomic variables. For income shocks, Miguel et al. (2004) propose variation in rainfall data as a plausible instrument for economies that rely on agricultural production and lag extensive irrigation systems. Botero et al. (2004) argue that the legal origin of a country can explain the level of labor regulations and this in turn determines unemployment levels. While this could be a promising vein to isolate exogenous variation in unemployment rates that is driven by institutional constraints, the application of instrumental variables is associated with severe problems as well. La Porta, Lopez-De Silanes, and Shleifer (2008) do not recommend the use of legal origins as an instrumental variable for a single institution since these traditions influence a broad range of rules and regulations. Applied to our study this means that even if legal traditions influence conflict risk through labor regulation and unemployment, it is not likely that this is the only channel of influence. Rather, legal traditions have been shown to influence financial development, property rights protection and political outcomes as well (La Porta et al. 1998, 1999; Beck, Demirgüç-Kunt, and Levine 2003). In this case, the key identifying assumption in the instrumental variable approach, namely that legal origin affects conflict only through unemployment, is hard to justify (see also Burke et al. (2014) for a discussion).

For these reasons, we do not rely on instrumental variables techniques. However, legal traditions might still yield valuable information for the transmission channels through which demographic pressures change the likelihood of civil conflict. In particular, since legal origins have a persistent impact on the size of government ownership, the scope of regulatory devices and thus the overall institutional setting, they can indicate the extent to which individuals are constraint in their access to private and public goods. Thus, in a broader sense differences in legal traditions capture what we understand as institutional constraints to the access to markets entailing income opportunities such as labor and credit markets, participation in political competition and so on. In column (5) and (6) of table 3 we therefore substitute legal origins for changes in unemployment and test the interaction with the youth-bulge ratio. We compare civil law traditions to British common law that is defined as the base category. La Porta et al. summarize existing research on the consequences of legal origins on the various institutional dimensions as follows: “In all these spheres, civil law is associated with a heavier hand of government ownership and regulation than common law [...] with adverse impacts on markets, such as greater corruption, larger unofficial economy, and higher unemployment” (La Porta, Lopez-De Silanes, and Shleifer 2008, 286). Hence, we would expect that civil law tradition, through its negative effect on economic outcomes, increases the risk of

insurrections. This idea is supported in column (5) of table 3. Civil legal origin indeed increases the likelihood of a conflict onset. In column (6) we find that the results for the interaction with the relative youth cohort size are very similar to our baseline results for male youth unemployment: An increase in the youth-bulge ratio aggravates the risk of violent conflict onsets more in countries with a civil law tradition. Though these results must be treated with caution due to the presumably complex interplay of legal rules and civil conflict as well as problems of sample bias from the unequal distribution of legal traditions across countries, the findings support our theoretical implications that the violent potential of a large youth cohort depends on the overall institutional setting of the country and its institutional capacity to integrate an abundant youth successfully into the (official) society.

5 Conclusions

This paper provides a theoretical and empirical analysis of how the interplay of a youth bulge and basic politico-economic institutional structures impact on the risk of insurrection activities. We have developed a theoretical model of insurrection markets and integrated the relative youth cohort size as a measure of the youth bulge. Moreover, we have tested the empirical implications of our theory by help of a cross-country panel data set. Our empirical model confirms the hypothesized causality between a binding labor-market constraint in interaction with a youth bulge on the one hand and the probability of insurrection onsets at the aggregate country level on the other.

Our central finding implies that whether or not the phenomenon of a youth bulge actually translates into outbreaks of political violence at an aggregate scale depends on the surrounding politico-economic institutions:

- If the economic and political institutions do not have closed-shop character, then there is nothing to gain from insurrection activities on the side of the revolutionary elite R which has been modeled as violent political entrepreneurs in this paper. In such a case the insurrection market does not supply opportunities for insurrection activists.
- If the official labor market offers comparatively attractive career opportunities and if an education system prepares young people for these career opportunities, "employment" offers by insurrection entrepreneurs, even as far as they exist, loose

relative attractiveness from the point of view of the youth-bulge cohort.

Our findings refine the youth-bulge discussion insofar as they relate the simple demographic phenomenon with the underlying politico-economic institutional setting. In doing so they do not only point to the potential of political violence that the phenomenon of a youth bulge implies but isolate the institutional conditions under which such an empirical phenomenon may actually translate into political violence and under which this is not to be expected.

While our empirical investigation has focused on unemployment as an indicator for a binding labor-market constraint, further determinants of the politico-economic structure should also be tested. These may range from education opportunities and indicators of institutional barriers to entry into economic and political markets to the extent of informal sector employment. Indicators of political competition, fiscal oppression, red tape and the distribution of wealth may also be related to insurrection onsets in interaction with a youth bulge.

When it comes to further theoretical work, it may be desirable to integrate commitment problems of the insurrection entrepreneurs, that is with the revolutionary elite, vis à vis the potential insurrection activists they hire. Different from employers on official labor markets, insurrection entrepreneurs do not have access to legal systems that serve as commitment devices for the mutual liabilities that follow from their contracts (Gates, 2002). We have taken account for that problem only by the exogenous variable μ that also measures the degree of loyalty to the government. However, commitment problems form the way labor-market contracts are shaped and enforced, and they restrict the types of activities on labor markets. This may be taken into account for a more flexible model setup in further theoretical work.

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A Appendix

The revolutionary elite's maximization problem

Considering (4) in combination with (2), the maximization problem of the revolutionary elite is:

$$\mathfrak{S} = t^R \beta I - w_I I + \lambda(\tau^R Y - t^R).$$

The *Kuhn-Tucker* conditions are then:

$$\mathfrak{S}_I = t^R \beta - w_I \leq 0; \quad (15)$$

$$\mathfrak{S}_{t^R} = \beta I - \lambda \leq 0; \quad (16)$$

$$\mathfrak{S}_\lambda = \tau^R Y - t^R \geq 0; \quad (17)$$

$$I, t^R, \lambda \geq 0; \quad (18)$$

$$I \mathfrak{S}_I = I(t^R \beta - w_I) = 0; \quad (19)$$

$$t^R \mathfrak{S}_{t^R} = t^R(\beta I - \lambda) = 0; \quad (20)$$

$$\lambda \mathfrak{S}_\lambda = \lambda(\tau^R Y - t^R) = 0. \quad (21)$$

The citizens' maximization problem

Given the Lagrangian in equation (9), the Kuhn-Tucker conditions of the citizens' maximization problem are:

$$\mathfrak{S}_l = (1 - t^G A^G) w_L - \lambda_1 - \lambda_2 \leq 0; \quad (22)$$

$$\mathfrak{S}_i = ((1 + w_I)^{r^\mu} - 1) - \lambda_1 \leq 0; \quad (23)$$

$$\mathfrak{S}_{\lambda_1} = 1 - l - i \geq 0; \quad (24)$$

$$\mathfrak{S}_{\lambda_2} = \varepsilon - l \geq 0; \quad (25)$$

$$l > 0; i, \lambda_1, \lambda_2 \geq 0; \quad (26)$$

$$l \mathfrak{S}_l = l((1 - t^G A^G) w_L - \lambda_1 - \lambda_2) = 0; \quad (27)$$

$$i \mathfrak{S}_i = i((1 + w_I)^{r^\mu} - 1) - \lambda_1 = 0; \quad (28)$$

$$\lambda_1 \mathfrak{S}_{\lambda_1} = \lambda_1(1 - l - i) = 0; \quad (29)$$

$$\lambda_2 \mathfrak{S}_{\lambda_2} = \lambda_2(\varepsilon - l) = 0; \quad \text{hence : } \lambda_2 \mathfrak{S}_{\lambda_2} = \lambda_2(\varepsilon N - N) = 0. \quad (30)$$

Table A.1: Summary Statistics

Variable	Full sample					Insurrection Countries				
	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
Insurrection onset	2658	0.031	0.173	0	1	645	0.126	0.332	0	1
Civil wars	2239	0.017	0.128	0	1	259	0.139	0.347	0	1
All onsets	3061	0.039	0.194	0	1	987	0.122	0.327	0	1
Youth bulge ratio	2658	15.07	3.775	7.575	22.723	645	16.994	3.066	9.413	21.703
Change in male youth unemployment	2658	0.061	2.973	-19.1	26.7	645	0.049	2.049	-10	18.2
Change in total unemployment rate	2658	-0.02	1.505	-12.4	18.2	645	-0.01	1.223	-6.9	11.6
Male youth unemployment rate	2658	16.745	10.922	0.2	70.2	645	16.598	12.33	0.9	70.2
Total unemployment rate	2658	9.034	6.481	0.3	39.3	645	9.822	8.134	0.6	39.3
Proximity to conflict	2658	0.123	0.253	0	1	645	0.386	0.351	0	1
Total population (ln)	2658	9.017	1.466	5.799	14.129	645	9.614	1.692	6.071	14.129
Anocracy	2658	0.266	0.442	0	1	645	0.412	0.493	0	1
Neighbor at war	2658	0.631	0.483	0	1	645	0.753	0.431	0	1
Per capita income (ln)	2754	7.975	1.63	3.913	11.382	645	6.836	1.267	3.913	10.647
Infant mortality rate	2722	38.419	34.511	1.887	244.439	645	62.923	37.239	4.415	244.439
Regime type	2722	3.318	6.735	-10	10	644	1.208	5.974	-9	10
Military expenditure (% of GDP)	1471	2.226	2.366	0.149	39.615	510	2.79	3.89	.179	39.615
Secondary education	1471	77.529	31.141	5.165	160.619	424	54.144	30.807	6.157	112.622
Legal Origin	2715	0.73	0.444	0	1	810	0.76	0.427	0	1

Table A.2: Correlation Matrix for Important Variables

v	Variables	v1	v2	v3	v4	v5	v6	v7	v8	v9	v10	v11
v1	Insurrection onset	1.000										
v2	Youth bulge ratio	0.120	1.000									
v3	Change in male youth unemployment	-0.005	-0.045	1.000								
v4	Male youth unemployment rate	-0.035	-0.136	0.149	1.000							
v5	Total population (ln)	0.090	-0.085	0.006	-0.179	1.000						
v6	Per capita income (ln)	-0.136	-0.778	0.028	0.103	-0.022	1.000					
v7	Anocracy	0.114	0.387	-0.011	-0.084	-0.061	-0.405	1.000				
v8	Neighbor at war	0.073	0.383	-0.021	-0.096	0.014	-0.412	0.303	1.000			
v9	Proximity to conflict	0.179	0.246	0.008	-0.054	0.148	-0.332	0.204	0.185	1.000		
v10	Economic growth rate	0.004	-0.055	-0.115	0.012	-0.017	0.009	-0.010	-0.025	-0.037	1.000	
v11	Civil law	0.031	-0.172	0.021	0.001	0.076	-0.001	-0.039	0.025	0.080	0.039	1.000

Table A.3: Results for Changes in Total Unemployment

Dep. variable: Insurrection onset	Pooled logit model		Fixed-effects logit model		OLS model	
	(1)	(2)	(3)	(4)	(5)	(6)
Youth bulge ratio	0.098* (0.057)	0.099* (0.057)	0.286 (0.217)	0.338 (0.232)	0.005 (0.004)	0.004 (0.004)
Change in total unemployment	0.081 (0.090)	-0.937*** (0.203)	0.256* (0.147)	-0.893*** (0.335)	0.003 (0.002)	-0.021** (0.010)
Youth bulge ratio x change in total unemployment		0.059*** (0.013)		0.072*** (0.020)		0.002** (0.001)
Total unemployment rate	0.029* (0.016)	0.022 (0.017)	-0.106 (0.110)	-0.183 (0.143)	-0.000 (0.001)	-0.000 (0.001)
Total population (ln)	0.395*** (0.075)	0.390*** (0.075)	-2.097 (1.398)	-2.192 (1.437)	-0.076* (0.041)	-0.075* (0.041)
Per capita income (ln)	-0.281** (0.142)	-0.279* (0.144)	1.376* (0.756)	1.416* (0.786)	0.022 (0.017)	0.021 (0.017)
Anocracy	0.616** (0.260)	0.611** (0.258)	0.703* (0.421)	0.662 (0.425)	0.044** (0.021)	0.044** (0.021)
Neighbor at war	0.117 (0.299)	0.134 (0.317)	-0.048 (0.454)	-0.289 (0.439)	0.004 (0.010)	0.003 (0.010)
Proximity to conflict	1.499*** (0.297)	1.506*** (0.303)	-2.050*** (0.521)	-2.064*** (0.538)	-0.138*** (0.025)	-0.138*** (0.025)
Observations	2,658	2,658	645	645	2,658	2,658
Country FE	No	No	Yes	Yes	Yes	Yes
No. of conflicts	82	82	82	82	82	82
No. of countries	151	151	45	45	151	151
(Pseudo) R^2	0.155	0.164	0.088	0.106	0.026	0.029

Notes: Robust standard errors clustered at the country-level are reported in parentheses. All time-varying explanatory variables are lagged by one year. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A.4: List of Conflict Onsets

Country	Insurrection onsets (1)	Civil war onsets (2)	All conflict onsets (3)
Afghanistan	1	0	1
Angola	3	0	7
Azerbaijan	2	2	4
Bangladesh	1	0	1
Burundi	2	1	2
Central African Republic	3	0	4
Chad	2	2	2
China	1	0	1
Comoros	1	0	1
Congo	3	2	3
DR Congo (Zaire)	3	3	4
Egypt	1	0	1
Eritrea	3	0	3
Ethiopia	1	1	4
Georgia	2	0	2
Guinea	1	0	1
Guinea-Bissau	1	1	1
Haiti	1	0	1
India	0	0	12
Indonesia	1	1	2
Iran	3	3	5
Iraq	1	1	1
Israel	0	0	2
Ivory Coast	2	0	2
Lesotho	1	0	1
Liberia	1	0	1
Libya	1	1	1
Macedonia, FYR	1	0	1
Mali	3	0	3
Mauritania	1	0	1
Mexico	2	0	2
Nepal	1	0	1
Niger	3	0	4
Nigeria	3	0	3
Pakistan	2	1	4
Peru	1	1	1
Philippines	0	0	3
Russia	2	1	4
Rwanda	2	2	2
Senegal	5	3	5
Serbia (Yugoslavia)	1	1	1
Sri Lanka	2	2	2
Sudan	0	0	1
Tajikistan	2	1	2
Thailand	1	0	1
Turkey	0	0	1
Uganda	1	1	1
United Kingdom	1	1	1
United States of America	2	2	2
Uzbekistan	2	0	2
Yemen	2	2	2

Notes: Column (1) refers to the baseline definition of *insurstart* and reports all conflict onsets in the sample that cause at least 25 battle-related deaths with no ongoing conflict in the current or previous country-year. Column (2) contains only those onsets from the list in column (1) that cause at least 1,000 battle-related deaths. Column (3) reports all conflict onsets that are reported in PRIO, irrespective whether there is another conflict ongoing in the respective country and year.