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Abstract

We develop a simple model of an insurrection market based on a kleptocratic politico-economic institutional setting, within which a certain government elite holds both all central government position and all productive assets. The kleptocratic setting provokes the appearance of insurrection entrepreneurs that are called the revolutionary elite and that aim at redistributing wealth away from the government elite. To that end, the revolutionary elite hires insurrection activists and compensates them in cash or in kind. We integrate the youth bulge measured by the relative youth cohort size into the insurrection market by defining certain youth-specific characteristics that influence relative productivities on the insurrection market as compared to an official labor market. We find that, apart from certain spontaneous outbreaks of violence or riots, youth bulges alone are not a good predictor for political violence. Moreover, deliberate insurrection activities that aim at changing political and economic power positions are affected by youth bulges only when related to certain politico-economic institutional settings, from which kleptocracies may be the most vulnerable.

JEL-Codes: H56; J10; J22; P16.

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

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Youth Bulges, Insurrections, and Politico-Economic Institutions

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 derive a number of testable empirical implications.

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 model in section 3.

In section 4, we discuss our results as well as some empirical implications of the model and suggest further empirical and theoretical work. Section 5 concludes.

2. Some basic concepts and definitions

Urdal (2004; 2006) as well as Staveteig (2007) 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 (1956) 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 led 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 position 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 members, 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, 2007: 7).

To put it in economic terms: While the bottleneck hypothesis of youth bulges implies that an abundant youth cohort faces 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 privilege 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, 1995; 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, 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

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 modelled 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, 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 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 that employees between 15 and 24 are, 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 $r > 0$ with as a 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 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 *Inada* 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 $0 < \delta < 1$. The economy's output *Y* is then:

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

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 also both the share in 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 citizen's 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:

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

were π is 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 their 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:

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

where w_I is the compensation rate for insurrection activities, and $\tau^R \epsilon(0,1)$ 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 payments of 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; Apolte, 2012). 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

[1] That is gross labor income $w_L l$ minus effective labor income tax, defined by the effective tax rate $t^G A^G$.

the extent to which compensations for insurrection activities enter the citizens' utility function. Summing up, the citizens maximize the following utility function:

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

Note that, for $\mu = 0$, we get $(1 + w_I)^{r\mu} = 0$, 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 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:

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

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 conditions[2] for a maximum of Y^R with respect to L give:

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

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]

$$\mathcal{L} = (1 - t^G A^G) w_L l + (1 + w_I)^{r\mu} i + \lambda_1 (1 - l - i) + \lambda_2 (\varepsilon - l). \tag{9}$$

If both restrictions in (9) were non-binding, so that $\lambda_1 = \lambda_2 = 0$, then this would imply (by equation VI 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 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 VII in the appendix, be associated with either i=0, or with $(1 + w_I)^{r\mu} = 0$, or both. The implication is this: Should $\lambda_2 > 0$, so that the citizens are ra-

[2] See the appendix for details.
[3] The full set of the Kuhn-Tucker conditions is given in the appendix.

tioned in their labor-market supply, and should the marginal utility from insurrection activities $(1 + w_I)^{r\mu}$ 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 $(1 + w_I)^{r\mu} = 0$; 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.

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 $\lambda_2 \geq 0$.

Case A: $\boldsymbol{\lambda_1 = 0; \lambda_2 > 0}$

From equation VI 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 $(1 + w_I)^{r\mu}$ in combination with equation II in the appendix implies $(1 + w_I)^{r\mu} = 0$ 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 IX as well as the assumption of case A that $\lambda_2 > 0$, the equilibrium in case A is:

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

$$(1 - t^G A^G)\delta r^{-1}F'(L) = \lambda_2 > 0. \qquad (10)$$

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.

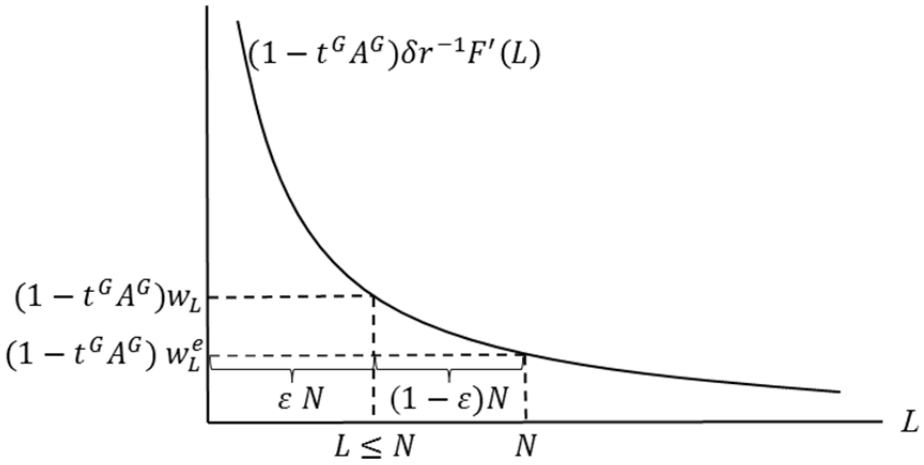

Figure 1

Case A 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 $\boldsymbol{\lambda_1 > 0; \lambda_2 \geq 0}$

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

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

which, according to VII, is associated with *i*=0,[4] as in case A. This case, however, requires $\lambda_2 = 0$, since any $\lambda_2 > 0$ 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 are 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 $(1 + t^R \beta)^{r\mu} > 0$. 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:

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

which, according to VII, 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 mar-

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

ginal 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 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.

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. $(1 + t^R \beta)^{r\mu}$) on the other. Insurrection activities *i* and labor-market activities *l* always add 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.

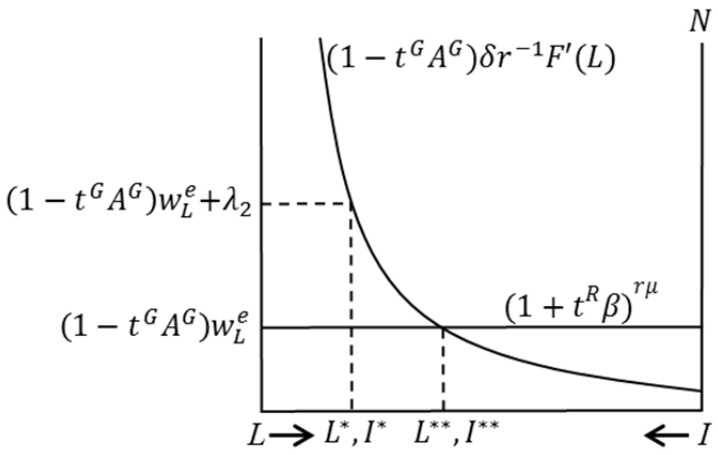

Figure 2

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 $(1-t^G A^G)\delta r^{-1}\frac{\alpha}{L^{1-\alpha}}-\lambda_2=(1+t^R\beta)^{r\mu}$ and, because of $N=L+I$, into:

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

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 implications and further research

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, 2007). What rather counts for potential insurrection activists is the relative attractiveness of activities in the official or in the insurrection sector (Collier/Hoeffler, 2002; Sageman, 2004; Krieger/Meierricks, 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 sector.

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 $I'(r) > 0$, so that a rise in the youth-bulge ratio tends to drive people away from the regular labor market and 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 in percent of the rest of economically active people – and in societies with traditionalist division of labor between the sexes – young male people, 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 institutional structure:

- 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 modelled 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 demographical 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 it isolates the institutional conditions under which such an empirical phenomenon may actually translate into political violence and under which this is not to be expected.

For further empirical research our findings imply that relations between the demographic structure and particular politico-economic institutional structures should be tested. In particular, factors like unemployment rates in general and specific youth unemployment rates, education opportunities, indicators for institutional barriers to entry into economic and political markets, indicators for political competition and the like may be related to the relative youth cohort size RYCS in order to test the relative attractiveness of insurrection markets as compared to official labor markets. Furthermore, interactions between a youth bulge and the distribution of wealth and, in particular, a concentration of assets in the hand of some elites that are closely related to the government are an indicator that measures the incentives for political insurrection to enter the market and to hire insurrection activists from the relative abundant youth cohort.

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 account for more deliberately in further theoretical work.

5. Conclusions

We have developed a model that relates the relative youth cohort size RYCS to basic politico-economic institutional structures. As a benchmark, we have modeled what can be called a kleptocracy in which productive wealth is concentrated in the hands of a certain elite (the "governmental elite") that, at the same time, holds all important positions in the government. This concentration of both political and economic power positions provokes the appearance of political entrepreneurs of some type that hire insurrection activists in order to redistribute power and wealth away from the government elite. The ensuing market for insurrections has been related to the RYCS in that it shows how changes in RYCS affect the allocation of time of potential insurrection activists from the youth cohort.

The main findings are that central characteristics of the underlying politico-economic institutional structure in relation to the RYCS are important determinants of insurrection activities. By implication, a large RYCS as such does not necessarily raise the level of political violence in a society. Whether or not it does so rather depends on the interaction of the phenomenon of a youth bulge with socio-economic indicators such as the degree of openness of career options, the quantity and quality of education and employment opportunities for young people, and the distribution of power positions in economic and political terms. Based on these findings, we suggest further theoretical as well as empirical work.

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Appendix

The revolutionary elite's maximization problem

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

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

The *Kuhn-Tucker* conditions are then:

A) $\mathcal{L}_I = t^R \beta - w_I \leq 0$;

B) $\mathcal{L}_{t^R} = \beta I - \lambda \leq 0$;

C) $\mathcal{L}_\lambda = \tau^R Y - t^R \geq 0$;

D) $I, t^R, \lambda \geq 0$;

E) $I\mathcal{L}_I = I(t^R \beta - w_I) = 0$;

F) $t^R \mathcal{L}_{t^R} = t^R(\beta I - \lambda) = 0$;

G) $\lambda \mathcal{L}_\lambda = \lambda(\tau^R Y - t^R) = 0$.

The citizens' maximization problem

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

I. $\mathcal{L}_l = (1 - t^G A^G) w_L - \lambda_1 - \lambda_2 \leq 0$;

II. $\mathcal{L}_i = (1 + w_I)^{r\mu} - \lambda_1 \leq 0$;

III. $\mathcal{L}_{\lambda 1} = 1 - l - i \geq 0$;

IV. $\mathcal{L}_{\lambda 2} = \varepsilon - l \geq 0$;

V. $l > 0; i, \lambda_1, \lambda_2 \geq 0$;

VI. $l\mathcal{L}_l = l((1 - t^G A^G) w_L - \lambda_1 - \lambda_2) = 0$;

VII. $i\mathcal{L}_i = i((1 + w_I)^{r\mu} - \lambda_1) = 0$;

VIII. $\lambda_1 \mathcal{L}_{\lambda 1} = \lambda_1(1 - l - i) = 0$;

IX. $\lambda_2 \mathcal{L}_{\lambda 2} = \lambda_2(\varepsilon - l) = 0$.; hence $\lambda_2 \mathcal{L}_{\lambda 2} = \lambda_2(\varepsilon N - N)$.

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