NATIONAL RESEARCH UNIVERSITY
HIGHER SCHOOL OF ECONOMICS

Vadim Ustyuzhanin

WEALTH AND REBELLION: A DUALISTIC PERSPECTIVE ON INCOME LEVEL AND REVOLUTIONS

BASIC RESEARCH PROGRAM

WORKING PAPERS

SERIES: POLITICAL SCIENCE

WP BRP 92/PS/2024

Vadim Ustyuzhanin[1]

Wealth and Rebellion: A Dualistic Perspective on Income Level and Revolutions[2]

In the field of civil war studies, there is now a consensus that the risk of war decreases as average income increases. Nevertheless, such consensus has not been reached in the field of unarmed revolutions, which dominate the revolutionary process of our time. This can be explained by the fact that the researchers assumed a linear effect of income level on the risk of unarmed revolutions' onset. In contrast, this paper proposes a curvilinear framework that challenges this conventional assumption. It is demonstrated that two opposing trends can be identified within the context of economic development. On the one hand, economic development increases the resources required by the state to prevent illegal displacement and makes revolt costly for potential rebels. Conversely, it develops infrastructure and resources for civil resistance, which gives rise to the politicization of a society and the demand for political rights and participation. Utilizing two independent datasets to define revolutions and employing distinct methodological strategies, I have identified robust support for the inverted "U-shaped" relationship between income level and the risk of unarmed revolutions.

JEL Classification: Z00.

Keywords: revolutions, wealth, income level, civil resistance, civil wars.

[1] National Research University Higher School of Economics (Moscow, Russia). Center for Stability and Risk Analysis. Research fellow. E-mail: vadim.v.ustyuzhanin@gmail.com

[2] Supplementary online materials as well as replication materials are available at the online folder: https://github.com/vadvu/wealth_paper

This Working Paper is an output of a research project implemented within NRU HSE's Annual Thematic Plan for Basic and Applied Research in 2024.

Introduction

The intricate relationship between a nation's wealth and its political stability has intrigued scholars for decades. Theories have ranged from the assumption that economic hardship spurs citizens to revolt and that countries with lower income are unstable, as posited Przeworski and Limongi (1997), to the notion that prosperity leads to an increase of instability because of values' modernization, that is shown by Inglehart and Welzel (2005), or provision of both the resources and the infrastructure necessary for effective organization and mobilization that McCarthy and Zald (1977) noted. In contrast, Huntington (1968) argues that, on the one hand, unmodernized societies with low economic development are not "mature" for revolution, while modernized wealth states are too stable and "revolution is thus an aspect of modernization", so it "is most likely to occur in societies which have experienced some social and economic development" (1968, 265). Despite the existence of opposing theoretical frameworks, it is widely accepted that the invisible hand of economics not only guides market forces but also plays a significant role in influencing the complex dynamics of societal stability.

Similarly, in contemporary empirical research from newer "generations"[4] of revolutionary studies there are also rather mixed results on the role of economic prosperity on the risks of revolutions' occurrence. Knutsen (2014) found that income level is significantly and negatively associated with revolutionary attempts that is supported by his further research on patterns of regime breakdown, including uprisings, since the French Revolution of 1789 (Djuve, Knutsen, and Wig 2020). In contrast, Albrecht and Koehler (2020), studying revolutions in authoritarian regimes, raise an opposite conclusion about the positive effect of economic development on risks of revolutionary situations. Nevertheless, work by Keller (2012) did not find any significant effect of GDP per capita on revolutions without dividing them on some types.

One possible reason for such discrepancies is fundamental differences in causes (Cunningham 2013) and consequences (Celestino and Gleditsch 2013) of two dichotomous types of revolutions – armed (violent) and unarmed (nonviolent). Introducing their popular dataset, Chenoweth and Lewis note that "perhaps the most striking is that violent and nonviolent campaigns share only one determinant in common: population size" (2013, 420). Meanwhile, in civil war studies (which are armed revolutions[5]) "there is now consensus that the risk of war decreases as average income increases" (Hegre and Sambanis 2006, 508–9). This fact is explained

[4] On classification of revolutionary studies by generations "where a general understanding of what was to be explained was widely shared by scholars who had common methodological and theoretical approaches" (Beck and Ritter 2021, 134) see Goldstone (2001), while for critique of such approach one can see paper by Beck and Ritter (2021).
[5] See the next section "what is revolution?" on this.

primarily via opportunity-costs (Collier and Hoeffler 2004) or state capacity (Fearon and Laitin 2003) mechanisms. However, such a consensus reached at the beginning of this century in the field of civil wars has not been reached in the field of unarmed revolutions, which dominate the revolutionary process of our time. As Schock noted a decade ago, "nonviolent resistance has become recognized as a powerful method of struggle that can be dismissed as naive by only those with a fetish for violence" (2013, 287).

In abovementioned paper by Chenoweth and Lewis (2013), authors ran a preliminary analysis of nonviolent revolutions' onset and found GDP per capita as an insignificant factor. These results are supported by later research who studied all possible cases (Dahl et al. 2020; Gleditsch and Rivera 2017; Karakaya 2018; Rørbæk 2019; Schaftenaar 2017) or some specific ones (Braithwaite, Braithwaite, and Kucik 2015; Brooks and White 2023; Cunningham 2013) using primary opportunity-cost or state capacity optic.

All these studies have in common one thing: they assumed a linear effect of income level on risks of unarmed revolutions' onset. In contrast, in this paper I propose a curvilinear framework that challenges this conventional assumption to reconcile the disparate results observed in previous studies by integrating insights from existing literature and introducing a general theory. Using two datasets on revolutions, namely NAVCO 1.3 (Erica Chenoweth and Christopher 2020) and extended M. Beissinger's data (Beissinger 2022; Goldstone et al. 2023), I show that income level is crucial factor for understanding both armed and unarmed revolutions, where there is a linear negative relationship with violent revolutions and robust inverted U-shape link with nonviolent ones that explained insignificance in the previous studies. These results provide a different perspective on the problem of the "middle-income trap": while achieving a certain level of income may help countries to avoid civil wars, it also increases the risk of unarmed revolutions.

Arguments and Hypotheses

What is revolution?

While there are numerous numbers of revolution definition, in this paper I use the consensus minimalist definition established within the fourth generation of revolutionary theory by Lawson: "revolution is a collective mobilization that attempts to quickly and forcibly overthrow an existing regime in order to transform political, economic, and symbolic relations" (2019, 5). These definition is in line with, for example, Goldstone (2001, 142), Beissinger (2022, 3) as well as Chenoweth and Stephan (2011) definition of revolution which they call "maximalist campaign" that is "a series of observable, continual, purposive mass tactics in pursuit of a political objective"

(2011, 14) with maximalist goals such as “regime change, antioccupation, and secession” (2011, 68)[6].

Relying on such definition leads to a specific case selection strategy, where Munich Putsch of 1923 in Germany or March on Rome of 1922 in Italy are considered revolutions just as much as Velvet revolution of 1989 in Czechoslovakia or Egyptian revolution during Arab Spring in 2011. Some well-known authors such as Lederer (1936) or Amann (1962) would disagree with such an approach, calling it too general and missing the point of the subject. Moreover, all of them see violence as the necessary feature of revolution, whereas “contemporary revolutions, in contrast, are much more likely to be unarmed” (Beck, Bukovansky, and Chenoweth 2022, 2) and, as Schock noted a decade ago, “nonviolent resistance has become recognized as a powerful method of struggle that can be dismissed as naive by only those with a fetish for violence” (2013, 287). This prompts a reconsideration of the essence of revolutions and, as a consequence, the development of novel approaches. For these reasons, I rely on the depicted definition, which allows for the consideration of revolutions in all their diversity, regardless of their ideological orientation, tactics, and success. Putting differently, this definition enables the study of both classical "big R" revolutions and contemporary “small r”[7] revolutions, which helps to identify a greater diversity of factors that may contribute to the occurrence of any revolutionary cases.

The final remark to be made is that civil wars are revolutions that employ armed tactic, because their core features are also mass mobilization (in the form of an army) with the aim of changing political relationships in a society by illegal mechanisms. As McAdam, Tarrow and Tilly (2001) posit, both revolutions and civil wars are facets of a more comprehensive concept – "collective political struggle" – and the distinction between them is minimal due to the convergence of mobilization strategies and logic. Accordingly, as Beissinger (2022, 25–26) note, the distinction between revolutions and civil wars is largely artificial.

Prosperity and uprisings

A number of studies have put forth competing hypotheses regarding the relationship between income level and political violence. The two most prevalent theories are those of state capacity and opportunity cost. The state-capacity approach posits that if the state is unable to effectively police its territory and is in a constant situation of acute resource shortage, then rebels

[6] This point is further supported by the fact that Chenoweth’s database of Nonviolent and Violent Campaigns and Outcomes (NAVCO) designates as campaigns all the indisputable revolutions since 1900 including Russian revolutions of 1905–1907 and 1917, Constitutional Revolution in Iran, Xinhai Revolution in China, Mexican Revolution of 1910–1917 and so on.

[7] On division of revolutions on classical “big” and modern “small” see Beck et al. (2022, 3–4).

are more likely to gain strength and win, which encourages groups to revolt and initiate civil war (Fearon and Laitin 2003). The second theory suggests that in case of poverty spending time on rebellion for radical change of society seems more profitable than "usual" life that leads to civil wars (Collier and Hoeffler 2004). Though these theories propose the same link between income level and civil violence, their interpretation is different which has created controversy over the choice of the overriding mechanism (Jakobsen, de Soysa, and Jakobsen 2013), while both views are based on rational-choice optics.

A number of authors have sought to apply one of these theories to the rationale behind unarmed civil resistance. However, they have been unable to find empirical evidence to support their claims, leading them to conclude that these theories can only explain the tactics of insurgents, rather than those of unarmed revolutionaries. Indeed, it is difficult to argue with the assertion that "violent and nonviolent tactics have different resource mobilization demands and draw upon different social networks for this purpose" (Butcher and Svensson 2016, 312). Nevertheless, it can be argued that state capacity and opportunity cost mechanisms exert a similar influence on the choices of groups regarding armed rebellion, but an opposing effect when it comes to unarmed forms of resistance. The following section elaborates on this idea in greater detail.

During a period of income levels rising, societies move from poverty to wealth. This is reflected in industrialization, infrastructure development, the proliferation of education, and the emergence of a middle class. Additionally, there is a shift from survival to self-expression values (or, alternatively, emancipative values, as defined by Welzel (2013)). This shift gives rise to the politicization of society and the demand for political rights and participation (Inglehart and Welzel 2005; Welzel 2013) and, on the other hand, demand for stability (Lipset 1959), less support for revolutionary changes (MacCulloch 2004) and stable institutions that hard to displace (Kennedy 2010). Such a process can be considered to have three stages.

In the first stage, there are revolutions of "those who have nothing to lose but their chains". It can be exampled by social revolutions[8] (Skocpol 1979) where the main goal of the rebels is to change the class structure of a society via armed struggle to destroy past institutions at the root. If one looks on some examples of social revolutions, such as Russian October revolution (1917), "La Matanaza" in El Salvador (1932), Ar-Rashid revolt in Iraq (1963), Naxalite uprisings in India (1967-72), Sandinista Revolution in Nicaragua (1978-79) or Nepalese Civil War (1996-2006)[9],

[8] Social revolutions "are rapid, basic transformations of a society's state and class structures; and they are accompanied and in part carried through by class-based revolts from below" (Skocpol 1979, 4). Comparing social revolutions to revolutions at all, one can see that the main characteristic of social ones is (attempt of) class-based transformation.
[9] See, for ex., Beissinger (2022) on classification of that revolutions as social.

two things can be observed: all that revolutions occurred in relatively "poor" undeveloped societies to radically redistribute wealth and power by starting a civil war. That observation has been empirically tested and found strong arguments in the literature: indeed, the risks of armed rebellion are higher in countries with the lowest income level that usually is connected with week or failed state (Hegre and Sambanis 2006). Using rational choice theory, the revolutionaries decide in favor of armed revolution because they are dissatisfied with the current situation and believe that any struggle will lead to a better redistribution of wealth. In other words, spending time on risky violent activity for radical change of society seems more profitable than "usual" life (Grossman 1991). At the same time, states have limited abilities for preventing insurgency at this stage because of low financial, administrative, police and military capabilities as well as less developed infrastructure which weakens the ability to control peripheries and gives the rebels more opportunities to launch a campaign without significant resistance (Fearon and Laitin 2003).

In the second stage, when people have more than "chains" including prospects and opportunities, there are revolutions of people "who want more". This stage is typified by unarmed revolutions, such as the Color Revolutions or the Arab Spring, which predominately occurred in middle-income countries. Individuals at this stage have achieved a satisfactory standard of living with stable access to food, education, and healthcare. This results in a drop in infant mortality (as well as overall mortality), which increases the value of human life (and then increases cost of risky activity). Finally, "fading existential pressures increase the utility of universal freedoms and people begin to value these freedoms accordingly" (Welzel 2013, xiv) that shifts ideological preferences from collectivistic to more individualistic (Welzel 2013) which reduces the potential radicalization of the protesters, who are less inclined to utopian ideas of a complete reorganization of society through revolution. Meanwhile, individuals believe that a change in political regime can bring them more benefits than the pre-revolutionary way of life. Their goal is not to radically alter the entire structure of a society, but to overthrow a regime that is perceived as ineffective. Although such revolutions can be violent, they typically do not escalate into civil war because revolutionaries cannot guarantee a sufficient radicalization and sufficient number of rebels willing to sacrifice their lives because of people's accumulated resources, including physical assets and human capital, as well as more peaceful values. Translating this into the rational choice theory, the costs of armed uprising are much higher in comparison with the previous stage of "chains", while the potential benefits are lower. Consequently, the risks that protesters are willing to accept are smaller, which drives them to choose unarmed tactics that are less risky than engaging in civil war. Conversely, at the middle-income level, state capacity increases, which makes the government more effective at responding to armed struggle. Consequently, state capacity in medium-developed countries serves to preclude the possibility of armed rebellion, but the benefits from revolution remain considerable, allowing groups to pursue their objectives through unarmed rebellion while armed tactics become ineffective.

In the final stage, governments have more resources and a prepared structure to counter revolutions. Citizens are often unwilling to participate in the possible redistribution of resources in case of a successful revolution, which can lead to mass episodes of instability in these countries that is too costly. Thus, on the one hand, states have accumulated enough resources to resist any illegal methods of overthrowing, and on the other hand, they have created institutional mechanisms to suppress rebellion: be it democratic mechanisms, when the “the ballot box has been the coffin of revolutionaries” (Goodwin 2003, 67), or mechanisms for repression, co-optation or intimidation, which are used by modern autocracies (Guriev and Treisman 2022). Indeed, it was found that high income stabilizes all types of regimes (Kennedy 2010) and “can buy off part of the increase in revolutionary support when freedoms are constrained” (MacCulloch and Pezzini 2010, 330). Therefore, it is more probable that groups would utilize the available institutional channels as a primary means of achieving their objectives, rather than adopting more risky strategies.

To illustrate this point, consider the "echo" of the Arab Spring in Saudi Arabia. In this instance, a strong state with a high income suppressed the movement in its infancy, preventing it from forming a cross-class coalition as it was in Egypt or Tunisia. A "Day of Rage" in Saudi Arabia was scheduled for March 11, 2011, approximately one and a half months after the fall of Ben Ali's regime in Tunisia. The demands of the demonstrators were maximalist, encompassing the establishment of a democratic parliament and an independent judiciary. Nevertheless, on the designated date, only one individual appeared at the demonstration in the capital, which was disseminated on social media. He was promptly apprehended. In the following days, some other protests were held, with hundreds of people in attendance. However, the primary demand was for the release of political prisoners. The government responded rapidly, dispersing the protests and announcing a significant social program. Among other measures, this program included the immediate payment of two months' salaries to civil servants and discounts on education, as well as substantial infrastructure investments (Mabon 2012). This marked the finishing point of the Arab Spring in Saudi Arabia. The state, which possessed significant resources in contrast to Tunisia or Egypt, was able to swiftly finance loyalty.

Thus, there are two contradictory trends in economic development. On the one hand, it increases the resources required by the state to prevent illegal displacement and makes revolt costly for potential rebels. On the other hand, it develops infrastructure and resources for civil resistance and gives rise to the politicization of a society and the demand for political rights and participation. Accordingly, the probability of unarmed revolutions is lower in low-income and high-income countries, while in the middle-income countries the risks of unarmed revolution are at their highest. This assertion can be operationalized as an inverted "U-shaped" relationship between GDP per capita and the probability of unarmed revolution. Consequently, the following hypothesis is put forth for consideration:

H: GDP per capita has inverted “U-shape” link with probability of unarmed revolution occurrence

Materials and Methods

Dependent and Independent variables

As dependent variables I use binary indicators for a start of unarmed revolution from different databases. The first one is Nonviolent Action NAVCO 1.3 that covers period from 1900 to 2019 and as a unit has a campaign, which, as I stated before, is revolution. The second source for dependent variable is combined datasets by M. Beissinger (2022) and by Goldstone, Grinin, Ustyuzhanin and Korotayev (2023). The first one covers period from 1900 to 2014, while the second one has years from 2000 to 2022 and includes all Beissinger’s cases from 2000 because of the same coding procedure. Thus, I join those datasets at 2000 year. The dependent variable from combined dataset is also a start of unarmed revolution.

The principal dissimilarities between the NAVCO and Beissinger datasets pertain to the coding methodology. The NAVCO dataset includes what might be considered "quasi-revolutionary" episodes and occasionally marks the emergence of opposition organizations as the start of revolution. In contrast, the second dataset includes "pure revolutions" and codes the start year as the moment of mass struggle. To illustrate, the Egyptian Revolution of 2011 is coded in NAVCO as the "Anti-Mubarak movement," with the start year designated as 2007. This year saw the occurrence of protests against constitutional reforms and during elections to the Shura Council (the upper house of Parliament). In contrast, the main protests, which were triggered by the Tunisian Revolution, commenced in 2011 (Lynch 2013), which is typically regarded as the start year of the Egyptian Revolution.

Secondly, “quasi-revolutionary” episode is event with “mass mobilization, but there are no demands to overthrow the government, or sufficient efforts are not made to overthrow the government and seizing power (there is no evidence that there have been serious attempts to overthrow the government and seize power)" (Goldstone, Grinin, and Korotayev 2022, 7)[10]. One of the examples is "Denim revolution" (or the so-called "Jeans Revolution") in Belarus (2006) that is post-election anti-Lukashenko protests that took place just a few days in March 2006, in most of which the number of participants was only a few hundred (Korosteleva 2009), and no serious attempts to take power were undertaken. One can also consider "Dissenter's March" in Russia in 2007-08 (Beissinger 2022) or "Kefaya" movement in Egypt in 2000–2005 (Clarke 2011) with no attempts to take political power. Such events are considered as campaigns in NAVCO (then, included to the dependent variable), but are not taken into account by Beissinger and Goldstone et al. as seemed as episodes with no revolutionary claims and attempts to overthrow the regime by illegal methods. This fact explained the lower number of events in the second dataset (126 unarmed revolutions) compared to NAVCO (239 nonviolent campaigns) from 1950 to 2019.

Besides that, several studies have shown similarity of discussed databases in terms of produced empirical results (Goldstone et al. 2023; Ustyuzhanin and Korotayev 2023). This is due to the fact that the coding procedures employed are similar, although not identical. Consequently, they are comparable and can be used for the operationalization of unarmed revolution.

As the key independent variable, I use GDP per capita. That data is gotten from Gapminder (Gapminder 2024) that combines 3 different datasets on GDP per capita, namely Maddison project, Penn Tables and World Bank. The final variable is measured in international 2017 dollars in PPP. In the analysis, I use its logarithmic version to normalize it and make more comparable across units.

Control variables

The existing literature on revolutions, civil wars, and civil resistance has proposed a number of factors that may explain the start of revolutions. However, I limit the inclusion of factors due to concerns regarding the collider problem, although the majority of social indicators can be considered confounders.

The first control variable is the level of democracy, which is known to impact income levels and revolutions. Furthermore, I introduce a quadratic term to capture the fact that anocracies (intermediate regimes as partial democracies or autocracies) are more prone to instability (Jones and Lupu 2018) and revolutions in particular (Korotayev et al. 2024). The operationalization of this variable is the Polity-5 index (Marshall and Keith 2020). The next confounder that is included

[10] See also Beissinger (2022) for similar definition.

in models is also taken from the Polity-5 database and measures the durability of a regime in years. This indicator demonstrates the stability of a political system, which should affect both income levels and revolutions (E. Chenoweth and Ulfelder 2017). To normalize the data, I use a logarithmic version of the variable, adding one initially to all units, as 0 is included in the range. This makes the data more comparable across units. Another control variable is the level of corruption, which is obtained from the V-Dem dataset (Coppedge et al. 2021). This is operationalized as the executive corruption index, which has also been identified as an important variable in revolutionary studies (Beissinger 2022) which theoretically affects income level.

Next 2 confounders are “modernization” variables that hugely connected to GDP per capita – urbanization level and mean years of schooling – and revolutions. Urbanization is sourced from dataset by Beissinger (2022), who covers period from 1900 to 2014, and World Bank (2023), from which I take information since 2014. In turn, data on mean years of schooling is provided by the United Nations Development Program (UNDP 2022). Also, I include measure of natural resources rent that affects both income level and revolutions, because it provides government with additional recourses increasing its state-capacity, on the one hand, and potentially making them more vulnerable due to dependency of economy on global market fluctuations, on the other. This variable is operationalized as crude oil production measured in kilowatt-hours per capita and taken from Our World in Data project (2024) that combined information from the Energy Institute Statistical Review of World Energy and The Shift Dataportal. I use its logarithmic version (adding 1 initially to all units, because 0 is included to the range) to normalize it and make more comparable across units.

Also I introduce population in the model, because majority of the studies has shown that it is one of the most import factors, explained significant part of the variance in revolutionary process (E. Chenoweth and Ulfelder 2017), while its effect on GDP per capita is negligible. I take this variable from World Population Prospects (United Nations 2022) and use its logarithmic version to normalize it and make more comparable across units.

In addition, I include a measure of economic growth as a potential confounder, but use its 5-year average rate. A sharp decline in the economy should increase grievances (Knutsen 2014) and restrict government resources, which in turn increases the probability of unarmed revolution. However, revolution also has a substantial impact on economic growth, causing market uncertainty, capital withdrawal, and so forth. Given that the data is measured in years, it is not possible to distinguish the impact of economic growth on revolution from the effect of revolution on economic growth. Consequently, the use of a lagged variable at time t-1 partially addresses the reverse causality issue, yet abovementioned theoretical explanation of the effect of economic growth on revolutions, assuming an instantaneous effect, becomes untenable. Consequently, I utilize the average lagged economic growth rate, which operationalizes the unfulfilled expectations of the population. The variable is calculated based on the GDP per capita presented above.

The final group of control variables is calculated from the dependent variables. The first control variable is a binary indicator of revolution in the same region (based on the UN subregion classification), which demonstrates the impact of a revolutionary wave. Furthermore, I include one more variable that is a lag for abovementioned variable to account for potential delayed effects, as evidenced by the Arab Spring, where the Tunisian revolution, which commenced in December 2010, undoubtedly influenced subsequent revolutions in 2011. The second variable is the sum of past revolutions, which attempts to operationalize the concept of a "revolutionary tradition" and the existence of sustainable mobilization institutions within a given country.

Finally, data covers period from 1950 to 2019 (the end of NAVCO 1.3 list of events) with the inclusion of countries with a population of at least 150,000 in 2019. For further details on the variables employed, see descriptive statistics in Supplementary Online Materials.

Estimation procedure

The dependent variable, revolutions, is rare events data – "binary dependent variables with dozens to thousands of times fewer ones ("events") than zeros ("nonevents")" (King and Zeng 2001, 138)[11]. In that case ML estimator for logistic regression produces biased (King and Zeng 2001) and potentially infinite estimates (Kosmidis and Firth 2009). To address this issue, I use mean bias-reducing score adjustment (Kosmidis and Firth 2009) to correct estimates and make them less biased and certainly finite. However, another strategy for dealing with rare events exists: reducing the number of "0" that leads to usual classification problem either "rare events" classification problem (King and Zeng 2001). To test the robustness of the results, I exploit this approach using several matching procedures (see supplementary online material; looking ahead, the results obtained by these two methods are not substantially different).

To test the hypothesis about "U-shape" relationship between unarmed revolutions and GDP per capita, I introduce quadratic term to the models, as it is usually done. However, such an approach has its own limitations (Lind and Mehlum 2010; Simonsohn 2018), which mainly stem from the fact that the introduction of a quadratic term in the equation forces the model to estimate

[11] In my dataset the percentages of observations with revolutions are 2.5% and 1.3% for NAVCO 1.3 and Beissinger & Goldstone combined dataset respectively (see Supporting Online Material with descriptive statistic).

a nonlinear relationship and in some cases the significance of the polynomial term is deceptive. In particular, "when the true relationship is convex but monotone over relevant data values, a quadratic specification may then erroneously yield an extreme point and hence a U shape" (Lind and Mehlum 2010, 110). Besides plotting marginal effects and adjusted predictions to address this issue, I also use non-parametric method that does not require any assumption about the type of the relationship (and then direct specification of the effect by introduction of second-degree polynomial) between income level and unarmed revolutions. As such method, I exploit random forest with quantile classifier (O'Brien and Ishwaran 2019), which is used for rare events data[12], with G-mean performance metric (that is geometric mean of true positive and true negative rates) and entropy as splitting criteria.

The presented data has panel structure with country-year as a unit of observation. To account for the structure of the data (as well as to reduce endogeneity problem due to omitted factors), I incorporate one-way fixed effects on time (years), because the goal of presented research is to analyze cross-sectional variance and then block time-variant variance, while two-way fixed effects theoretically suits only difference-in-difference design, blocking both time-variant and time-invariant variance of estimated effects (Kropko and Kubinec 2020)[13]. However, the introduction of fixed effects to logit model produces biased estimates. The usual strategy to deal with it is to estimate conditional model, but such a model does not provide substantive marginal effects estimates that is crucial in case of presented "U-shape" hypotheses. Based on this, I choose logistic model instead of conditional one accepting bias, which should be small due to relatively large number of observations in each fixed-effect group (Katz 2001). Moreover, I correct standard errors estimation using cluster robust standard errors on countries because observations in them are interdependent.

Endogeneity concerns

In the presented research design, I see following main sources of endogeneity: (1) reverse causality problem; (2) omitted confounders; (3) selection bias; and, finally, (4) omitted observations.

[12] In machine learning studies, "rare events" problem is known as "two-class imbalanced problem".

[13] It is also worth noting that I have conducted analysis using region FE (in UN subregion classification), which shows an effect of GDP per capita on unarmed revolutions generalized to cross-sectional units. In other words, it shows how dynamic of GDP per capita affects probability of unarmed revolutions (within-effect). To go ahead, in models without multiple imputations the coefficients are marginally significant, while in case of models estimated on imputed data, the results are highly significant. Thus, results are robust and endogeneity due to omitted time-invariant factors in the main analysis does not affect results substantially (what is also shown by matching with exact math on region and year, see Supplementary Online Materials).

To address the first issue with reverse causality, I use all variables with one year lag that at least makes estimation less suffering from endogeneity. The second and the third issues are foremost connected to the chosen control variables. Some of the presented variables can be theoretically both confounders and colliders: level of democracy can be the product of country's development one can say, as well as education level or urbanization. In the main analysis, I use all presented variables, assuming that they are mostly confounders then colliders. However, to check resilience of GDP per capita estimates to all possible combinations of used control variables, I exploit Extreme Boundary Analysis (Sala-i-Martin 1997), which aggregate effect of independent variable across all possible model specifications with at least 4 control variables[14]. The results and more comprehensive description of this technic are discussed in the Supplementary Online Materials. To go ahead, GDP per capita as well as its quadratic term are extremely resilient to different combinations of variables.

As usual in social sciences, there is a huge amount of missings in analyzed data[15] that leads to endogeneity in case of not completely random pattern in missings. In the case of presented study, omissions become particularly critical, generating so-called "advanced democracy bias" when "poorer and less democratic countries are more likely to have missing data, causing listwise deletion to give rise to a particular selection problem" (Lall 2016, 415) that skewness the sample distribution and overrepresent developed countries, whereas "poorer" countries are of particular interest for the study, generating left tail of the proposed "U-shape" curve. To address this issue, I use multiple imputation technic via imputation algorithm Amelia-II (Honaker, King, and Blackwell 2011) that accounts for panel data structure to produce 50 imputed datasets[16].

Results

Table 1 shows four models for both dependent variables: the first and the third models are estimated on original data with missing values, while the second and the fourth models are estimated on 50 imputed datasets. In the first and the second models for each dependent variable (M1, M1 imp, M3, M3 imp), GDP per capita is introduced without its quadratic term to model linear relationship. One can see that in all models this association is insignificant at any acceptable

---

[14] I additionally include indicators for ethnic discrimination, inequality, "youth bulge" and manufacturing. Finally, I have a list with 14 control variables.

[15] After the listwise deletion from 10 183 original observation remains only 6 691 (about 65%).

[16] There exist a variety of methodologies for the identification of the number of imputed datasets. As demonstrated by Rubin (1987), five datasets are typically sufficient in most cases. Nevertheless, Von Happel (2009) proposes a more conservative strategy, whereby the number of datasets should be a percentage of the missing data. In turn, I employ an even more conservative strategy, creating 50 imputed datasets. The additional computational costs associated with this approach are outweighed by the enhanced efficiency and resilience of the estimates.

level of confidence, while the magnitudes of coefficients are approximately zero that replicates results of the previous research on this topic. In contrast, introduction quadratic term of GDP per capita (M2, M2 imp, M4, M4 imp) produces highly significant inverted “U-shape” relationship between income level and risks of unarmed revolutions.

Tab. 1. Logistic regression models for “rare events” on unarmed revolutions occurrence, 1950-2019

	Dependent Variable:							
Variable	NAVCO 1.3				Beissinger's data			
	M1	M1 (imp)	M2	M2 (imp)	M3	M3 (imp)	M4	M4 (imp)
(Intercept)	-6.64	-8.35	-21.69	-25.21	-6.76	-8.74	-24.27	-27.13
	(-4.66)***	(-6.46)***	(-3.95)***	(-5.53)***	(-5.54)***	(-8.13)***	(-5.11)***	(-6.34)***
GDP pc, ln	0.09	0.17	3.6	4.09	0.09	0.2	4.16	4.48
	(0.54)	(1.07)	(2.9)**	(4)***	(0.63)	(1.57)	(3.85)***	(4.63)***
GDP pc, ln (sq)			-0.2	-0.22			-0.23	-0.25
			(-2.85)**	(-3.91)***			(-3.76)***	(-4.43)***
Population, ln	0.19	0.2	0.18	0.21	0.22	0.26	0.24	0.27
	(3.76)***	(4.14)***	(3.72)***	(4.28)***	(5.34)***	(5.99)***	(5.81)***	(6.36)***
Polity	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01	-0.01	-0.02
	(-0.91)	(-0.75)	(-1.36)	(-1.22)	(-0.83)	(-1.07)	(-1.12)	(-1.4)
Polity (sq)	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
	(-2.37)*	(-2.04)*	(-2.24)*	(-1.79)	(-4.62)***	(-4.58)***	(-4.26)***	(-4.17)***
Regime durability, ln	-0.16	-0.18	-0.15	-0.17	-0.13	-0.13	-0.12	-0.12
	(-1.97)*	(-2.42)*	(-1.84)	(-2.39)*	(-1.89)	(-2.2)*	(-1.79)	(-2.15)*
Urbanization	<0.001	<0.001	<0.001	<0.001	-0.01	-0.01	-0.01	<0.001
	(-0.31)	(0.25)	(-0.25)	(0.49)	(-1.42)	(-1.13)	(-1.32)	(-0.99)
Corruption	1.22	1.43	0.95	1.16	0.86	0.92	0.57	0.66
	(3.15)**	(3.61)***	(2.51)*	(3.04)**	(2.7)**	(3.14)**	(1.81)	(2.33)*
Education	0.07	0.05	0.06	0.04	0.09	0.08	0.08	0.07
	(1.61)	(1.36)	(1.36)	(1.08)	(2.44)*	(2.42)*	(2.35)*	(2.27)*
Oil rent pc	-0.04	-0.04	-0.04	-0.05	<0.001	-0.01	-0.01	-0.02
	(-1.84)	(-2.37)*	(-2.09)*	(-2.71)**	(-0.06)	(-0.87)	(-0.31)	(-1.24)
Rev. in region (t)	0.67	0.56	0.66	0.54	0.28	0.37	0.26	0.34
	(3.9)***	(3.3)***	(3.78)***	(3.14)**	(1.69)	(2.61)**	(1.58)	(2.44)*
Rev. in region (t-1)	0.19	0.23	0.16	0.21	0.73	0.68	0.71	0.67
	(1.05)	(1.43)	(0.92)	(1.3)	(4.48)***	(4.87)***	(4.44)***	(4.73)***
Rev. in the past	0.28	0.29	0.26	0.25	0.18	0.18	0.15	0.15
	(5.08)***	(5.4)***	(4.62)***	(4.81)***	(3.68)***	(3.95)***	(3)**	(3.2)**
Economic growth, 5-year average	0.16	0.61	-0.51	-0.27	-0.66	0.59	-1.65	-0.56
	(0.11)	(0.52)	(-0.35)	(-0.23)	(-0.38)	(0.4)	(-0.9)	(-0.37)
N	6 691	10 183	6 691	10 183	6 691	10 183	6 691	10 183

Notes: ***p<0.001, **p<0.01, *p<0.05; all predictors are at t-1 except revolution in the region and revolutions in the past; z-statistics are in parenthesis; year fixed effects are included in all models; standard errors are clustered on countries; models with multiple imputations (imp) are based on 50 imputed datasets.

As previously stated, the significance of both linear and quadratic terms cannot fully support the presence of a "U-shaped" link between variables. Figure 1 depicts the marginal effect (ME) of GDP per capita with conditions on its own values (from minimum to maximum values from the original dataset with a 0.2 step). The right-hand graph depicts the dependent variable derived from the extended dataset by Beissinger, whereas the left-hand graph presents the dependent variable derived from the NAVCO 1.3 dataset. The lines on each graph represent the ME of the independent variable from models with a quadratic term estimated on the original data (M2 and M4, red line) and imputed data (M2 imp and M4 imp, blue line), respectively. It becomes evident that there is a significant inverted "U"-shaped relationship between income level and the probability of an unarmed revolution occurring. Initially, the probability of an unarmed revolution increases with income level, reaching a peak at a certain point in GDP per capita. Subsequently, the probability declines as income level continues to increase, reaching a negative significant effect. Moreover, this outcome is replicated for two dependent variables and remains consistent when imputed data are employed. In contrast, the impact is observed to be more pronounced when using imputed data.

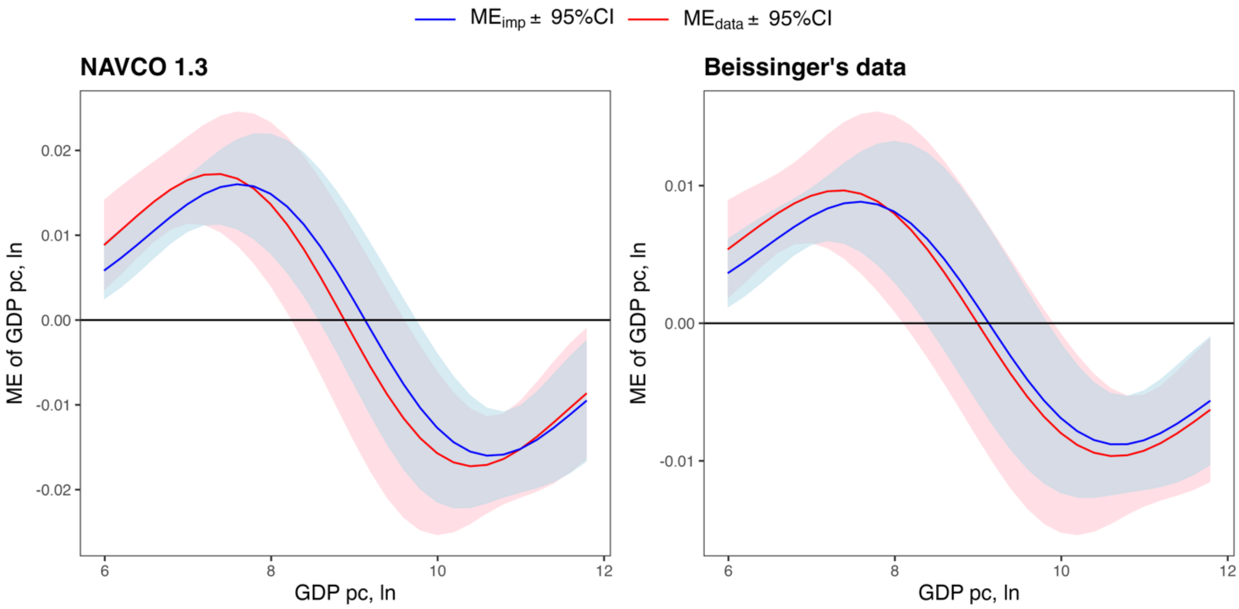

Fig. 1. Marginal effect of GDP per capita conditional on its values.
Notes: red line shows models estimated on original sample with listwise deletion from Table 1, blue line shows models estimated on 50 imputed datasets; 95% CI is plotted.

Figure 2 depicts the adjusted prediction of the probability of an unarmed revolution conditional on GDP per capita, which is a further visualization of the models presented in Table 1. As can be observed, there is an inverted U-shaped relationship between GDP per capita and the probability of unarmed revolution.

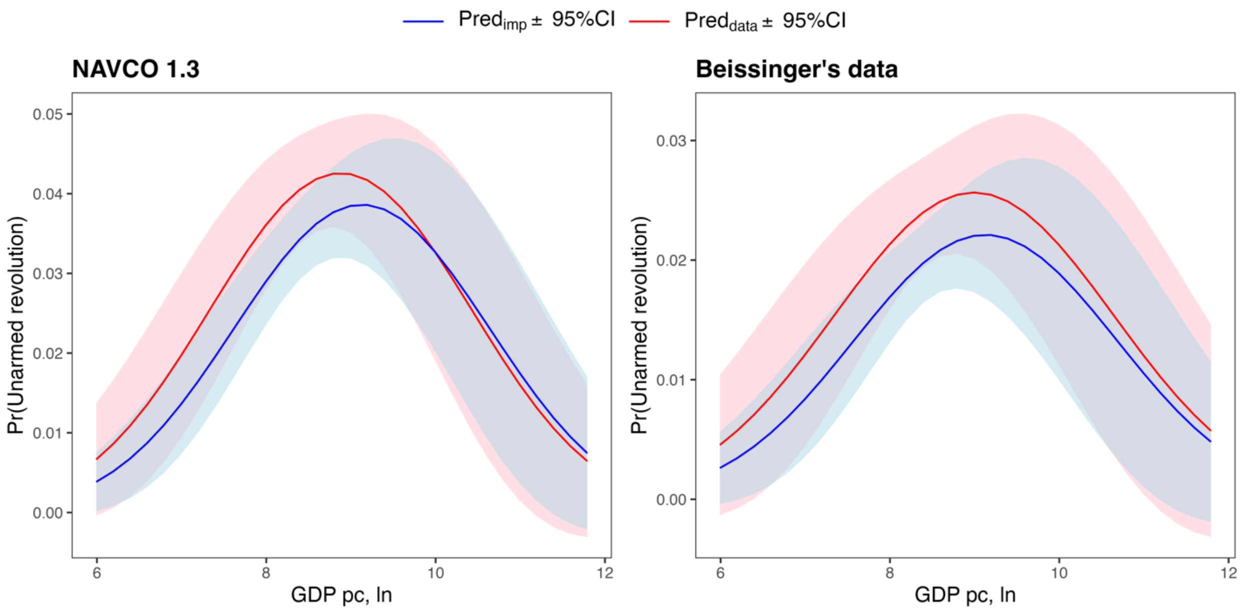

Fig. 2. Adjusted predictions of probability of unarmed revolution conditional on GDP per capita.
Notes: red line shows models estimated on original sample with listwise deletion from Table 1, blue line shows models estimated on 50 imputed datasets; 95% CI is plotted.

Additional tests

As an additional test, a random forest with a quantile classifier and the G-mean performance metric, along with entropy as the splitting criteria, was estimated. The partial effect of this model is presented in Figure 3. It can be observed that the replication of the "U"-shaped relationship between variables, which was not assumed a priori in the model, is still evident.

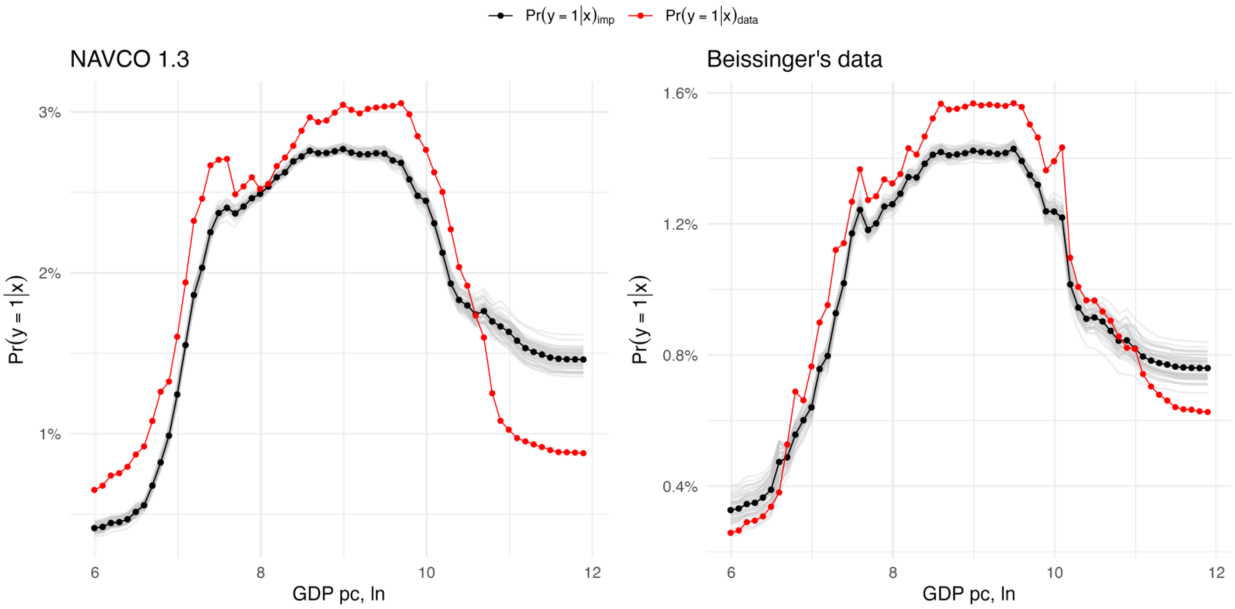

Fig. 3. Partial effect of GDP per capita on probability of unarmed revolution estimated by random forest with RFQ classifier.
Notes: red line shows models estimated on original sample with listwise deletion, grey lines show each model estimated on one of 50 imputed datasets, black line shows their mean.

Furthermore, additional tests were conducted, including extreme boundary analysis and matching procedures. A detailed description of the methodology and results can be found in the supplementary materials. In the context of extreme boundary analysis, both linear and quadratic terms of GDP per capita demonstrate extreme resilience to a range of variable combinations. The associated coefficients are found to be highly significant, with overall two-tailed p-values for both terms below 0.001. Conversely, GDP per capita, which is represented by a single term in most models (and models with a linear link only), is found to be insignificant. Its overall p-value is considerably higher than 10%. Consequently, the inverted "U"-shaped relationship between income level and the probability of unarmed revolutions is highly resilient to any model specification, while the hypothesis about its linear effect is rejected. In the case of a matching procedure with exact math on region and year (which is similar to introducing fixed effects for all dimensions), the results of the main analysis presented above are fully replicated. Both linear and quadratic terms have the theoretically expected signs, producing an inverted “U”-shaped relationship between the probability of an unarmed revolution and income level. Finally, if one modifies the strategy from exploiting time-FE to cross-sectional-FE, the coefficients are marginally significant in models without multiple imputations, while in models estimated on imputed data, the results are highly significant. Consequently, the results are reliable and the potential for endogeneity due to omitted time-invariant factors in the main analysis does not dramatically impact the results.

Discussion

The findings indicate a robust inverse-U relationship between income level and the probability of unarmed revolutions. This provides a novel perspective on the phenomenon of the middle-income trap. While the risk of civil war declines with income growth, it experiences a significant increase at the stage between low-income and middle-income. In particular, the probability of unarmed revolutions reaching a tipping point is highest in countries where economic stagnation is a significant concern. This, in turn, increases the likelihood of further revolutionary activity, which is not conducive to further development.

One additional noteworthy conclusion from the presented analysis is indirect corroboration of one of the conclusions by Przeworski and colleagues (2000), namely that democratic transition is more probable at the middle level of development. Indeed, in the field of revolutionary studies, there is a widely held belief that unarmed revolutions are more probable to result in democratization in comparison with armed ones (Celestino and Gleditsch 2013; Kim and Kroeger

2019). Consequently, the probability is higher at this stage of development, where the risks of unarmed revolutions are higher. This paper proposes an inverted "U-shaped" relationship between GDP per capita and the probability of unarmed revolution, indicating that the highest risks are present at the middle level of development.

It is important to note that the presented analysis is subject to several limitations. Firstly, it should be noted that revolutionaries may initially utilize non-violent methods of resistance, but may subsequently adopt armed means. This was evidenced by the transformation of the Northern Ireland Civil Rights movement into the Provisional Irish Republican Army movement (Beck, Bukovansky, and Chenoweth 2022). The selected dependent variables only capture the initial stages of the event, failing to account for subsequent developments in terms of tactics. Secondly, revolutionaries are heterogeneous and may employ completely disparate tactics simultaneously, despite being part of the same movement and espousing similar demands. Consequently, while the majority of protesters employ unarmed resistance, a minority may resort to armed tactics (so-called "violent flanks", see (Erica Chenoweth and Schock 2015)), as evidenced by the case of the 2014 Euromaidan revolution in Ukraine where about 30% of all protest's events were violent or confrontational (Ishchenko 2016). Thirdly, unarmed revolutions themselves are highly heterogeneous in terms of the tactics employed. As demonstrated by Kadivar and Ketchley (2018), in the majority of nonviolent campaigns, protesters utilize sticks, stones, and Molotov cocktails, which cannot be considered nonviolent tactics. One can consider the distinction between the Egyptian Revolution of 2011, which involved numerous attacks on police stations (Ketchley 2017)[17], and the Velvet Revolution in Czechoslovakia in 1989, which was bloodless and under the slogan "We do not want violence," which became the leitmotif of the revolution (Wheaton and Kavan 2018). It is evident that the group of "unarmed" revolutions is not homogeneous and therefore requires further research. Nevertheless, the within-variance in unarmed revolutions' tactics is still considerably smaller than the difference in tactics between unarmed and armed revolutions.

Conclusion

The objective of this paper is to reconcile the disparate results observed in previous studies regarding the effect of income level on unarmed revolutions. This paper demonstrates that there are two contradictory trends in economic development that explain the insignificance of the linear

[17] Kadivar and Ketchley (2018, 10), for example, described hand-to-hand fighting during Egyptian revolution on 2 February, where "anti-regime protestors and pro-Mubarak forces exchanged stones and Molotov cocktails in a protracted street battle that lasted into the following day".

effect of income level, which has been replicated many times by other authors. This has led them to conclude that the role of "state-capacity" and "opportunity-cost" mechanisms is negligible in the context of unarmed revolutions and civil resistance campaigns.

On the one hand, economic development increases the resources required by the state to prevent illegal displacement and makes revolt costly for potential rebels. Conversely, economic development facilitates the growth of infrastructure and resources for civil resistance, which in turn politicizes society and increases the demand for political rights and participation. Consequently, the probability of unarmed revolutions is lower in low-income and high-income countries, while in middle-income countries the risks of unarmed revolution are at their highest. This assertion can be operationalized as an inverted "U-shaped" relationship between GDP per capita and the probability of unarmed revolution.

Utilizing two independent datasets to define revolutions and employing distinct methodological strategies, I have identified robust support for the inverted "U-shaped" relationship between income level and the probability of unarmed revolutions. In other words, initially, the probability of an unarmed revolution increases with income level, reaching a peak at a certain point in GDP per capita. Subsequently, the probability of an unarmed revolution declines as income level continues to increase, reaching a negative and statistically significant effect.

References

Albrecht, Holger, and Kevin Koehler. 2020. "Revolutionary Mass Uprisings in Authoritarian Regimes." *International Area Studies Review* 23(2): 135–59. doi:10.1177/2233865920909611.

Amann, Peter. 1962. "Revolution: A Redefinition." *Political Science Quarterly* 77(1): 36–53. doi:10.2307/2146496.

Beck, Colin J., Mlada Bukovansky, and Erica Chenoweth. 2022. *On Revolutions: Unruly Politics in the Contemporary World*. New York: Oxford University Press, Incorporated.

Beck, Colin J., and Daniel P. Ritter. 2021. "Thinking Beyond Generations: On the Future of Revolution Theory." *Journal of Historical Sociology* 34(1): 134–41. doi:10.1111/johs.12315.

Beissinger, Mark. 2022. *The Revolutionary City: Urbanization and the Global Transformation of Rebellion*. Princeton University Press.

Braithwaite, Alex, Jessica Maves Braithwaite, and Jeffrey Kucik. 2015. "The Conditioning

Effect of Protest History on the Emulation of Nonviolent Conflict.” *Journal of Peace Research* 52(6): 697–711. doi:10.1177/0022343315593993.

Brooks, Risa, and Peter B. White. 2023. “The Military before the March: Civil-Military Grand Bargains and the Emergence of Nonviolent Resistance in Autocracies.” doi:10.1177/00223433231180921.

Butcher, Charles, and Isak Svensson. 2016. “Manufacturing Dissent: Modernization and the Onset of Major Nonviolent Resistance Campaigns.” *Journal of Conflict Resolution* 60(2): 311–39. doi:10.1177/0022002714541843.

Celestino, Mauricio Rivera, and Kristian Skrede Gleditsch. 2013. “Fresh Carnations or All Thorn, No Rose? Nonviolent Campaigns and Transitions in Autocracies.” *Journal of Peace Research* 50(3): 385–400.

Chenoweth, E., and Maria J. Stephan. 2011. *Why Civil Resistance Works: The Strategic Logic of Nonviolent Conflict*. Columbia University Press.

Chenoweth, E., and J. Ulfelder. 2017. “Can Structural Conditions Explain the Onset of Nonviolent Uprisings?” *Journal of Conflict Resolution* 61(2): 298–324.

Chenoweth, Erica, and W. S. Christopher. 2020. *List of Campaigns in NAVCO 1.3*. Cambridge, MA: Harvard Dataverse.

Chenoweth, Erica, and Orion A. Lewis. 2013. “Unpacking Nonviolent Campaigns: Introducing the NAVCO 2.0 Dataset.” *Journal of Peace Research* 50(3): 415–23. doi:10.1177/0022343312471551.

Chenoweth, Erica, and Kurt Schock. 2015. “Do Contemporaneous Armed Challenges Affect the Outcomes of Mass Nonviolent Campaigns?*.” *Mobilization: An International Quarterly* 20(4): 427–51. doi:10.17813/1086-671X-20-4-427.

Clarke, Killian. 2011. “Saying" Enough": Authoritarianism and Egypt’s Kefaya Movement.” *Mobilization: An International Quarterly* 16(4): 397–416.

Collier, Paul, and Anke Hoeffler. 2004. “Greed and Grievance in Civil War.” *Oxford economic papers* 56(4): 563–95.

Coppedge, Michael, John Gerring, Carl Henrik Knutsen, Staffan I. Lindberg, Jan Teorell, Nazifa Alizada, David Altman, et al. 2021. “V-Dem Dataset V11. 1.”

Cunningham, Kathleen Gallagher. 2013. “Understanding Strategic Choice.” *Journal of Peace Research* 50(3): 291–304. doi:10.1177/0022343313475467.

Dahl, Marianne, Scott Gates, Kristian Gleditsch, and Belen Gonzalez. 2020. “Accounting for Numbers: Group Characteristics and the Choice of Violent and Nonviolent Tactics.” *Economics of Peace and Security Journal*.

Djuve, Vilde Lunnan, Carl Henrik Knutsen, and Tore Wig. 2020. “Patterns of Regime Breakdown since the French Revolution.” *Comparative Political Studies* 53(6): 923–58.

Fearon, James D., and David D. Laitin. 2003. “Ethnicity, Insurgency, and Civil War.” *American Political Science Review* 97(1): 75–90. doi:10.1017/S0003055403000534.

Gapminder. 2024. “GDP per Capita in Constant PPP Dollars (V30).” https://www.gapminder.org/data/documentation/gd001/.

Gleditsch, Kristian S., and Mauricio Rivera. 2017. “The Diffusion of Nonviolent Campaigns.” *Journal of Conflict Resolution* 61(5): 1120–45. doi:10.1177/0022002715603101.

Goldstone, Jack A. 2001. “Toward a Fourth Generation of Revolutionary Theory.” *Annual review of political science* 4(1): 139–87.

Goldstone, Jack A, L. Grinin, V. Ustyuzhanin, and A. Korotayev. 2023. “Revolutionary Events of the 21st Century: A Preliminary Quantitative Analysis.” *Polis. Political Studies (In Russ.)* (4): 54–71. doi:10.17976/jpps/2023.04.05.

Goldstone, Jack A., Leonid Grinin, and Andrey Korotayev. 2022. “Introduction. Changing Yet Persistent: Revolutions and Revolutionary Events.” In *Handbook of Revolutions in the 21st Century*, Societies and Political Orders in Transition, eds. Jack A. Goldstone, Leonid Grinin, and Andrey Korotayev. Cham: Springer International Publishing, 1–34. doi:10.1007/978-3-030-86468-2_1.

Goodwin, Jeffrey. 2003. “The Renewal of Socialism and the Decline of Revolution.” In *The Future of Revolutions: Rethinking Radical Change in the Age of Globalization*, Zed Books, 59–72.

Grossman, Herschell I. 1991. “A General Equilibrium Model of Insurrections.” *The American Economic Review*: 912–21.

Guriev, S. M., and Daniel Treisman. 2022. *Spin Dictators: The Changing Face of Tyranny* *in the 21st Century*. Princeton ; Oxford: Princeton University Press.

Hegre, Håvard, and Nicholas Sambanis. 2006. “Sensitivity Analysis of Empirical Results on Civil War Onset.” *Journal of Conflict Resolution* 50(4): 508–35. doi:10.1177/0022002706289303.

Honaker, James, Gary King, and Matthew Blackwell. 2011. “Amelia II: A Program for Missing Data.” *Journal of Statistical Software* 45(7). doi:10.18637/jss.v045.i07.

Huntington, Samuel P. 1968. *Political Order in Changing Societies*. New Haven, Conn.: Yale Univ. Press.

Inglehart, Ronald, and Christian Welzel. 2005. *Modernization, Cultural Change, and Democracy: The Human Development Sequence*. Cambridge university press.

Ishchenko, Volodymyr. 2016. “Far Right Participation in the Ukrainian Maidan Protests: An Attempt of Systematic Estimation.” *European Politics and Society* 17(4): 453–72.

Jakobsen, Tor Georg, Indra de Soysa, and Jo Jakobsen. 2013. “Why Do Poor Countries Suffer Costly Conflict? Unpacking per Capita Income and the Onset of Civil War:” *Conflict Management and Peace Science* 30(2): 140–60. doi:10.1177/0738894212473923.

Jones, Zachary M., and Yonatan Lupu. 2018. “Is There More Violence in the Middle?” *American Journal of Political Science* 62(3): 652–67.

Kadivar, Mohammad Ali, and Neil Ketchley. 2018. “Sticks, Stones, and Molotov Cocktails: Unarmed Collective Violence and Democratization.” *Socius* 4: 2378023118773614. doi:10.1177/2378023118773614.

Karakaya, Süveyda. 2018. “Globalization and Contentious Politics: A Comparative Analysis of Nonviolent and Violent Campaigns.” *Conflict Management and Peace Science* 35(4): 315–35. doi:10.1177/0738894215623073.

Katz, Ethan. 2001. “Bias in Conditional and Unconditional Fixed Effects Logit Estimation.” *Political Analysis* 9(4): 379–84.

Keller, Franziska. 2012. “(Why) Do Revolutions Spread?” In *APSA 2012 Annual Meeting Paper*,.

Kennedy, Ryan. 2010. “The Contradiction of Modernization: A Conditional Model of Endogenous Democratization.” *The Journal of Politics* 72(3): 785–98.

doi:10.1017/S0022381610000162.

Ketchley, Neil. 2017. *Egypt in a Time of Revolution: Contentious Politics and the Arab Spring*. 1st ed. Cambridge University Press. doi:10.1017/9781316882702.

Kim, Nam Kyu, and Alex M Kroeger. 2019. "Conquering and Coercing: Nonviolent Anti-Regime Protests and the Pathways to Democracy." *Journal of Peace Research* 56(5): 650–66. doi:10.1177/0022343319830267.

King, Gary, and Langche Zeng. 2001. "Logistic Regression in Rare Events Data." *Political Analysis* 9(2): 137–63. doi:10.1093/oxfordjournals.pan.a004868.

Knutsen, Carl Henrik. 2014. "Income Growth and Revolutions." *Social Science Quarterly* 95(4): 920–37.

Korosteleva, Elena. 2009. "Was There a Quiet Revolution? Belarus After the 2006 Presidential Election." *Journal of Communist Studies and Transition Politics* 25(2–3): 324–46. doi:10.1080/13523270902861038.

Korotayev, Andrey, Andrew Zhdanov, Leonid Grinin, and Vadim Ustyuzhanin. 2024. "Revolution and Democracy in the Twenty-First Century." *Cross-Cultural Research*: 10693971241245862.

Kosmidis, I., and D. Firth. 2009. "Bias Reduction in Exponential Family Nonlinear Models." *Biometrika* 96(4): 793–804. doi:10.1093/biomet/asp055.

Kropko, Jonathan, and Robert Kubinec. 2020. "Interpretation and Identification of Within-Unit and Cross-Sectional Variation in Panel Data Models" ed. Talib Al-Ameri. *PLOS ONE* 15(4): e0231349. doi:10.1371/journal.pone.0231349.

Lall, Ranjit. 2016. "How Multiple Imputation Makes a Difference." *Political Analysis* 24(4): 414–33. doi:10.1093/pan/mpw020.

Lawson, George. 2019. *Anatomies of Revolution*. Cambridge University Press.

Lederer, Emil. 1936. "On Revolutions." *Social Research* 3(1): 1–18.

Lind, Jo Thori, and Halvor Mehlum. 2010. "With or without U? The Appropriate Test for a U-shaped Relationship." *Oxford bulletin of economics and statistics* 72(1): 109–18.

Lipset, Seymour Martin. 1959. "Some Social Requisites of Democracy: Economic

Development and Political Legitimacy." *American political science review* 53(1): 69–105.

Lynch, Marc. 2013. *The Arab Uprising: The Unfinished Revolutions of the New Middle East*. New York: Public Affairs.

Mabon, Simon. 2012. "Kingdom in Crisis? The Arab Spring and Instability in Saudi Arabia." *Contemporary Security Policy* 33(3): 530–53. doi:10.1080/13523260.2012.727683.

MacCulloch, Robert. 2004. "The Impact of Income on the Taste for Revolt." *American Journal of Political Science* 48(4): 830–48. doi:10.1111/j.0092-5853.2004.00104.x.

MacCulloch, Robert, and Silvia Pezzini. 2010. "The Roles of Freedom, Growth, and Religion in the Taste for Revolution." *The Journal of Law and Economics* 53(2): 329–58.

Marshall, Monty G., and Jaggers Keith. 2020. "Polity V Project: Political Regime Characteristics and Transitions 1800–2018." https://www.systemicpeace.org/polityproject.html.

McAdam, Doug, Sidney Tarrow, Charles Tilly, and Sidney G. Tarrow. 2001. *Dynamics of Contention*. Cambridge: Cambridge University Press.

McCarthy, John D., and Mayer N. Zald. 1977. "Resource Mobilization and Social Movements: A Partial Theory." *American journal of sociology* 82(6): 1212–41.

O'Brien, Robert, and Hemant Ishwaran. 2019. "A Random Forests Quantile Classifier for Class Imbalanced Data." *Pattern recognition* 90: 232–49.

Our World in Data. 2024. "Oil Production per Capita." https://ourworldindata.org/grapher/oil-prod-per-capita?time=1901..latest#sources-and-processing.

Przeworski, Adam, Michael E. Alvarez, Jose Antonio Cheibub, and Fernando Limongi. 2000. *Democracy and Development: Political Institutions and Well-Being in the World, 1950–1990*. 1st ed. Cambridge University Press. doi:10.1017/CBO9780511804946.

Przeworski, Adam, and Fernando Limongi. 1997. "Modernization: Theories and Facts." *World politics* 49(2): 155–83.

Rørbæk, Lasse Lykke. 2019. "Ethnic Exclusion and Civil Resistance Campaigns: Opting for Nonviolent or Violent Tactics?" *Terrorism and Political Violence*: 475–93. doi:10.1080/09546553.2016.1233872.

Rubin, Donald B. 1987. *Multiple Imputation for Nonresponse in Surveys*. 1st ed. Wiley. doi:10.1002/9780470316696.

Sala-i-Martin, X. 1997. "I Just Ran Two Million Regressions." 87(2): 178–83. doi:10.3386/w6252.

Schaftenaar, Susanne. 2017. "How (Wo)Men Rebel: Exploring the Effect of Gender Equality on Nonviolent and Armed Conflict Onset." *Journal of Peace Research* 54(6): 762–76. doi:10.1177/0022343317722699.

Schock, Kurt. 2013. "The Practice and Study of Civil Resistance." *Journal of Peace Research* 50(3): 277–90. doi:10.1177/0022343313476530.

Simonsohn, Uri. 2018. "Two Lines: A Valid Alternative to the Invalid Testing of U-Shaped Relationships with Quadratic Regressions." *Advances in Methods and Practices in Psychological Science* 1(4): 538–55.

Skocpol, Theda. 1979. *States and Social Revolutions: A Comparative Analysis of France, Russia and China*. Cambridge: Cambridge University Press. doi:10.1017/CBO9780511815805.

The World Bank. 2023. "The World Bank Databank: World Development Indicators." https://databank.worldbank.org/ (May 25, 2022).

UNDP. 2022. "UNDP: Human Development Reports." *UNDP*. http://hdr.undp.org/en/indicators/103006 (August 5, 2021).

United Nations. 2022. "World Population Prospects." https://population.un.org/wpp.

Ustyuzhanin, Vadim, and Andrey Korotayev. 2023. "Education and Revolutions: Why Do Revolutionary Uprisings Take Violent or Nonviolent Forms?" *Cross-Cultural Research* 57(4): 352–90.

Von Hippel, Paul T. 2009. "How to Impute Interactions, Squares, and Other Transformed Variables." *Sociological methodology* 39(1): 265–91.

Welzel, Christian. 2013. *Freedom Rising: Human Empowerment and the Quest for Emancipation*. 1st ed. Cambridge University Press. doi:10.1017/CBO9781139540919.

Wheaton, Bernard, and Zdenek Kavan. 2018. *The Velvet Revolution: Czechoslovakia, 1988-1991*. New York: Routledge.

Author:
Vadim Ustyuzhanin
National Research University Higher School of Economics (Moscow, Russia). Center for Stability and Risk Analysis. Research fellow;
E-mail: vadim.v.ustyuzhanin@gmail.com;

Any opinions or claims contained in this Working Paper do not necessarily reflect the views of HSE.